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The informed performer : towards a bio-culturally informed performers' practice

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The Informed Performer

Towards a bio-culturally informed performers' practice

The following work presented for this thesis contains, to the best of my knowledge, no material previously published or written by another person, nor submitted for the award of any other degree at this or any other university, except where due reference is made in the text.

This dissertation is written in partial fulfilment of the requirements for the doctoral degree program docARTES of the Orpheus Institute and Leiden University. The remaining precondition consists of a demonstration of the research and its findings in the form of a lecture-performance.

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Abstract

This dissertation is directed at carefully and systematically evaluating the state of musicianship in an age of informative abundance and connectedness, to consider ways of re-balancing its epistemic grounds and attuning its information systems, with a view to artistic development, enrichment and/or liberation, and to put these contextual re-arrangements to the test in practical situations.

Technological advances in our Information Age and the renewed institutional architectures of the European Higher Education Area in recent decades have been rather generous in facilitating access to an abundant amount of knowledge via information, but for some reason(s), musical practice still seems to be reluctant (or unable) to meet the challenge of practically engaging with knowledge and insights generated by an extensive field of practical, academic and para-academic enquiry. The grounds for such a state of affairs seem to be both of an ideological-epistemic nature as well as of a more practical and operational kind. In the dissertation, a conceptual and contextual space is created with regard to the notion of an 'informed performer' where these systemic bottlenecks are discussed and a way forward is proposed under the heading of *a Bio-Culturally informed Performers' Practice* of Western Art Music [BCiPP].

Throughout the investigation, which is primarily meta-practical in its focus, the following elements are proposed in support of such a new conceptual space: 1/ a discipline-specific, activity-based understanding of *information*, one that safeguards the role of imagination and freedom in artistic practice; 2/ a specification of the concept of an *informed performer* by relating it to an active, prospective, and systematic interest in information originating from extra-disciplinary fields; 3/ the creation of a multilevel context that supports the exchange of knowledge via information, stimulates the integration of a theoretical, practical and productive track in musical enquiry, and creates a dedicated research space for *Artistic Information Researchers*; 4/ the interposition of *personal theory* as an experienced-based and processual mediator between theory and practice; 5/ considering *performers' practice* as a performers-centred social practice and as an interconnected array of activities and metapactical/(proto-)theoretical understandings; 6/ the introduction of a bio-cultural approach to music which can function, via a focus on experience, action and interaction, as a common ground between musical practice and *academia*; and finally 7/ a process-oriented topical attractor-model that acts as an information system mediating between a performer's concerns and the abundance of an information galaxy.

The impact of a bio-culturally informed performership on the concerns of score-based musicians is illustrated by presenting two case-studies that pragmatically and consiliently integrate extra-disciplinary information units in score-based performance. On the action-side, the *Quadrant-technique* is proposed as a framework to reflect on the basic stroke(s) in piano-playing. In the field of musical

interaction, the concept of an *Interactional and Bio-topical Performative Analysis* is proposed as an experience- and interaction-based analytical tool to vitalise performances.

Finally, and in conclusion, the concept of a *Bio-Culturally informed Performers' Practice* [BCiPP] is situated within a larger framework of an *Informed Pluralistic and Creative Pragmatism* [IPCP].

Orthography

- Spelling:
 - British English
 - Sources in American English will preserve their original spelling.
 - Greek terms will be introduced in their original spelling (Greek alphabet, not italicized) with their transliteration (ISO basic Latin alphabet, italicized) and translation in English.
- Citation style:
 - APA Format–6th Edition
- As far as reprinted, republished or translated books are concerned, the parenthetical in-text citations will use this model: (Freud, 1923/1961).
- When the original source text is not in English, a translation will be provided either by reference to an existing translation or by own translation. If not indicated otherwise, it concerns a translation by the author.
- Double inverted commas are indicative of ‘within text citations’.
- Single inverted commas are used to indicate citations within a citation or to mark off a word or phrase that’s being discussed.
- Italics are used to indicate book titles, foreign words and phrases, words used as words, and emphases.
- Square brackets indicate:
 - a text or words as found in the original source text.
 - translations.
 - language identification.
 - reference to passages in classical books without a particular bibliographical reference (Plato’s Republic, Augustinus’ Confessions, Kant’s *Kritik der Urteilskraft*, Oxford English Dictionary) e.g. [Plat. Rep. 10.596b], (Kant, 2000, p. 188 [KU §47]), [Aug. Conf. IV.xv.25], [OED, *educated*, 2].
 - own remarks or additional information within quotations.

Acknowledgements

The document before us is a pianist's report on an extensive journey into extra-disciplinary domains of expertise and inquiry and recalls the title of the first piece in Schumann's *Kinderszenen* op.15: *von fremden Ländern und Menschen*. Leaving the piano-studio to explore what a 21st century knowledge society can offer in terms of information also reminds the archetypical *theoros* in antiquity, a member of society, send out to visit other town-states to explore interesting patterns of living and culture. *Theoroi* were of two types: some of them were guided by private interest and lived a life of personal enrichment in terms of ideas and experiences, the 'official' *theoros* however was asked to report back to the polis on his findings and ensuing proposals. Embarking upon a doctoral research at the *Academy of Creative and Performing Arts* in Leiden made me a *theoros* of the second type and was a continuous and structural motivation to punctually recount the findings and insights that I encountered and developed.

I thank the academic and office staff of the *Academy of Creative and Performing Arts* at Leiden University, for their outstanding functional professionalism and support over more than a decade. I value the long-term relation between Leiden University and myself as a *buitenpromovendus* as an ultimate instance of trusted commitment, patience and loyalty.

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Glossary

- Action: a process of doing something which usually involves and integrates elements such as attitudes, beliefs, motivations, intentions, goals, cognition and motor behaviour.
- Affect: an encompassing term referring to a pre-personal and universal way in which the body prepares itself for action in a given circumstance. Within the category of affect at least four affective phenomena can be distinguished: emotion, feeling, mood, temperament.
- Affect attunement: “the performance of behaviours that express the quality of feeling of a shared affect state without imitating the exact behavioural expression of the inner state” (Stern, 1985, p. 142).
- Attractor: a super-concept that acts as a magnet and emerges within a field of initial undisciplined, chaotic and non-linear activity or inquiry.
- Attunement: being or bringing into harmony; a feeling of being "at one" with another being.
- Behaviour: all the activities that living organisms exhibit and which are perceivable.
- Bio-cultural (in a musical context): adopting a bio-cultural perspective with regard to music is to consider the wide variety of musical activities not as phenomena *sui generis* but rather as cultural instances or personal particularisations of the human capacity to meaningfully and intentionally generate and react to temporally patterned sounds.
- BCiPP – Bio-Culturally informed Performers’ Practice: an interconnected array of activities and understandings within the broader category of score-based performership that is underpinned by a shared and active interest in information on generics and particulars in musical action and interaction as a factor in creating a sonic environment from which musical experiences can evolve (the ‘i’ of informed is not capitalised to symbolize its mediating role).
- Bio-topics: frequently encountered (embodied) states of vitality when performing a piece of music.
- Cognitivy fluidity: the capacity to integrate ways of thinking and stores of knowledge from separate intelligences so as to create types of thoughts that could never have existed within a domain-specific mind (Mithen, 2005, pp. 263–264).
- Consilience: from *salire* (lat. ‘to jump’), and *con* (lat. ‘together’); the jumping together of items that appear to be so separate. The type of consilience proposed in the context of BCiPP is consilience between the science of phenomena (biology), their interpretations and situated manifestations (culture) and artistic practice (the sayings and doings of musicians). This type

of consilience is not directed at 'explanation' but at pragmatically and creatively invigorating and freeing the personal theories and beliefs that serve as a background for artistic behaviour.

- Deep learning: a learning process connected to the concept of neural networks. In the sphere of Information Technology, it refers to a particular way in which computers are trained and fine-tuned on the basis of lots of examples rather than by human programming. In score-based performance, deep learning refers to acquiring musical, stylistic and technical proficiency via long-term exposure to a variety of musical scores.
- Diegesis: the telling of a story by a narrator who represents events.
- Dyadic performative focus: (performer-audience) perspective where the focus of the score-based performer is on the effect of musical action on the listener.
- Emotion: relates to a relatively brief episode of coordinated neural, autonomic, and behavioural changes that facilitate a response to an external or internal event of significance for the organism; emotions are the projection/display of a feeling – either genuine or feigned – which expresses our internal state or fulfils social expectations; emotion is often intertwined with mood, temperament, personality, disposition, and motivation. Examples of what are supposed to be universal emotions are anger, disgust, fear, happiness, sadness, and surprise.
- Entrainment: a phenomenon in which two or more independent rhythmic processes synchronize with each other in such a way that they adjust towards and eventually 'lock in' to a common phase and/or periodicity. In music, rhythmic entrainment relates to metre and groove.
- Extra-disciplinary information: information that does not originate in one's own field of expertise. In the context of this dissertation, by 'extra-disciplinary' is meant information that does not originate in the field of musical practice but from other branches of learning or knowledge production. Musical practice is here considered as a discipline or as "a branch of learning or knowledge; a field of study or expertise; a subject" [OED, 'discipline', 7.a.].
- Fallibilism: the thesis that no belief (theory, view, thesis, framework, model) can ever be rationally supported or justified in a conclusive and error-free way.
- Feeling: the subjective representation of emotions; feelings are personal and biographical; they are based on sensation which have been checked against previous experiences.
- GIM – Generally Informed Musicianship: see GIP.
- GIP – Generally Informed Performership: a mental space within the broader category of musicianship where a score-based performer (habitually) orients her/himself in an active, prospective, and systematic manner to information originating from extra-disciplinary fields as a complement to intra-disciplinary paths of artistic training, learning, and development, and

allows this information to potentially make a difference to her/his *Image* of music-making and to the actions and imaginations that build upon that *Image*.

- GIPP – Generally Informed Performers’ Practice: a mental space within the broader category of musicianship where a score-based performer looks in an active, prospective and systematic manner for information originating from extra-disciplinary fields as a complement to intra-disciplinary paths of artistic training, learning, and development, and allows this information to potentially make a difference to her/his *Image* of music-making, and the actions and imaginations that build upon that image. The effectuation of a GIPP builds on the increased transfer-capacity of knowledge in an Information Age, on the integrative turn in education and on a dedicated research space within the framework of Artistic Research.
- HIP – Historically Informed Performance: an orientation in the performance of music that takes historical information (scores, instruments, practices) as a basis for musical action.
- Image: (indicated in italics) a personal world-view (Boulding, 1961).
- Imagery: a technical term that relates to the development of mental images without the presence of an external stimulus.
- Imagination: a term that pertains to the arts and poetics; linked to discovery, invention and originality because it is thought of in relation to the possible rather than to the actual. See also ‘cognitive fluidity’.
- Information (in an artistic context): a difference which (potentially) makes a difference with regard to our personal and collective *Image* related to art production and reception and the actions and imaginations that build upon that *Image*.
- Interactional and Bio-topical Performative Analysis: identifying affordances for musical interaction and communicative musicality in a musical score and linking these affordances to embodied states of mind (bio-topics) of a performer.
- IPCP – Informed Pluralistic and Creative Pragmatism: an epistemic framework that addresses (research-)questions by: 1/ creating a reservoir with personal theories; 2/ locating and gathering punctual information; 3/ organising a stake-holder discussion with the information as intentional object; and 4/ coming to a creative and/or pragmatic way forward, one that includes fallibilism.
- Meta-practical: concerning the practice of reflecting on a practice. Meta-practice provides meanings (formal and informal) by which practitioners understand the work that they do.
- MSP – Main Stream Performance: an orientation in music performance that takes performance tradition (masters and guiding examples) as a main reference.
- Mood: refers to a diffuse affective state that is often of lower intensity than emotion, but

considerably longer in duration – moods are not usually associated with the patterned expressive signs that typically accompany emotion and sometimes occur without apparent cause.

- Mimesis: enactment or imitation of an extra-contextual experience by using the body as a representational canvas (action-metaphor).
- Monadic performative focus: (performer) perspective where the focus of the score-based performer is on self-expression.
- Personal theory: In score-based performance, personal theory refers to a systematic and transmissible understanding gained from reflection on practical experience. It consists of beliefs, opinions, understandings and rules of thumb that have been pragmatically abstracted from particular practical contexts or that have been retained from existing practice traditions and models. Personal theory is the epistemic backbone by which practitioners judge new practice situations and is amenable to revision if new situations necessitate it. If personal theories seem to be unable to provide efficacious answers to practice-based questions, or in cases where reviewing or assessing these personal repertoires is called for, the practitioner will dialogue with extra-disciplinary modes of information, including academic theory.
- Pragmatism: a philosophical tradition that emphasizes the practical consequences that follow from the acceptance of a belief and claims that the value and meaning of a proposition is in the practical consequences that follow upon accepting it.
- Quadratic performative focus: (performer-work-audience-universe) perspective where the focus of the score-based performer is on an element of the universe (persona, flora, fauna, event, habitat) which is presented (mimesis) or represented (diegesis).
- Recontextualisation: a process which is concerned with appropriating discourses and information from extra-disciplinary fields of production, and translating them into the discourse of another field.
- Repertoire (sociology): the set of strategies and their analogic potential that any one individual possesses (Bernstein, 2000, p. 158).
- Reservoir (sociology): the total of sets of strategies that any one individual possesses and its potential to the community (Bernstein, 2000, p. 158).
- Reproduction: the way in which recontextualized knowledge and information is presented in the context of education and pedagogy.
- Resonance: the condition in which an object or system is subject to an oscillating signal having a frequency at or close to that of a natural vibration of the object or system. By behavioural resonance (in the context of music) is meant the corporeal immersion in sound energy, which is a direct way of feeling musical reality.

- SIPP – Scientifically Informed Performers’ Practice: the framework of a scientific approach to musical performance which aims to ground the practice of performing on scientific facts.
- Topical attractor model: information system based on identifying attractors in a field of interest.
- Triadic performative focus: (performer-work-audience) perspective where the focus of the score-based performer is on paying joint attention to an element of the immediate environment (the coded or sonic environment).
- Vitality: the experience of life based on the internal dynamics of one’s own being, something not observable from outside.
- Vitality affects: “those dynamic, kinetic qualities of feeling that distinguish animate from inanimate and that correspond to the momentary changes in feeling states involved in the organic processes of being alive” (Stern, 1985, p. 156).
- Vitality contours: to refer to the manner in which an act is performed and the feeling that directs it.

Abbreviations

A Treatise: *A Treatise of Human Nature* (D. Hume)

AEC: Association Européenne des Conservatoires, Académies de Musique et Musikhochschulen

AERs: Artistic Experimental Researchers

AIRs: Artistic Information Researchers

Anthr: *Anthropologie* (I. Kant)

AR: Artistic Research

ARRs: Artistic Reflective Researchers

B: Bar

BCiPP: Bio-Culturally informed Performers' Practice (the 'i' of informed is not capitalised to symbolize its mediating role)

Conf.: *Confessions* (St. Augustine)

Def.: definition

DIM: *De Institutione Musica* (Boëthius)

DIP: Distal interphalangeal joints

EHEA: European Higher Education Area

Essay: *An Essay concerning Human Understanding* (J. Locke)

GIM: Generally Informed Musicianship

GIP: Generally Informed Performership

GIPP: Generally Informed Performers' Practice

HIP: Historically Informed Performance

IBR: Information Behaviour Research

IPCP: Informed Pluralistic and Creative Pragmatism

KrV: *Kritik der reinen Vernunft* (I. Kant)

KU: *Kritik der Urteilkraft* (I. Kant)

MSP: Main Stream Performance

MCP: Metacarpophalangeal joint

n.d.: no date

OED: Oxford English Dictionary

OLD: Oxford Latin Dictionary

PIP: Proximal Interphalangeal Joints

s.o.: A sense of

SIPP: Scientifically Informed Performers' Practice

Introduction

Playing a musical instrument is generally considered to be a very complex human behaviour involving the integration and coordination of a broad range of human functions such as perception, imagination, memory, information processing, emotion, communication, and dexterity.¹ From this perspective, it seems only reasonable to assume that, in an age of informational and communicational abundance, this intrinsic multifacetedness manifests itself in numerous and systematic informational contact-points between musical practice and a variety of academic and para-academic fields which zoom in on these specific elements of musical activity. Such is not the case today. Scientists and clinical therapists have shown a special and increasing interest in music and musicians in terms of phenomena such as neural plasticity, coordination, expressiveness, memory, attention, perception, cooperation, and creativity but the informational outcomes of these investigations have barely reached the doings and sayings of music practitioners. A look at contemporary conservatoire-curricula, as primary indicators of what counts as valid knowledge in a field², indicates that the theory-side of music performance programmes is primarily concerned with intra-disciplinary elements (harmony, counterpoint, analysis), complemented with a few humanities-oriented disciplines (history, philosophy, liberal arts); only in a few instances, explicit reference is made to more positivist oriented branches of academia (psychology, sociology, physiology)³ and para-academia (Alexander technique, Feldenkrais method). Why is that? And how would an artistic and epistemic environment that promotes an inclusive and more broadly informed musicianship look like?

These are the questions that will guide us throughout this inquiry, eventually leading to the construction of a conceptual framework, being denoted and introduced here as a bio-cultural approach to musical performership. To be clear, a *Bio-Culturally informed Performers' Practice* is at present not one of the received concepts among which a 'historical approach to music performance' (Butt, 2002) is probably the most prominent and familiar one. Thinking of music as a bio-cultural phenomenon, and not merely as a historically or personally contingent one, is to consider the wide variety of musical activities not as phenomena *sui generis* but rather as cultural instances or personal particularisations of the human capacity to meaningfully and intentionally generate and react to

¹ In technical terms (and mainly related to the motor component of playing an instrument): "performing music at a professional level is one of the most complex human accomplishments. Playing an instrument requires the integration of multimodal sensory and motor information, the generation of appropriate action plans, the selection and retrieval of highly refined movement patterns from procedural motor memory, and the initiation of movement" (Altenmüller, Ioannou, & Lee, 2015, p. 90).

² See Bernstein (1971/2003, p. 156) for the role of curricula in the field knowledge production.

³ The results of a sample survey containing 10 conservatoire-curricula are summarized in Appendix 11 (Vanmaele, 2014).

temporally patterned sounds (Cross, 2003a). The *ratio legis* for preferring *performers' practice* over *performance practice* relates to the fact that throughout the dissertation it will be argued that the proximal target domain of information is not the performance but rather the performer. To aspire to a state of bio-culturally informedness as a musician then implies an emphatic interest in universal and systematic characteristics of music making and their relation to the socio-cultural contexts that encircle particular musical acts and decisions. Such an informational attitude does not come without its challenges: the sheer abundance of information is always in need of systematic streamlining, assessment, and transpersonal support and the weighed and delicate balance between information, imagination, experience, freedom, artistry and action is a keystone to informational success in an environment which has its roots in centuries-old traditions of genius and individual and hyper-subjective accomplishment.

Retrospectively, the proto-ideas for developing a generic framework in support of extending the informational scope of musicians emerged as an explicit response to a cascade of unanswered questions that followed the personal confrontation with a partial and chronic motor deficit. These questions naturally and gradually acquired a more generic and formal status within the context of this doctoral research project. The chronicle leading up to this undertaking can be ordered in three overlapping phases of inquiry that to this day leave a clear and implicit imprint on the structure and contents of the dissertation.

An initial cluster of questions ensued from the impact of a pervasive neuro-muscular pathology that engendered a new physical and artistic situation some twenty years ago.⁴ Mentioning explicitly the physical as well as the artistic aspect points to the fact that, from the early start, a strong and unexpected link between degenerative motor functions and artistic transformation became apparent. Not only the body showed signs of automatically induced compensations with regard to muscle activation and fingerings, also the interpretative and artistic choices indicated the search for a new equilibrium. The physical context of altered capacities quasi-automatically led to selecting suitable repertoire and to staying in the realm of the possible as far as technique was concerned. This first phase prompted a logical and primary interest into the mechanics and characteristics of musical movement and, more specifically, their relation to artistic identity. Frustrated by the inadequacy of existing models and expertise (both within and outside the field of artistic practice) to account for the

⁴ Within the study, no further explicit referencing will be made to the personal medical condition that initiated this study since the investigation aims exceeding the personal sphere by extrapolating certain insights into a more general framework. It can be mentioned here that it concerns a pathology called *Multifocal Motor Neuropathy* [MMN] which affects the peripheral motor pathways, gives rise to local conduction blocks [deficits in neuronal signal-transmission] and clinically results in the multifocal [in multiple places] and gradually decrease of muscle strength (Nowacek & Teener, 2013).

complexity and non-linearity of certain bodily and artistic phenomena, the need and ambition arose for creating (no less than) a practical and ecologically valid model of music performance. Based on the initial insights related to my own practice as a performer, the model gradually broadened its scope within the context of my work as a piano-teacher and through the extra-disciplinary⁵ exploration of the scholarly work which is often only distally related to these issues.

Parallel to an initial focus on what will be discussed in the final chapters under the heading of 'action', a new set of questions surfaced when it became clear that an isolated understanding of musical action was inadequate when separated from the context in which such an action produces its effects. The triangular relation between composer, performer and audience came in view and required an orientation towards the notion 'inter-activity', implying some basic properties of music making such as perception, action-effect coupling, communication, entrainment, and narration. This interactive turn constituted a second phase in the inquiry and brought about new insights into the characteristic properties of performing Western Art Music and its relation to other forms of 'musicking' (Small, 1998). Finally, an important meta-question came to the fore, rooted in the expertise acquired throughout the previous phases, and giving a final and meta-practical impetus to the investigation before us. Digging into the fields of 'action' and 'interaction' led to a multitude of disciplinary directions going from psychology, philosophy, neurology, musicology and sociology and resulted in a personal information base containing more than 7000 items (books, articles, essays, presentations, summaries, reviews). This hunter-gatherer strategy only offered limited support to the quest for a more systematic and pragmatic understanding of music performance; the Gutenberg Galaxy of information (McLuhan, 1962), related to the topics action and interaction was simply too vast and too fragmented to be digested by a solitary informavorous fox⁶ (Berlin, 1953/1997; Miller, 1983). The bottom-up diet of the hunter-gatherer was set to be supplemented with the structural systematics of a sedentary lifestyle grounded within the permeable boundaries of artistic practice.

The following question arose: how can artistic expertise relate meaningfully and pragmatically to information and understandings that have their origins in the traditional sciences and the humanities, realizing moreover that the latter two parties have been struggling for centuries with issues of coherence of their own (Bendegem, 2009; Berlin, 1980; Snow, 1961)? This meta-question brought to mind cognitive scientist Mark Turner's observation in his prologue to *The Artful Mind*:

⁵ Extra-disciplinary information is information that does not originate from one's own field of expertise. In the context of this dissertation, by 'extra-disciplinary' is meant information that does not originate from the field of musical practice but from other branches of learning or knowledge production. Musical practice is here considered as a discipline or as "a branch of learning or knowledge; a field of study or expertise; a subject" [OED, 'discipline', def. 7.a.].

⁶ Isaiah Berlin discusses in this essay 'the fox and the hedgehog' two types of researchers and quotes thereby Aeschylus: "The fox knows many things, but the hedgehog knows one big thing" (Berlin, 1953/1997, p. 436).

The individual human being, in form and movement, in thought and action, is a seamless intersection of powerful histories—phylogenetic history, individual development, and social and cultural history—all profoundly influential. A human being is a unified agency of biology, psychology, and social, environmental, and cultural patterns. And yet, the academic study of human beings is fragmented into scattered disciplines. How can science overcome this academic incoherence to launch a tradition of research in which neuroscientists, cognitive and developmental psychologists, archaeologists, vision scientists, evolutionary theorists, artists, art historians, semioticians, sociologists, and cultural historians join to explain the artful mind and its expression in cultures? How, in short, can inquisitive twenty-six-year-olds inspired to explain the artful mind discover a unified intellectual framework and institutional setting in which to begin thinking about it? (Turner, 2006, p. xvi)

Turner does not explicitly provide an answer to these questions in his book – not even in the epilogue – but seems to sympathize with a direction leading to what will be introduced further in this study as a bio-cultural and dialogical approach. That is, a perspective that does not advocate a deterministic integration of all knowledge and information but rather the pragmatic connection or linkage (consilience) of disciplinary-based information in new contexts whereby each unit of information allows for new practical and dispositional orientations. The image came to mind of a framework that enables musical practitioners to organize their shared and often unsystematic, tacit expertise around some well-chosen and explicit attractors or *topoi*, and, serves as a base of operations for a guided dialogue with the cross-disciplinary world of which it is a part.

With the formulation of this meta-practical⁷ objective we are coming to the end of an archaeological exploration into the circumstances that led to the work that will be presented hereafter. We can therefore switch to the present tense now and focus on the journey that lies ahead. This dissertation is an attempt to carefully and systematically evaluate the state of musicianship in an age of informative abundance and connectedness, to consider ways of re-balancing its epistemic grounds and attuning its information systems, with a view to artistic development, enrichment and/or liberation, and to put these contextual re-arrangements to the test in practical situations. Thirteen chapters, organized into three 'PARTS' will actualize this ambition.

The aim of PART I is to arrive at delineating the essential contours of an *Informed Performership*. To that aim, the concept of information, which is pivotal in this investigation (but underdetermined in musical practice), is approached from three different angles: the presence of an informational vocabulary in musical discourse, the role of information in the history of words and ideas, and the generic dispositional presence of informational elements in human behaviour. Chapter 1 ignites the enquiry by setting the scene and anticipating a dialogical conversation between the semantic spectrum

⁷ The practice of reflecting on a practice. Meta-practice provides meanings (formal and informal) by which practitioners understand the work that they do (Usher, Bryant, & Johnston, 2003, p. 390).

that surrounds information and the one that is attached to its alleged counter-term, imagination. The *pas-de-deux* between these two conceptual fields will be a *Leitmotiv* throughout the investigation in PART I. Following these initial observations and field delineations, Chapter 2 is concerned with tracing the practical meaning and use of information in discourses related to three selected performance backgrounds: Historically Informed Performance [HIP], Scientifically Informed Performers' Practices [SIPP], and the field of Main Stream Performance [MSP]. These practice-specific understandings will provide basic insights with regard to the varied use, the mechanics and the practical implications of information in the context of score-based performance. Chapter 3 aims at opening the conceptual horizon by revisiting the conceptual duality between information and imagination and extensively spading into the history of words and ideas for perspectives that challenge the *status quo* and align with the concerns of musicians. From the extended investigation into a manifold of possible configurations between information and imagination, the keystones will be selected for modelling the role of information in an artistic context.

Chapter 4 is evolutionary, developmentally, and behaviourally oriented. An excursus into the evolution and ontogenetic development of information and imagination has the objective of finding trans-cultural features which relate to the affiliation between these particular human capacities. The study on information behaviour is a relatively new strand of enquiry but shares the objective of finding common ground that ties the variety of cultural approaches together. The three perspectives on information (practical, historical, behavioural) will be taken into account when proposing a tailor-made and operational understanding of information in a musical environment in the final chapter of PART I which concludes by prompting the next question: is it conceivable to extend the projects of SIPP and HIP into a more Generally Informed Musicianship [GIM] where the information-base of musical performers is broadened into the direction of extra-disciplinary fields such as sociology, psychology, biology, physics?

The three chapters in PART II are contextual and assess the viability of such an inclusive musicianship by presenting three contemporary contexts that seem to be conducive to such a shift. At a *macro*-level the *Information Age*, in all its theoretical, technological, and socio-economical aspects, has led to an explosion in the fields of information and communication and affords new epistemic configurations. The essential tenets and affordances of an *Information Age* will be systematically analysed, and two corollaries ('scientification' and 'information overload') will be touched upon to achieve a more elaborate discussion in PART III.

At a *meso*-level, the project of a European Higher Education Area [EHEA] ushered in new prospects for the integration of professional and academic expertise. It will be argued that this institutional upheaval allows and stimulates a confluence and re-arrangement of three main historical currents in music –

music as theory, music as education and music as craft – and thereby opens the possibility for supra-disciplinary integration.

Finally: at a relative *micro*-level, the concept of Artistic Research will be identified as a facilitating and stimulating context, allowing for reflective, experimental and informational developments within musical practice.

In PART III the tone of optimism, present in the foregoing section, is counterbalanced by reviewing and analysing three bottlenecks that seem to hamper the development of an integrated musicianship. The time-honoured gap between theory and practice is a usual suspect in this domain, and will be situated both historically and behaviourally. A pragmatic way out of the apparent deadlock situation is proposed by positing an extended understanding of the concept of *Performance Practice* into a *Performers' Practice* – a socio-cultural practice where performers instead of performances are the intentional objects – and by introducing a third and mediating party: *personal theory*.

The second bottleneck concerns the epistemic status of musical practice. The position of the performing musician has undergone several historical revolutions (paradigm-shifts) until it acquired the status of an autonomous field with a focus on composed works, traditions, and hermetic, transcendental categories. Treating music as a bio-cultural phenomenon offers an alternative platform which allows for intra-, inter-, trans- and supra-disciplinary dialogue and connections.

Finally, a very practical but essential element of concern, already raised in PART II, is revisited. Information in its free-floating and not yet meaningfully imbedded capacity creates systemic overload and often inhibits practical integration, both on an individual and collective level. A topical attractor model of musical performance based on 'action' and 'interaction' is presented in Chapter 11 as an open-ended prototype of an information system that identifies, prioritizes and links certain conceptual magnets/attractors within a chaotic field and can function both as an information reservoir and as a problem-solving utility.

In PART IV, the elements of a *Bio-Culturally informed Performers' Practice* are revisited with a view to activating and operationalizing the action-interaction model by means of two case studies. The first study zooms in on a punctual component of instrument-directed action: the basic stroke in piano-playing. Information units from a variety of research fields are linked and add to the construction of an informed theory on the possibilities of striking a note on the piano in an efficient and expressive way. The second example is situated in the sphere of performative analysis and imagination: 'feeling the score' builds on the framework of topic theory and communicative musicality to construct elements for an *Interactional* and *Bio-topical Performative Analysis* that takes different forms of vitality as a point of departure.

From the chapter-overview above it can be deduced that the investigative project presented in this dissertation is not atomistic in nature, that it is not directed at understanding a small unit of musical practice but, on the contrary, that it involves a holistic and meta-practical outlook on a vast field of interest, accompanied by a focal ambition with regard to creating the epistemic and practical conditions that allow musicians to integrate relevant information into their practice. This straddle – which is an intrinsic part of the undertaking – calls for a few preliminary elucidations and disclaimers:

- The coverage of a vast field of expertise is inherent to the inquiry. An exhaustive investigation into all the elements that pertain to these domains (consultation of all primary and secondary sources) evidently exceeds the scope of this dissertation and, above all, the processing capacities of a single researcher. Personal expertise in the field of musical performance will at times be invoked to justify certain choices and selected references. From an academic point of view this may seem to be an easy way out, but as it will be argued in the Chapter 9, personal theory and the unique view of someone who is doing it, is a crucial and indispensable element in pragmatically overcoming the theory-practice gap.
- (Re-)connecting musicianship with a broader field of study, and stimulate discussion on a supra-, inter-, intra-, cross-, and trans-disciplinary level requires next to the invocation of personal theory also dialogue. In support of that requisite, the text will be rather generous in providing quotations, footnotes and bibliographical references. The use of quotations is an indispensable and a performative part of such a dialogical outlook and recalls the methodology used by the pioneering authors of the Historically Informed Performance movement.
- Although certain elements and mechanisms in this study may be transferrable to a variety of musical activities (composing, improvising, performing) and musical styles, there is an ultimate focus on the performance of Western Art Music. The horizon will in some instances extend to musicianship in general, or narrow down to the performance of music for piano; the intention however is to keep with the bandwidth of score-based performance as far as the applicability of the framework is concerned. The focus on the tradition of Western Art Music implies a confinement of the research-perspective to the aesthetic realm and the ritual relationship between performer and audience rather than addressing larger social and political dimensions in artistic practice.
- The methodology that goes along with an enquiry of this nature and extent is (necessarily) eclectic, varied, tailor-made, and mainly driven and measured by the effectiveness of its outcomes in the practical field. Punctual methodological clarification will be provided throughout the investigation, but in general, a balance is envisioned between a bottom-up approach (literature review, collection, inventarisation, personal experience, primary sources)

and a top-down perspective (survey of existing theories, overviews, and categorisations in the field). The prominence of a literature review method rather than a more empirical or experimental approach – which is more common in practice-based research – resonates with the performative aspect of the dissertation and the general claim with regard to importing and relating to extra-disciplinary fields of enquiry.

- As far as the bottom-up track is concerned, there is a distinctive bias towards performing music that is written for piano solo; this focus relates to the specific expertise of the enquirer. The top-down approach is in most cases in synchrony with the epistemic orientation of the dissertation and holds on to a bio-cultural perspective, linking contemporary understandings to historical and behavioural (pre-historical) ones.
- Information systems and translations (heuristic devices, chronological overviews, models) will be used on a functional basis in order to enhance the digestibility of certain elements. There is awareness concerning their inherent limitations with representing an all-encompassing picture of discipline-specific discourses but as they are helpful mediators in introducing and navigating through proximal and distal fields of interest, their development and inclusion in the text is also vital element of the journey.
- This investigation does not offer definitive and clear-cut solutions. Some of the issues that will be discussed (e.g. theory-practice divide, information overload) have haunted mankind for centuries, and it would be more than presumptuous to claim that in the following pages a 'solution' to these 'problems' is presented. The enquiry only claims to create within the context of the twenty-first century an open-ended and effective framework that pragmatically addresses certain persistent challenges that have hitherto hampered fruitful contact with informational elements that are potentially relevant but out of reach to musicians.

The research presented hereafter is part of a larger programme that aims at creating contact-points between musical practice and extra-disciplinary expertise via the medium of information. The programme as such seems at first sight to be much like the 'projects' that *romancier* Daniel Defoe defines in *An Essay Upon Projects* (1697/1887) as "a vast undertaking, too big to be managed". It will be argued however that a bio-cultural approach to music performance can meet the managerial challenges if it is considered as a 21st-century-bound opportunity that is in need for facilitation in terms of epistemic and practical dispositions in order to fully emerge and develop. Within this larger context, the ambition of the contribution that is presented hereafter is to demonstrate that an information-strategy can be beneficial to performing musicians if information is well understood in its limitations and affordances and if it is accompanied by adequate information-systems. When these conditions are met, a *Bio-Culturally informed Performer's Practice* can legitimately situate itself alongside existing or

emerging socio-cultural, academic and artistic currents and is able to give direction to a number of practical questions that occupy the minds and bodies of performers. In that capacity, it holds an interesting potential as an inclusive and inspirational framework for future artistic and pedagogical work.

PART I: The informed performer – a conceptual exploration

Words and concepts have the capacity to create mental spaces (Fauconnier, 1994)⁸, spaces that can be navigated through whenever decisions are to be made, new questions present themselves, or simply when new horizons are being explored. The space of ‘information’ and ‘being informed’ generally comes in view whenever the communication of knowledge between two or more parties (individuals, groups, practices, services) is at stake. Information is then considered to be a mediating currency in a process that liberates situated and embodied knowledge⁹ from its particular context and makes it broadly available. In relation to musical performance where romantic categories such as originality, genius, autonomy, creativity, imagination, subjectivity and virtuosity are still very influential, being or aspiring to be an informed musician may seem to be a rather dull, second-order and slightly paradoxical ambition: are not the ones to be remembered in artistic practices primarily those who initiate paradigm-shifts, get rid of existing frameworks, and ‘form’ new ways of artistic thinking? Is artistic practice in general terms not more about creating and imagining possible worlds rather than being informed about an actual and verifiable world?

In PART I, the apparent tension between information and artistic practice is examined by following a three-stage path which takes us from practical understandings by music practitioners (Chapter 2), to a more generic and intellectual history of terms and ideas (Chapter 3), and finally, to an evolutionary, developmental, and behavioural perspective on the concept of information (Chapter 4). Concluding PART I, and building on the foregoing analyses, a discipline-specific, tailor-made and provisional understanding of ‘information’ in the practice of performing scored music will be proposed and discussed; one that is directed at safeguarding and balancing individual freedom and imagination against the virtues and vices of being informed.

Next to the ‘what?’-question of informed performership, also a secondary and more practical issue is an intrinsic element of PART I. Living in an Information Age seems to hold a promise of unprecedented access to knowledge via information leading to the relative irrelevancy of discipline-oriented *Bildung*, and the facilitation of crossing of disciplinary borders (Lyotard, 1979). But is this really the case? How does an extra-disciplinary information galaxy behave when a musician is interrogating it? And what does it offer in terms of added value? These underlying questions are being put to the test in PART I

⁸ Gilles Fauconnier refers to mental spaces as “small conceptual packets constructed as we think and talk, for purposes of local understanding and action” (Fauconnier & Turner, 2003, p. 40).

⁹ I am aware of the pleonastic use of the adjectives ‘situated’ and ‘embodied’ in relation to ‘knowledge’ but since we have not made clear distinctions yet, it seems reasonable to allow these adjectives here. ‘Embodied’ means here ‘structured by the body with its sensorimotor capacities’ and pertaining to an individual knower; ‘situated’ refers to the link between knowledge and environment (natural, cultural, social).

by ‘performing’ them. Throughout the investigation, disciplinary borders will be crossed by involving epistemic terrains that seem at first sight not to pertain to a musician’s primary epistemic horizon (linguistics, philosophy, evolutionary theory, psychology). This may lead to a certain extensiveness *qua* volume and detail (especially in Chapter 3) but the assessment of this performative element will serve as a frame of reference for the contextual (why?), practical (how?) and operational aspects of an informed performership that will be addressed in PARTS II, III, and IV.

Chapter 1: Setting the scene for an informed performership

Unlike concepts such as ‘authenticity’¹⁰, ‘interpretation’, ‘creativity’, ‘emotion’, or ‘musical work’, the notion of ‘information’ has hardly been the object of any in-depth analysis in the field of music performance.¹¹ Information entered the musician’s vocabularies most prominently – but at the same time also rather haphazardly and informally – in the context of ‘Historically Informed Performance [HIP]’, where it came to the fore as an alleviating alternative to the contested ideology of ‘authentic’ or ‘period’ performances. Being ‘historically informed’, ‘historically aware’, ‘historically minded’¹², ‘historically-oriented’¹³, ‘historically inspired’¹⁴, ‘historically-alert’¹⁵ was introduced to protect musical performance against an ideological regime of utopian and scholarly totalitarianism and to reclaim (mental) space for artistic imagination, freedom and interpretation. Indeed, not an insignificant ambition to be accomplished by just one word. In a well-known critique on authenticity in Early Music, musicologist Richard Taruskin is not convinced for this single term to make a significant difference:

A retreat into euphemism can be observed. The American Musicological Society, in its guidelines to the Noah Greenberg Award, now uses the term ‘historically-aware’. The New York concert series ‘Music Before 1800’ has used ‘historically accurate’ in its promotional literature. At Oberlin, ‘historically informed’ is the going phrase. But these ersatz shibboleths will not achieve a cease-fire, if that is their intent, for they still imply invidious comparison with what is unaware, inaccurate, and un-or misinformed. (Taruskin, 1988, pp. 139–140)

Taruskin’s argument is prolonged by philosopher Peter Kivy in ‘On the Historically Informed Performance’ (Kivy, 2002), one of the few papers that critically interrogates the surplus value of being informed. The crucial question that preoccupies Kivy’s philosophical and analytical considerations is the target domain of information. Is it the performer who is informed, or rather the performance? If the former is the case, Kivy asserts that “one could be as historically informed as you like, but completely rejecting of that historical knowledge as a guide to performance” (Kivy, 2002, p. 132). In

¹⁰ Ton Koopman claims a resembling process regarding the introduction of ‘authenticity’ when stating “*Niemand weet trouwens zeker wie het woord ‘authentiek’ heeft bedacht. Waarschijnlijk is het afkomstig van de platenindustrie in de jaren zestig van de vorige eeuw.*” (Koopman, 2008, p. 3) [“nobody knows for sure who came up with the word ‘authentic’. Probably, it has its origins in the recording industry of the 60’s in the previous century”]; the analytical follow-up of the term however has undoubtedly been of a more deliberate nature (Fabian, 2001a; Kivy, 1997; Taruskin, 1988).

¹¹ A precise and formal use of the term (one that refers to elements of information theory) was initiated in the context of music theory, psychology and aesthetics (Eco, 1989; Meyer, 1957; Overill, 2012) but its impact on musical practice and discourse has been rather limited. The information processing paradigm as it is known in cognitive psychology will reappear in Chapter 4.

¹² Kerman, 1985, p. 185. Kerman suggests ‘contextual’ as a valuable substitute for ‘authentic’ (Kerman, 1985, p. 192).

¹³ See Walls (2003, p. 1).

¹⁴ See Walls (2003, p. 10).

¹⁵ See Walls (2003, p. 146).

that case, the impact of being informed is either irrelevant or trivial: “it certainly sounds nice to be informed. Who could object to that?” (Kivy, 2002, p. 130). If, on the other hand, performances are to be “formed, stamped, impressed, and imbued with performance history” (Kivy, 2002, p. 138) – Kivy refers here to a definition in the Oxford English Dictionary¹⁶ – then there seems to be no difference between a historically authentic and the more liberal notion of a Historically Informed Performance. In both cases, performers will operationalize the available information to the fullest extent possible, but will necessarily have to invoke personal taste in judgement where information is not available or incomplete.

Leaving the specific context of Early Music aside and approaching the issue from a broader perspective philosopher Walter Benjamin expresses in a 1936 essay a fundamental scepticism concerning the value of information in an artistic context (*in casu* storytelling), and argues that information, by its self-evident character, seems to be at odds with traditional practices of storytelling:

Information [...], lays claim to prompt verifiability. The prime requirement is that it appears ‘understandable in itself’. Often it is no more exact than the intelligence of earlier centuries was. But while the latter was inclined to borrow from the miraculous, it is indispensable for information to sound plausible. Because of this it proves incompatible with the spirit of storytelling. If the art of storytelling has become rare, the dissemination of information has had a decisive share in this state of affairs. (Benjamin, 1936/2007, p. 89)

Physicist and philosopher Carl Friedrich von Weizsäcker confirms in his essay ‘*Information und Imagination*’ (Weizsäcker, 1973) the difficult position of information in an artistic setting by pointing to the epistemic and classical origins of the term. He juxtaposes ‘information’ to ‘imagination’, referring to the Platonic framework where ‘to in-form’ designates the materialization and bringing into existence of eternal and everlasting Forms¹⁷, and where – in Weizsäcker’s thought – ‘imagining’ is seen as a counter-term (*‘Gegenbegriff’*) referring to a mere and second-order imitation (*‘mimesis’*) of already materialized ideas.¹⁸ In this setting, ‘information’ relates to our modern conception of rational and scientific truth and is considered to be superior to ‘imagination’, a notion more characteristic of artistic discourse. Weizsäcker bequeaths the information-imagination dialectic a central place within

¹⁶ Kivy refers to the second definition of ‘to inform’ in the OED; in the current edition of the dictionary it is meaning III that defines ‘to inform’ as: “To give form or determinant character to”.

¹⁷ ‘Form’ will be capitalized when it refers to its metaphysical meaning within the context of pre-modern philosophy.

¹⁸ “*im Sinne der platonischen Philosophie bedeutet Information Einformung. Sie bedeutet, einer Form einen Leib zu geben, also ein Ewiges Unvergängliches zur Erscheinung zu bringen*”. [“In platonic philosophy, information means ‘giving a form to’. It means, giving a body to a form, making apparent something eternal and everlasting”] (Weizsäcker, 1973).

Western cultural and intellectual history and holds it to be the primary cause of the arduous relation between the arts and the sciences.¹⁹

Even these selected comments seem to concur with a view of a tenacious and longstanding tension between the space of information and the one that encircles artistic practices: information is usually linked to a realm of objectivity, rationality, truth, science, yes- and no-answers, and factual knowledge about an actual world, whereas artistic practices are more readily situated in the realm of subjectivity, intuition, personal knowledge, imagination, interpretation, emotion, and the creation of possible worlds.

A look into more dedicated work (MacKay, 1969; Seiffert, 1971; Capurro, 1978; Machlup & Mansfield, 1983; Rowley, 1998; Madden, 2000; Capurro & Hjørland, 2003; Bates, 2010a; Burgin, 2010; Floridi, 2010; Lenski, 2010; Adriaans, 2013) learns that although information is frequently used in colloquial conversation in the sense of ‘knowledge communicated’²⁰, information, as a concept, suffers from the age-old semantic syndrome that St. Augustine identifies in relation to time: “What, then, is time? If no one asks me, I know what it is. If I wish to explain it to him who asks me, I do not know” (St. Augustine, CE 397-400/1955, bk.11 ch.14). Seasoned experts in the field attest that “[information] is a term that has been defined in countless ways, over many decades” and that “it would be fair to say that there is no widely agreed-upon definition or theoretical conception of the term” (Bates, 2010a). More concretely:

The notion of information has been taken to characterize a measure of physical organization (or decrease in entropy), a pattern of communication between source and receiver, a form of control and feedback, the probability of a message being transmitted over a communication channel, the content of a cognitive state, the meaning of a linguistic form, or the reduction of an uncertainty. These concepts of information are defined in various theories such as physics, thermodynamics, communication theory, cybernetics, statistical information theory, psychology, inductive logic, and so on. There seems to be no unique idea of information upon which these various concepts converge and hence no proprietary theory of information. (Bogdan, 1994, p. 53)

The basic phrase ‘What is information?’ seems to be on the same level as: What is energy? What is matter? What is life? The question is very hard to answer, although it is addressed in numerous fields

¹⁹ He proceeds with a critique of empiricism and specialization in the natural sciences with a view to reconciling the terms and to attribute an important role to imagination in physics. According to Weizsäcker, the natural sciences seem to have lost their capacity to see the overall picture of things (“das grosse Ganze, [...] wird in Stücke zerlegt” p. 19) and, in order to compensate for that loss, they are in need of an art of imagination as a capacity to think holistically (“das Vermögen, ein Ganzes zu denken” p. 28).

²⁰ “The imparting of knowledge in general” [OED: Information II].

from physics, biology, neuroscience, cognitive science, electrical engineering and psychology to philosophy, economics, and humanities (Spink, 2010, p. vii). One way to account for the versatility of the term is to consider information from a historical perspective. ‘Information’ has a long and complex history²¹ and according to media historian and social theorist John Durham Peters, “four main forms of life” can be discerned in connection with the notion of ‘information’, “traveling from the late medieval schools through the essays of the British empiricists to the statistical data of state bureaucracies and today’s computer technology” (Peters, 1988, p. 10)²².

Based on its pre-classical use in the context of pottery, poetry, and visual perception, information (and its analogues in Latin and Greek) initially takes part in a vocabulary that describes how matter is “imbued with the intelligible order of Forms” (Peters, 1988, p. 11). In antiquity’s cosmology, perfect order is to be situated in nature, either in a separate realm of Ideal Forms (Platonist dualism – *universalia ante res*) or in the things themselves (Aristotelian hylomorphism – *universalia in rebus*). Understanding the in-formed world and living a good life then, is a matter of (rationally) contemplating and imitating that perfect order of Forms, not one of creatively contributing to it. This first form of life spans from antiquity until the late Middle-Ages and is still included in the OED with the indication ‘now rare’.²³

In the seventeenth and eighteenth centuries, the theory of pre-existing eternal forms gradually loses ground in favour of the doctrine of empiricism and the centrality of sense perceptions in epistemic development. “The universe as described by Newton, particularly, is no longer in any sense a place of peace and harmony; rather it is a world of blind forces and collision” (Ferry, 2011, p. 109). Within that framework, information’s second life-form is initiated: disordered information comes to refer to “the fragmentary, fluctuating, haphazard stuff of sense” (Peters, 1988, p. 13) and in the absence of a fixed amount of pre-existing ideas, the increase of (probable) knowledge is only possible on the basis of acquiring an increasing amount of isolated sense experiences (Adriaans, 2013). Instead of nature, the human mind becomes the central ordering principle and, by this subjective turn, also the primary target of informational processes (instead of material entities in antiquity).

²¹ Probably due to this complexity, the history of information as a term has received only limited and specialized attention. There’s no ‘information’-lemma in *the New Dictionary of the History of Ideas* (Horowitz, 2005). The most extensive and seminal analysis is to be found in Capurro’s *Information: ein Beitrag zur etymologischen und ideengeschichtlichen Begründung des Informationsbegriffs* (Capurro, 1978). Other, more modest, references include: Adriaans, 2013; Capurro, 2009; Capurro & Hjørland, 2015; Peters, 1988; Seiffert, 1971.

²² Rather surprisingly, Peters does not refer to the 1978 analysis of Capurro (Capurro, 1978); in a more recent publication on the concept of information (Capurro & Hjørland, 2005, p. 351), Capurro and Hjørland lend support to meta-analysis by Peters (see also: Adriaans, 2013).

²³ “The giving of form or essential character to something; the action of imbuing with a particular quality; animation (esp. of the body by the soul)” (Oxford English Dictionary, n.d.). Kivy invokes and resuscitates this archaic definition in his discussion on informed performances (Kivy, 2002, p. 133).

The operationalization of statistics in the 19th century extends the communication of informational elements beyond an individual's own limited field of experience (Capurro & Hjørland, 2003, p. 354) and marks a third form of life.

A final and fourth stage in the evolution of information as a concept sets in with Shannon's publication of *A Mathematical Theory of Communication* (Shannon, 1948), where it is asserted that information is not a measure of meaning but of pure quantity.²⁴ By this ultimate degree of abstraction, new techniques for manipulating data as systems are imagined, leading to the accomplishments of our contemporary network and information society.²⁵ Information is all around now and gets discipline-specific meanings in various disciplinary fields such as biology, psychology.

'Big data' is one of the more recent sprouts of the information age in the 21st century (potentially a fifth form of life) and challenges the subject-centred orientation that characterizes modernity.

[the phenomenon of big data] critically explores new forms of empiricism that declare 'the end of theory', the creation of data-driven rather than knowledge-driven science, and the development of digital humanities and computational social sciences that propose radically different ways to make sense of culture, history, economy and society. (Kitchin, 2014)²⁶

It is remarkable that information's alleged counter-term 'imagination' seems to befall a similar fate in terms of definitional vagueness and historical versatility:

One question may be left surprisingly unanswered – or at least insufficiently answered – [...], namely, the question of what imagination is. Interestingly, this question has proved remarkably difficult to answer – so much so, in fact, that many authors [...] explicitly refrain from even trying to do so. Rather, they rely instead on our intuitive understanding of the phenomenon under discussion. [...] one might worry that there is no single conception of imagination in play in philosophical discussions and that philosophers have relied on importantly different conceptions in putting imagination to work in different philosophical contexts. This worry has recently been given colourful expression by Noël Carroll, who notes that imagination has become "the junkyard of the mind" – a place where everything gets thrown in. (Kind, 2016, p. 1)

The extensive bibliographical corpus that deals with the historical development of the term 'imagination'²⁷ – a line of scholarship that is not usually linked to the one of information – presents a

²⁴ "The fundamental problem of communication is that of reproducing at one point either exactly or approximately a message selected at another point. Frequently the messages have meaning; that is they refer to or are correlated according to some system with certain physical or conceptual entities. These semantic aspects of communication are irrelevant to the engineering problem. The significant aspect is that the actual message is one selected from a set of possible messages" (Shannon, 1948b, p. 379).

²⁵ Peter's overview predates the era of the World Wide Web. The increase in connectedness of information however is not a conceptual turn in the meaning of information, but a consequence of this final form of information.

²⁶ See also Hofstetter (2014).

²⁷ Unlike 'information', 'imagination' is represented by a lemma in *the new dictionary of the history of ideas* (Barth, 2005).

semantic trajectory that in many ways mirrors the four lifecycles of information (Bundy, 1927; Welch, 1935; Warnock, 1978; Kearney, 1988; Watson, 1988; White, 1990; Kearney, 1998; Brann, 1993; McLean, 2008; Schlutz, 2009; Kind, 2016). Imagination makes one of its first formal and textual appearances in the biblical *passuses* that are dedicated to divine creation (or ‘information’ – in the archaic sense) and warn against human image-making.²⁸

It is in Plato’s dualistic ontology that a formal differentiation between ‘Forms’ – as elements of an eternal world of being – and ‘images’ – as belonging to a phenomenological world of becoming – is really set in motion. The overall picture is one that institutes a dominating role for eternal ‘Forms’ vis-à-vis second-order ‘things’ in nature and third-order ‘images’ created by artists.²⁹ As an impoverished reflection of the perfect cosmological order of Forms, imagination is situated in the mimetic realm (Kearney, 1988).

With the advent of modern philosophy and in quasi-synchrony with the birth of information’s second form of life, the tables start to turn: “the predominant metaphor of the mind as a mirror reflecting external reality” begins to wane in favour of that of “the mind as a lamp which radiates its own inner light on to the objects it perceives” (Cocking & Murray, 1991, p. v; see also Abrams, 1953). This new constellation allows for imagination to be creative instead of imitative and enables the concept of productive imagination to take root.

Initially, objective form and subjective imagination are still carefully balanced in Kant’s transcendental idealism but his synthesis paves the way for differential interpretations in the 19th century, creating a rift between the arts and the sciences and eventually leading to the apex of creative and productive imagination in romanticism: “the artist is no longer seen as a craftsman-like imitator of nature, but as an inspired genius who brings new worlds into being, spontaneously generating original creations out of the depths of his own mind” (Cocking & Murray, 1991, p. v).

The twentieth century, then, is characterized by a distrust in idealistic, creative and author-centred imagination, and a transition into existential³⁰ (Kearney, 1988, pp. 196–248) and post-modern, parodic variants of imagination³¹ (Kearney, 1988, pp. 251–298) sets in:

Talk of authentic expression becomes precarious to the extent the image itself usurps that reality it was intended to represent. Yet since the postmodern imagination is acutely aware of this irony, its paradigm is best described as a labyrinth of mirrors. The image of the labyrinth is meant to convey a mimesis gone wild, a reflection of reflection, a pure reflexivity without

²⁸ In the second commandment of the Decalogue: “Thou shalt not make unto thee any graven image” (Exodus 20 :4 ; Deuteronomium 5 :8) and in the book Genesis where imagination is related to the divine power of creating man from the dust of the earth [Genesis 2 :7] (Horowitz, 2005, p. 1102).

²⁹ Works of art are imitations of things in nature, and things in nature in turn are imitations of the Ideas in the world of Ideas. Thus works of art are “three removes from reality” [Plat. Rep. 10.599a].

³⁰ See Kierkegaard, Nietzsche, Camus, Heidegger, Sartre.

³¹ See Lacan, Althusser, Foucault, Barthes.

origin. This hyperbolic self-reflective tendency and intense self-awareness leads to a wilful self-parody. (Scribner, 2001, p. 186)

In our current time, imagination's star is rising again. According to some analysts and futurists, following the 'information age', we are heading in the direction of an 'imagination age', where creativity and imagination will surpass analysing and thinking as primary creators of economic value (King, 2007; Magee, 1993).

	'INFORMATION'	'IMAGINATION'
Pre-classical life	form in the context of pottery, poetry, visual perception	Old Testament: role in divine and human creation (Genesis)/ wariness (Decalogue, Genesis)
<u>1st form of life:</u> <i>Antiquity-Middle-ages</i>	<i>Productive/creative:</i> Giving (universal) Form to matter	<i>Mimetic:</i> Imitating an appearance, mind as mirror
<u>2nd form of life:</u> <i>Modernity (Descartes-Kant)</i>	<i>Empirical</i> Impressions through the fragmented stuff of sense	<i>Productive & transcendental</i> Mind as a lamp
<u>3rd form of life:</u> <i>19th century- 20th century (pre-WWII)</i>	<i>Supra-personal</i> Information beyond one's own experience	<i>Romantic & creative</i> Artist as genius
<u>4th form of life:</u> <i>20th century (post-WWII)</i>	<i>Quantitative</i> Mathematical approach to information as communication Discipline-specific meanings	<i>Existential</i> Distrust of author-centred imagination <i>Parodic</i> Meaning as an endless play of linguistic signs) : labyrinth
<u>5th form of life?:</u> <i>21st century</i>	Big Data?	Imagination Age?

Figure 1.1. The four lives of information and imagination.

Sketching the parallel histories of these two heavy-weight concepts (see the summary in Fig. 1.1), provides us with a general outline which, *prima facie*, is indicative for a shifting relation between information and imagination, especially in the first two forms of life. Both terms, 'information' and 'imagination', seem to stand in a dialectical twin-relation occupying alternating hierarchical positions

in the course of history. According to Livingston Welch³², the grounds for this volatile state of affairs are to be found in the worldview-shifts that operate in the background of information and imagination:

Thus at times man is taken as the mere vehicle of certain cosmic powers which he can illustrate or embody [ideal Forms & mimetic imagination]. [...]. At other times all productivity has been removed from nature, and consequently the power of creating novelty has been emphasized as something distinctively human. (Welch, 1935, p. 10)

Welch's framework analysis is helpful in accounting for the balanced relation between information and imagination in antiquity and early modernity, but shows inadequacies when related to the third and fourth form of life. In the 19th century, information as well as imagination seem to prosper in dedicated and separate realms of interest: information is strongly involved in mapping out an actual and objective world whereas creative imagination conquers the richness of possible and *noumenal* spheres of human thinking and feeling. In the twentieth century then, the vital force of both information and imagination is being challenged by similar processes of proliferation, deflation, and inter-permeability.

These first observations regarding the connection between information and imagination will be more closely examined in Chapter 3; for now it suffices to note and acknowledge an intimate relationship between information and imagination, one that is historically contingent, flexible and not reducible to one dominant paradigm as suggested by the authors that we referred to at the opening of this chapter. Dealing with notions that rely on an intuitive understanding in everyday communication but at the same time show a strong versatility in distinctive, historical and professional fields of application, can be both a curse and a blessing. On a communicative plane, deploying such umbrella-terms holds the danger of Babel-like and interminable confusion of tongues; on an ontological plane however, semantic differentiation and multi-perspectivism opens new possibilities by allowing for a dismantling and quasi-limitless re-engineering of stereotyping oppositions. Within the course of this investigation the inherent openness of both 'information' and 'imagination' will be considered as an opportunity and an argument for letting the relation between the two fields be the principle guide in a quest to accord information a discipline-specific space in an artistic practice of the 21st century. Moreover, by considering the concept of information in its relation to imagination a new meta-practical ground is being explored for discussing artistic activity and research, one that deviates from the well-known theory-practice divide (e.g. Borgdorff, 2012)³³ and anticipates on an inbuilt rapprochement between

³² This rather old monograph *Imagination and Human Nature* (Welch, 1935), is one of the few publications (if not the only one) that indirectly deals with the relation between information and imagination (chapter one: 'Imagination and Reason in the Classic Tradition').

³³ Within this context it can be noted that the theory-practice discussion deals with similar challenges: 'practice' is neither an all-encompassing marker of musicianship and 'theory' is also not the unique determinant of academic scholarship.

the spheres of information and artistry. However, promoting these two mental spaces to the status of leading protagonists requires further clarity and caution on two specific points.

Firstly, ‘information’ and ‘imagination’ seem (at first sight at least) to pertain to different linguistic categories. In everyday language, ‘information’ is commonly used as a count noun referring to a product, a thing, a commodity (Oxford English Dictionary, n.d., def. 1.2.), whereas ‘imagination’ is suffused with a process-oriented odour, referring to a capacity that is involved in producing internal images (Oxford English Dictionary, n.d., def. 1.a.)³⁴. This incongruence potentially problematises the dialectic between the two terms, even if the OED provides for both words definitions that indicate their all-round flexibility:

- ‘information’ can refer to an action or a process: “the imparting of knowledge”, “the action of imparting the knowledge of a fact” (Oxford English Dictionary, n.d., def. 1. & 1.3.a.). In fact, as we shall see, the meaning of information as a thing is orthogonal to the classical process-oriented meaning.
- ‘imagination’ covers also more product-like meanings: “An inner image or idea of an object or objects not actually present to the senses” (Oxford English Dictionary, n.d., def. 1.b.).

In order to overcome some of these intuitive incongruities, our analysis will not rigidly focus on the exact terms, but rather investigate the semantic spectra that envelop information and imagination; therefore, the terminological horizon will also involve terms such as ‘form’, ‘to inform’, ‘being informed’, ‘idea’, ‘image’, ‘to imagine’, ‘fantasy’, ‘fancy’.

Secondly, although imagination and creativity are passionately debated and controversial issues in the field of score-based performance³⁵, ‘imagination’ does not equal ‘performance’³⁶. It is clear that imagination is not the unique and all-determining aspect of music performance and that elements such as craft, technique, and interpretation are facets that might even be more amenable to a relation with information. Without pretending to present a fully-fledged ontology, the following often quoted appreciation (attributed to a journalist of the Seattle Times) of pianist Murray Perahia may be helpful

³⁴ An overview of dictionary definitions in the Oxford English Dictionary [OED] are presented in Appendix 3-6.

³⁵ The artistic practice of performing musical scores occupies an interesting position in this spectrum ; the duality between objectivism (‘*Werktreue*’, authenticity, re-creation) and subjectivism (performance as creative and experimental practice) is negotiated in a number of recent research projects: Research Centre for Musical Performance as Creative Practice (CMPCP) <http://www.cmcp.ac.uk> and *music experiment 21* <https://musicexperiment21.eu>.

³⁶ In the same way that also practice does not equal artistic practice in the theory-practice approach.

to temporarily situate the position of imagination within a performance context: “[Perahia possesses] the soul of a poet, the mind of a thinker, the hands of a virtuoso”³⁷. The three basic characteristics of musicianship mentioned here refer to elements of imagination, knowledge, and craft respectively. Within this informal ‘mini-ontology’, imagination occupies a position that is most closely associated with artistry as we know it in the modern system of the arts (Kristeller, 1951, 1952; Shiner, 2001) and therefore a worthy sparring partner for information.

This dialectical relation between information and imagination in the specific context of musical performance does not come out of thin air. Aaron Copland (1900-1990) dedicated a volume to music and imagination and considered the freely imaginative mind to be at the core of all vital music making and music listening (Copland, 1952, p. 7). In a more focused sense, imagination has been at the centre of Peter Walls’s engagement with ‘Historical Informed Performance’ [HIP]. In his monograph (Walls, 2003), he examines the relationship between performance practice research and actual performance and claims that the *History, Imagination and the Performance of Music* (Walls, 2003) began as an attempt to accommodate ‘imagination’ within the otherwise misleading ‘HIP’ acronym: “At one point I considered calling the book Historically Inspired Performance.) [...] The argument promulgated in my title [...] is that being historically informed shapes and stimulates the imagination” (Walls, 2003, p. 10). In *Music, Imagination and Culture* musicologist Nicholas Cook (1992) presents imagination as an essential element of musical culture: “at the core of this book lies the proposition that a musical culture is, in essence, a repertoire of means for imagining music” (Cook, 1992, p. 4). More in particular he points to ‘imagining’ as a central element in music production:

What makes a musician a musician is not that he knows how to play one instrument or another, or that he knows how to read music: it is that he is able to grasp musical structure in a manner appropriate for musical production - the most obvious (though of course by no means the only) example of such production being performance. (Cook, 1992, p. 85).

Cook continues by discussing ‘imagining’ as a philosophical equivalent of acquiring “productionally adequate cognitive representations of musical structure” (Cook, 1992, p. 86).

In the remainder of PART I ‘imagination’ will serve as a *pars pro toto*, as an artistic marker of musical performance in order to explore in a more general sense, the tensions and commonalities between two fields of human activity: academia (information) and art (imagination).

By setting the scene for an informed performership in this introductory chapter, we learned that the status of information in artistic and musical practice is far from established and even contested, that

³⁷ <http://www.carnegiehall.org/Calendar/2012/11/4/0730/PM/Murray-Perahia/> consulted in December 2016.

its potential as a mental space is vacant, that scholars seem to juggle the term within a semantic quasi-vacuum or within specific historical contexts and that, consequently, merging these two spaces into the concept of an informed performer is all but self-evident. Looking for ways in which the semantic spectrum can be enriched and tuned towards a valuable instrument in 21st century artistry, three lines of investigation will be developed:

- Creating a semantic platform based on the actual and practical use of 'information' by musicians (and not by academics) [Chapter 2].
- Investigating the alleged duality and opposition between the fields of information and imagination from a historical perspective (deconstruction and reconstruction) [Chapter 3].
- Looking for basic, behavioural fundamentals that connect both information and imagination [Chapter 4].

Chapter 2: The performer's voice – references in the 20th and 21st centuries

In this chapter, the focus is on the presence and operational semantics of 'information' in the discourse of musicians. A systematic enquiry therein is quasi-uncharted territory; therefore, there are inherent limits to the breadth, depth and organisation of the exploratory analysis that is presented below. The study is confined to the 20th and 21st centuries and focuses on three information patches which shed a differentiated light on the practical and semantic use of 'information' in musical performance.

A first patch relates to a performance mode heralded at the beginning of the twentieth century by pioneers of the historical performance movement. Their interest in understanding and reconstructing music of the past by consulting historical sources gave rise to a new performance style that, by explicitly implicating 'information' in the concept of 'Historically Informed Performance' [HIP] (Butt, 2002), makes this field particularly relevant and indicative for our enquiry.

A second terrain is less known and concerns the framework of a scientific³⁸ approach to musical performance, the first published records of which can be seen to have emerged at the turn of the 20th century (Jaëll, 1899; Breithaupt, 1905/1921; Steinhausen, 1905; Ortmann, 1929). This avenue of exploration that will be further referred to as the project of a 'Scientifically Informed Performers' Practice' [SIPP]³⁹ aimed at clarifying the more technical and instrument-directed aspects of music performance⁴⁰ and called in extra-disciplinary scientific information (anatomy, physiology, physics) to shift musicians' (primarily pianists') attitudes from an intuitive plane, based on personal experience, onto a more positivistic and scientific one, based on universal laws. Whereas the Early Music Movement succeeded in surviving a century of criticisms and evolutions, the scientific approach to musical performance has quasi-vanished from musicians' radars nowadays.⁴¹ In our analysis, we will look for indications that point to a correlation between the differential impact and the respective approach to information in both fields.

³⁸ 'Scientific' refers here to the explicit aim to inform instrumental technique with universal or experimentally validated laws.

³⁹ 'SIPP' will be used for internal reference only, it is not a received acronym in formal or informal discourse but in our view adequately summarizes the perspective of a group of authors. 'SIP', with the P of performance, would imply that the efforts were foremost directed at the sounding-effects on stage; since the focus is more on teaching and learning as part of a performers' practice, the first P stands for 'performers' and an extra P for 'practice' is added to the acronym to indicate the extension of the target domain. We will come back in our conclusions on PART I to the difference between information that has an immediate impact on performances and information that impacts on the practice of performers as an intermediary entity.

⁴⁰ Otto Ortmann considers it as "a sound physiological basis for the mechanics of piano technique" (Ortmann, 1929, p. xxxiv).

⁴¹ The sources are hardly referenced to in the daily discourse of musicians; most of the source material has not been re-edited (some of them are now available at *Forgotten Books*, a London-based book publisher specializing in the restoration of old books); SIPP is not institutionally embedded in conservatory departments.

Finally, and in addition to the two foregoing, rather specialised languages, the role and use of information in four ‘Main Stream Performance’ [MSP] texts will be examined with a view to connect with elements of a non-specialist, standard-view of information and to establish a benchmark-reference.

The three domains of interest mentioned above are different in their representation qua texts and context; the methodological approach applied to explore these three patches varies accordingly. Considering HIP’s century-long development and engagement with specifically attuned vocabulary⁴², HIP is analysed in a mini-anthology-like manner by presenting a cursory and chronological trajectory of the term information in text-fragments from seminal publications pertaining to the canon of HIP. In the corpus of primary sources related to SIPP the notion of ‘information’ is only implicitly present; instead of a term-bound and chronological approach, our investigation is therefore based on a more general assessment of the field by revisiting the main tenets, concerns, strengths and weaknesses of SIPP from an informational perspective and by having a closer look at three SIPP-texts. Finally, the informational attitudes in MSP are analysed by presenting source-texts that can be assumed to be part of every 21st century pianist’s personal library.

2.1 ‘Historically Informed Performance’ [HIP]

2.1.1 *Situating HIP*

The coexistence of alternative performance and interpretation styles is considered to be an important and defining feature of 20th and 21st century musical life; it constitutes the implicit background against which performers acquire their own specific or hybrid signatures.⁴³ The introduction of ‘interpretation’ as a mediator between performer and historical composition is often referred to as the causal factor leading to this particular state of affairs.⁴⁴ In a framework where a first distinction is made between hermeneutic and performative interpretation⁴⁵, musicologist Hermann Danuser (Danuser, 1996) differentiates within the latter category three modes of interpretation: a *Historischen-rekonstruktiver*

⁴² In Chapter 1, we have already mentioned a few alternatives for ‘historically informed’, such as ‘historically aware’, ‘historically minded’, ‘historically-oriented’, ‘historically inspired’, ‘historically-alert’. In reviewing the meaning of ‘authenticity’ in the early music movement, musicologist Dorrotya Fabian has established that the term underwent both historical as well as geographical evolutions (Fabian, 2001, 2003).

⁴³ Musicologist Jürgen Stenzl notes that “when a new interpretative approach emerges, both the old and the new approach briefly overlap before the new approach then displaces the earlier one... this was still the case during the 1920s. It is a unique feature of recent times that now different interpretations can compete in a single market for recordings” (Stenzl, 1995, p. 686).

⁴⁴ “[T]he opportunity to ‘interpret’ written and composed music arose only relatively late – in the 19th century; in the 20th century it became a necessity” “*Erst vergleichsweise spät – im 19. Jh. – ergab sich die Möglichkeit, noch später – im 20. Jh. – die Notwendigkeit einer ‘Interpretation’ der notierten Musik.*” (Danuser, 1996, p. 1053)

⁴⁵ See also the chapter ‘performative versus critical interpretation’ in Levinson (1996) for a comparable classification.

Modus, a *Traditioneller Modus* and a *Aktualisierender Modus*⁴⁶. The temporal horizon⁴⁷ is the crucial factor in Danuser's classification: musical interpretation can be guided by practices that connect to the time of creation, to a practice between the creation of the work and the current time ('*Wirkungsgeschichte*'), or to an actual state of affairs. The concept of 'Historically Informed Performance' is to be situated within a *Historischen-rekonstruktiver Modus* which aims at safeguarding historical music against the effects of time. Whereas initially 'period performance' and 'authenticity' emerged as key words in the conceptual representation of the movement, gradually the notion of 'informed performances' gained currency as a more flexible approach to the practice of integrating historical information with captivating performances. A full history of how this transition came to pass is yet to be written.⁴⁸ It is not our aim to revisit and disentangle the early music and authenticity debate but some key insights are relevant as a prelude to a more focused approach.

It is generally asserted that HIP's evolution started off with a very strict and dogmatic ideology to evolve gradually into a more pragmatic and lenient one. Such is indicated by the evolution from 'authentic' to (merely) 'informed' performances. Musicologist Dorottya Fabian (2003), however, has convincingly demonstrated that not the musicians themselves but rather the commercial propaganda surrounding them played a crucial role in promoting the value of new 'evidence':

Musicians from Dolmetsch and Landowska to Harnoncourt or from Dart and Donington to Leonhardt kept repeating that their focus of interest was to recreate works of art for the present, and in as musically effective a manner as possible. For them the 'spirit' of the work was more important than the historical context. (Fabian, 2003, p. 26)

Generally, three main focus areas and sources of information are involved in support of this interpretative mode: 1/ the use of critically edited texts (or manuscripts); 2/ the investigation of historical performance practices (which refers to the features of the music that conventional musical notation leaves out); and 3/ the re-introduction of historical instruments by means of which all this notated and un-notated music was transformed into sound (Kerman, 1985, p. 187). Fabian provides

⁴⁶ Alternative taxonomies and critiques are also available in the 20th and 21st century: Jürgen Stenzl distinguishes between *espressivo*, *neo-objective* and *restorative* interpretations (Stenzl, 1995). Bruce Haynes discerns three 'broad currents' or 'general types' specifically in relation to the performance of music from the Rhetorical period (music until about 1800): *Period style*, *Romantic Style* and *Modern style* (Haynes, 2007, p. 32). A break with traditional interpretative strategies based on sacred scores is promoted by Laurence Dreyfus in 'beyond interpretation' where he favours a more *experiential and intuitive notions* of making music: "musicians are not only biblical scholars pouring over dead manuscripts in the library so as to extract the divine spark" (Dreyfus, 2007). Paulo de Assis in a recent research programme explores the potential of an *experimental approach* as a viable, contemporary alternative for traditional score-based interpretation: "By clinging to an outmoded paradigm of interpretation, musical performance practices are becoming isolated from the wider fields of artistic research" (de Assis, n.d.).

⁴⁷ See Gadamer's hermeneutics and notions of *Wirkungsgeschichte*, *Horizont* and *Horizontverschmelzung* (Gadamer, 2007).

⁴⁸ Fabian provides a useful overview limited to the evolution of 'authenticity' in Bach performance (Fabian, 2003).

clear indications for a differentiation between a pragmatic/practical English approach and a theoretical/observational continental approach and relates these divergences to a different focus on the type of information source: while the musical establishment on the continent focused on scores and historical context (theoretical, observational attitude), British scholarship gradually shifted attention towards the restoration of performance practices (practical approach) (Fabian, 2003, p. 26). Finally, Fabian identifies experimental and ground-breaking groups of performers on the continent who explored the repertoire “largely independently from published research, focusing on performance style and on the playing techniques of period instruments” (Fabian, 2003, p. 26). It seems then that, at least in HIP, it is possible to discern a systemic correlation between information source and processing mode: 1/ coded (score) and contextual information gives rise to a theoretical mode of information processing (information as evidence); 2/ textual information about performance practice requires practical application and assessment; and 3/ exploring and playing new/old instruments can be coupled to a process of experimentation.

2.1.2 *An exploratory discourse-analysis*

With the elements above as a first orientation, we can now zoom in on information’s semantic spectrum within the field of HIP. What follows is an investigation on the prevalence of ‘information’ in a chronologically ordered collection of text fragments that pertain to the HIP-canon starting with Dolmetsch (1915) and concluding with Kuijken (2013).⁴⁹ Following up on the insights developed in Chapter 1, reference will be made to the relation between information and concepts that pertain to the sphere of imagination such as freedom, interpretation, inspiration, and creativity.

2.1.2.1 *The Interpretation of the Music of the XVIIth and XVIIIth Centuries Revealed by Contemporary Evidence (Dolmetsch, 1915)*

With the title of his book, musician and instrument maker Arnold Dolmetsch (1858-1940) indicates a strong positivist and evidence-based stance towards musical practice by pointing to “revelation by evidence” as a ground for interpretation. Revelation is a quasi-religious notion but Dolmetsch’s title counts as an invitation to reorient the epistemic horizons of musicians: interpretation is not a matter of divine inspiration or personal intuition but is based on contemporary⁵⁰ and factual evidence drawn from historical sources. The presence of ‘interpretation’ in the title validates Danuser’s analysis with regard to the crucial role of musical hermeneutics in the 20th century.

⁴⁹ A chronological structure is applied for reasons of overview and inclusiveness and to capture the differential perspectives between early, pioneering performers and their successors.

⁵⁰ The use of the term ‘contemporary’ can be called in support for considering HIP as a modernist project rather than an ‘authentic’, historical one (see for instance Taruskin, 1988).

Querying 'information' throughout the publication results in 29 hits, indicating that Dolmetsch is familiar with the term already in the pioneering stages of the Early Music movement. A closer look at the context in which 'information' is used exposes strong links between 'information', 'reliability', 'what to do' and 'clarity'.

Reliable information is to be found only in those books of instruction which the old musicians wrote about their own art. (Dolmetsch, 1915, p. vi)

Frescobaldi, in the third paragraph of the Preface quoted at page 4, says: — 'The beginnings of the Toccata should be played adagio and arpeggiando; the same applies to the syncopations and discords, even in the middle of the pieces. The chords should be broken with both hands so that the instrument may not be left empty; this battery can be repeated at pleasure.' This clearly tells us what to do, but not how to do it. Plenty of information is, however, available from other sources, and it is hoped the sequence will make everything clear. (Dolmetsch, 1915, p. 278)

From the last fragment, a belief into the accumulation of knowledge can be inferred, which, at least in Dolmetsch's view, eventually completes the puzzle of the 'what'- (interpretation) and 'how'- questions (technique).

In Dolmetsch's world, imagination is not an element which is discussed in the context of performership; it is largely relegated to the province of the listener.⁵¹

In music many things occur which require the help of the imagination, because they cannot be clearly heard. For example, in a concerto with a full accompaniment, the soloist always loses such notes as must be accompanied fortissimo, and those which are in unison with the tutti. Intelligent listeners supply whatever is thus lost, through their imagination, and it is these listeners that we should endeavour to please before all. (Dolmetsch, 1915, p. 190)

Next to the tendency towards an evidence-based positivism⁵² it is also noteworthy that qua methodology Dolmetsch's book is constructed as a dialogue with the written sources that are available to him; these sources are extensively quoted with only punctual comments. The information is presented as bare, collected 'evidence' without an extensive information-processing and interpretative follow-up.

⁵¹ The words 'imagination' and 'fancy' are only used in the treatment of 'expression in 17th and 18th century music' when citing from historical sources such as Couperin's *l'Art de Toucher le Clavecin* (1717).

⁵² That a positivist outlook does not automatically lead to the often-mentioned mechanical way of playing is testified by Dolmetsch himself in the following quotation that stands up for expression in the performance of early music: "A number of quotations from old books whose authority is not open to question [...] will show how erroneous is the idea, still entertained by some, that expression is a modern thing, and that the old music requires nothing beyond mechanical precision" (Dolmetsch, 1915, pp. vii–viii).

2.1.2.2 The Interpretation of Music (Dart, 1954)

The notion of information is also a significant⁵³ element in *The Interpretation of Music* (Dart, 1954). Thurston Dart (1921-1971), a musicologist, conductor and keyboard player, considers the performer as a “re-creative” artist (Dart, 1954, p. 11) who needs to approach the score as “primary evidence” (Dart, 1954, p. 14) and as the ultimate source of information: “every scrap of information that an early composer conveyed to his performer by means of the written notation he used must be treated as though it were gold; it is very precious, and far more valuable than any editor’s opinion, however enlightened this may be” (Dart, 1954, p. 15). Towards the end of the Dart’s monograph, the perspective on the role of scores is more nuanced: “the written text must never be regarded as a dead laboratory specimen; it is only sleeping, though both love and time will be needed to awaken it” (Dart, 1954, p. 16). Next to the score, Dart acknowledges the presence of an abundant array of information sources:

[An] enormous amount of information about the performance of early music [which] survives in contemporary sources, not only in treatises specifically dealing with the problem of interpretation, but also in prefaces essays, marginal notes, pictures, sculptures, miniatures, and descriptions in verse or prose of concerts, feasts, church services and amateur music-making. (Dart, 1954, p. 15)

Dart identifies a number of problems with information: 1/ sometimes the information is tantalisingly insufficient; 2/ in other instances it is too copious; 3/ sometimes the sources are too conflicting and confusing, for the scholar to be able to handle it; and 4/ “often the information comes from little men of immense pretensions, whose remarks have to be scrutinised with great care and weighed against less wordy but more accurate writers” (Dart, 1954, p. 16). Dart seems to be particularly concerned with the fragmented nature of information which impedes a state of complete certainty⁵⁴. Confronted with these inherent challenges⁵⁵, Dart offers two strategies: the first one is to limit the impact of the information supplied by these sources ‘strictly’ to its immediate field of application (Dart, 1954, p. 16); the second strategy is somewhat surprising in that Dart recommends to compensate for the lack of certainty, due to the fragmented nature of information, by acting with boldness rather than timidity⁵⁶. Throughout the monograph, information is granted the role of illuminator which is in need of imagination-related concepts such as ‘interpretation’, ‘judgement’, ‘musicianship’, and ‘common sense’ in order to be operational.

⁵³ The word ‘information’ appears sixteen times, based on a google-books query.

⁵⁴ It might be tempting to see connections with a mathematical notion of information as the reduction (not the liquidation) of uncertainty (Shannon, 1948; Wiener, 1948/1985), a notion that heralds the Information Age only a few years before *The Interpretation of Music* is published.

⁵⁵ The first chapter is entitled ‘the problem’ where in the author identifies multiple problems.

⁵⁶ “Boldness is better than timidity, perhaps” (Dart, 1954/1967, p. 16).

The performances must also be stylish; they must be illuminated by the fullest possible knowledge of the special points of phrasing, ornamentation and tempo that were associated with the music when it was first heard. The performer has every right to decide for himself that some of these special points are best forgotten; but he must at least be aware that they once existed, and that they were at some time considered to be an essential feature of a pleasing performance. (Dart, 1954, p. 164)

Dart concludes that “music is both an art and a science; like every art and every science it has no enemy save ignorance” (Dart, 1954, p. 16).

2.1.2.3 *The Interpretation of Music (Donington, 1965)*

In Robert Donington’s publication, information appears mostly in conjunction with adjectives such as ‘factual’, ‘reliable’, ‘important’. In a note to the second edition, he nuances the determining role of these bits of information by making a case for ‘inspired performances’ on the basis of ‘informed liberties’:

If my own opinions have changed at all, it is that I am more than ever impressed by the need for inspired performances. [...] No one is shocked or surprised when a Shakespearean producer lays firm hands on his text and makes a living drama out of it. We have to make living music out of baroque notation. Shakespearean studies have been going on for a long time, and producers can afford to take informed liberties. (Donington, 1965, p. 22)

Loyal to Dolmetsch, his teacher, Donington is a master of dialogue with primary sources and formulates the reasons for this referential abundance: they contain “more than merely factual information” (Donington, 1965, p. 26) and he thereby seems to tacitly imply that there is also another type of information: contextual information, which only indirectly hints to matters of interpretation. Donington advocates access to multiple sources in order to organize a dialogue between them and thereby offers, next to the two Dart-strategies (limited application & boldness), a third avenue towards a fruitful interaction with a variety of sources: dialectical confrontation.

Almost exactly half the words in the present book consist of quotations from the early authorities and other witnesses themselves. [...] they have an inherent authenticity with which no mere summary or discussion of them can compete; it is also that they convey so much more than merely factual information. That they are unreliable in varying degrees, self-contradictory or contradictory with one another in many respects, and tiresomely repetitive in others I shall be the first to admit I almost feel inclined to suggest that this is just why they are so valuable. (Donington, 1965, p. 26)

In general, Donington’s discourse is characterized by constantly striking a balance between fundamental *memes* in professional musicianship: innate talent, inspiration, interpretation, judgement experience and factual evidence (as information).

[...] scholarship can only be helpful if it is used musically; yet at the same time it can only be used musically if he has plenty of it. He must be in a position to weigh one piece of evidence against another. An isolated statement, out of context and perhaps untypical, can lead to devastatingly unmusical results; and that after all is the last thing we want our scholarship to end in. [...] We are trying to be better scholars in order to make better music. (Donington, 1965, p. 28)

2.1.2.4 *The Spheres of Music: Harmony and discord (1972)*

This multi-author publication, with 17 contributions by musicologists and prominent performers makes up the 1972 edition of the journal *Current Musicology*, and is dedicated to a special project entitled *The Spheres of Music: Harmony and Discord*.⁵⁷ As an incentive for the publication, project-editor and musicologist Léonie Rosenstiel refers to a state of affairs in which the interchange of ideas between practitioners, critics, musicologists, educators is problematic and “could lead to the isolation of each specialty and would ultimately be detrimental to all” (Rosenstiel, 1972, p. 81). In general terms, the aim of the publication is to propose a set of tools that can link theory to practice and promote an open communication.⁵⁸

In ‘Musicians’, music educator and musicologist Donna Kay Anderson (°1935) specifies this objective in terms of an “informational-inspirational exchange” between the distinctive and specializing parties in music such as musicology, composition, performance and music education (Anderson, 1972, p. 84). Anderson envisages a part-whole perspective and promotes double-roles for musicians as well as scholars thereby sketching and anticipating the contours of what could be meant by the notion ‘artist-researcher’ or ‘artistic researcher’.

In another contribution, violinist Yehudi Menuhin (1916-1999) prefers an alternative to ‘information’ by using the terms ‘inspiration’ and ‘advice’ as far as the contributions from musicology are concerned. Scholarly knowledge ought to play a role in an experimental and non-dogmatic process that involves trial, error, rejection, adaptation, acceptance, and embodiment before it can become part of an aesthetic analysis or instinct.

The musicologist is a mentor, one all the more inspiring since he himself has come to know the fire of discovery and re-creation. [...] Personally, I look upon such eminent and sympathetic musicologists as Denis Stevens as invaluable advisers, whose counsel I accept and apply experimentally. Yet I cannot actually incorporate such advice into my interpretation until the specific suggestions have become organically integrated into my own aesthetic analysis and

⁵⁷ Issue 14 of *Current Musicology* represents only PART I of a series of articles dedicated to this topic. In issue 15 (1973), another 6 articles are bundled under the heading of *The Spheres of Music, PART II*.

⁵⁸ The authors in this publication do not pertain to the core of the HIP-movement; it is clear however that the discussion is inspired by challenges raised in a HIP-context.

instinct. [...] For dogma can never replace the improbable and unpredictable dictates of true inspiration that have always motivated all great stylists, composers or performers. (Menuhin, 1972, pp. 143–144)

In 'Toward a Unity of Performance and Musicology', finally, pianist Rosalyn Tureck (1914-2003) introduces the concept and ideal of a 'historically informed performance art'⁵⁹. According to Tureck, two major problems impede the flourishing of informed performership: 1/ the time lag which occurs between the publication of musicological material and its absorption by those involved in performance—concert artists, teachers, and students; and 2/ a communication gap between the domains of musicology and performance (Tureck, 1972, p. 164). Tureck continues by discussing "several steps which may contribute toward the elimination of these barriers to achieving a historically informed performance art" (Tureck, 1972, p. 165). The first step towards taking down the barriers between scholarship and performance is a change in educational orientation and in work habits. According to Tureck again, "the inclusion of more reading in a performer's education would contribute not only to a reserve of historical knowledge but also to increasing reflection and judgment in performance style" (Tureck, 1972, p. 165). In addition to the requirement of reading the classic works and new publications, specific helpful steps toward expansion are: 1/ the reading of recent research reports in current musicological journals which contain not only recent "information" but also of their implied directions; 2/ systematic study of variants in manuscripts and early editions; 3/ study and communication with scholars who are working on manuscript sources. From a sequential perspective, Tureck proposes the following process of affairs:

The student years consist of the comparatively simple task of amassing information, repertoire, and technical skills. Only after this stage has been passed can the real work truly begin for the thinking, creative person. And this work so combines intuition and the gathering of information that it becomes in itself an integrated and spontaneous process. (Tureck, 1972, p. 167)

Tureck hereby sequentially links information to imagination and creativity and challenges the notion that a performer must spend virtually all of his time developing repertoire and a professional level of

⁵⁹ Nicholas Kenyon and John Butt confirmed through personal mail-communication the presence of 'information' early in the century and both situate the combination 'Historically Informed Performance' within a context of discomfort with the concept of an authentic performance in the eighties. There's no clear and certain answer to the question 'who' exactly coined the term and 'when'. 1972 is surprisingly early in any case. An interesting and prominent clue regarding the birth of 'Historically Informed Performance' is to be found in *Authenticity and Early Music* (Kenyon, 1988). In the preface the editor refers to a series of pre-publication Oberlin meetings entitled *Musical Interpretation: the influence of Historically Informed Performance*. It is intriguing however that this terminology has not been used in the title of the edited volume in 1988. It enforces the hypothesis that unlike the notion of authenticity, the introduction of 'information' in the realm of musical practice was not an intentional and fully strategic one.

skill in technique and musicianship: “breadth of study does not necessarily deprive one of depth in work and accomplishment” (Tureck, 1972, p. 165). Her project is summarized as follows:

The artist-performer must be concerned with forging the sum of all these parts into a great whole with depth of feeling and unobstructed freedom of communication. Such a marriage, though rare, is capable of producing great beauty and arrives as close to the composer’s thoughts as is humanly possible. This achievement is difficult on every level: it combines the musicological labour of the scholar with the technical and musical development of the gifted performer; it demands a talent for merging the two into an artistic unity. (Tureck, 1972, p. 172)

Tureck’s understanding of freedom and imagination is situated in a context of freely choosing from the information available rather than receiving and continuing unquestioned performance traditions.

In general, we can observe from these three contributions to *the Spheres of Music* a motivated attempt to (re-)unite information and performance into a dialectically unified conceptual and contextual space. The modes of interaction are carefully assessed in terms of inspiration, advice, information, or open communication which indicates the unsettled balance between academia-based knowledge production and the practice- and art-based concerns of musicians.

2.1.2.5 Musik als Klangrede (Harnoncourt, 1982/2004)

Musik als Klangrede (Harnoncourt, 1982/2004) is collection of texts produced by HIP-icon Nikolaus Harnoncourt (1929-2016) between 1954 and 1980. In the English translation (Harnoncourt, 1982/1995) ‘information’ and ‘informed’ are frequently used (the latter form especially in combination with the prefix ‘un-’) but that does not always correspond with the German *Urtext* where quasi-synonyms as ‘unwissend’ are more common (Harnoncourt, 1982/2004, p. 27).

Harnoncourt is uncompromising in his judgement with regard to the un-informedness of performing musicians in the second half of the twentieth century. He forges an immediate link between a lack of knowledge and the inability to be really creative and regrets the disappearance of the *Gesamt-Musiker*, who is both a theoretician and practitioner.

During the Middle Ages, the roles of theoretician [*Theoretiker*], practitioner [*Praktiker*] and ‘total’ musician [*Gesamt-Musiker*] were clearly delineated. The theoretician understood how music was constructed, but almost never performed it [*ausführen*]. [...] The practical musician, on the other hand, could play music but had no knowledge [*Einsicht*] at all of musical theory. [...] The instrumentalist and the singer were for a thousand years of Western history in a precisely analogous situation; they did not know, they were able, and understood without knowing [*er Weiss nicht, aber kann, und versteht ohne zu wissen*]. Lastly there was the ‘total’ musician, a person who was both theoretician and practitioner. Those in this category knew and understood musical theory, but did not regard it as an isolated subject removed from practical application, sufficient unto itself; they were able to compose and play music because they were familiar with and understood all of its related elements. What is the situation today?

[...] The practitioner, the performing musician, is just as uninformed [*unwissend*] as he was centuries ago. He is interested above all in performance, technical perfection, immediate applause and acclaim. He does not create music, but only plays it. Because the unity between his time and the music which he plays has been dissolved, he lacks the knowledge of music which the musicians of earlier periods possessed as a matter of course. (Harnoncourt, 1982/1995, p. 22)

As with others, for Harnoncourt the primary source of information for a performer is the score, and preferably the unedited manuscript. The score yields next to 'concrete information' also suggestions with regard to its actual performance.

Above and beyond their purely informational content, the notational picture, both of the single voice and especially of the full score, possess a suggestive power, a magic that no sensitive musician can resist whether he wants to or not, or is even aware of it. (Harnoncourt, 1982/1995, p. 177)

Aside from the suggestive power of the manuscript, which no print can duplicate, the manuscript also provides much concrete information, which we need to obtain directly wherever possible, and not from long-winded critical reports. (Harnoncourt, 1982/1995, p. 179)

2.1.2.6 *Playing with History (Butt, 2002)*

Harpsichordist, organist and conductor John Butt's *Playing with History* (Butt, 2002) contains one of the most comprehensive treatments with regard to the development of Historically Informed Performance and its embeddedness in philosophical and socio-cultural theory. Here, the acronym HIP receives its formal coinage. Throughout the text a careful negotiation between information and freedom is always palpable as the author asserts that "the notion of the uncomplicated restoration of past performance practice is paradoxically both erroneous and prodigiously productive. HIP serves to ground us in the present through renewed engagement with the past and in a way that has never been possible or necessary before" (Butt, 2002, p. 217). The process involves a loosening of traditional categories and a liberation of our thought from preconceived narratives about the past, resulting, according to Butt, to a net benefit that greatly outweighs the disadvantages. Butt advocates passionate commitment, risk and vision coupled with self-awareness, a sense of choice in performance, and responsibility to both the audience and the meanings of pieces of music (Butt, 2002, p. 23). By quoting Richard Taruskin, Butt summarizes this particular stance:

What I am after, in a word, is liberation: only when we know something about the sources of our contemporary practices and beliefs, when we know something about the reasons why we do as we do and think as we think, and when we are aware of alternatives, can we in any sense claim to be free in our choice of action and creed, and responsible for it (Butt, 2002, p. 22; Taruskin, 1995, p. 19).

2.1.2.7 *The End of Early Music (Haynes, 2007)*

In *The End of Early Music* (Haynes, 2007), oboist, recorder player and musicologist Bruce Haynes (1942-2011) defines 'Historically Informed Performance' and equals it with 'Historically Inspired Performances':

HIP (historically-inspired performance; historically-informed performance): a movement in reaction to the Romantic and Modernist movements. Also called Authenticity Movement; Early music Movement; Period Performance Movement; Second Practice. Contrasted here with: original performance. (Haynes, 2007, p. 14)

The last line is somewhat puzzling, especially since the author does not clarify what is meant by 'original performance'. From the context of the book, it can be deduced that he means performances that do not take into account elements of period performance practice but instead base their interpretation on personal/original interpretation and intuition. In that same vein, Haynes contrasts the process of information to the one of (arbitrary) interpretation.

The idea that there is implied or built-in performance information that is not explicitly written in the score is a very different one from the modern idea of 'interpretation'. At least, from the kind of interpretation that amounts to arbitrary intervention; adding personal ideas to the music, or even (God forbid) improvisation. It is known that Beethoven made disagreeable scenes when a musician dared to add a few trills. (Haynes, 2007, p. 112)

In another *passus*, Haynes clarifies the relation between the information that musicological scholarship turns up, performance practice, and performing musicians. (Historical) information is foundational for the construction of a performance practice which in turn acts as a fund from which musicians can draw from and contribute to; Haynes also points to the potentially explosive character of information.

There are also times when musicology turns up information that is awkward for performers. When all is said and done, historical musicology is still meant to act as a foundation of verifiable history on which performance practice can be constructed. Without it, we easily drift away from Period style, as we are now drifting away from copying original instruments. Performance practice is to performing musicians what original instruments are to makers, and manuscript sources are to publishers: a fund of reliable historical information that can be periodically revisited and reconsidered as both we, and it, change with time. (Haynes, 2007, p. 112)

2.1.2.8 *The Notation Is Not the Music (Kuijken, 2013)*

A last and recent source with regard to the use of the term 'information', is flautist Barthold Kuijken's *The Notation Is Not the Music* (Kuijken, 2013). Kuijken does not equal information with clear-cut instructions but rather considers it to be an attitude:

Early Music is not only a particular repertoire, but it is also understood as including Historically Informed Performance. In my eyes, this should not be a goal in itself. It is rather an attitude, a way of reading and rendering a score, striving for historical authenticity and at the same time taking up one's full responsibility as a performer. It certainly does not consist of easy-to-learn fixed sets of rules. (Kuijken, 2013, p. 2)

Further, Kuijken asserts that being informed does not discharge a performer from captivating an audience. Moreover, since information will always be incomplete, additional elements of artistic judgement and imagination will always be part of the process:

The wealth of historical documentation about the performance of Early Music can be studied, integrated, and put into practice. Such performances need not be less captivating for being better informed. However, it will be immediately clear that we shall never know, for example, exactly how J. S. Bach played (on which day?). All we can aspire to do is to fall reasonably well within the limits of probability and good taste. (Kuijken, 2013, p. 4)

The author considers information to be a tool that allows independent learning and relieves musicians from the master-apprentice model:

In my opinion, and not only in the field of Early Music, any teacher's goal is to make himself superfluous and train his students to become autodidacts. As artists, teachers as well as students need to acquire and maintain their instrumental or vocal mastery and simultaneously become and stay well informed, and let these two areas of study fruitfully interact with each other. (Kuijken, 2013, p. 4)

In a passage where Kuijken relates notational information to invention and image-formation:

As a result of my research I considered the notation to be mainly a type of roadmap, an aide-mémoire and help for invention, enabling the informed reader to create an inner image of the music. Quite naturally, this image is not definitive, but will change with time, mood, circumstance, and knowledge. Once this provisional image has been formed, in great detail, I can let it take an audible shape. In other words, I have to begin to play (or practice!) with the result clearly in my heart and mind. (Kuijken, 2013, p. 10)

Finally, the author observes that the original doubts about a fruitful relation between scholarship and performance seem to have been overcome:

In earlier decades they could often be heard stating that "historically informed" playing is, by its very nature, dull, absolutely east below the line, as if knowledge and scholarship were death blows to genuine musicianship. Fortunately this attitude is encountered less and less frequently. (Kuijken, 2013, p. 104)

2.1.3 Summarizing observations

The authors considered above are clearly information-biased (unlike the academics that we discussed in Chapter 1); they strongly believe in the innovative and cathartic power of historical information and

look for means and methods to integrate their findings and those of musicologist in interpretation and performance. One of the leading threads in the information-focused mini-anthology of HIP presented above is therefore the continual negotiation between information (as evidence) and an imaginative, interpretative musicianship often formulated as a bilateral, dialogical relationship between the spheres of historical musicology and musical practice.⁶⁰ Within this spectrum, information is a mediating factor which varies in its performative impact. Below, the main perspectives are ordered from an authoritative impact to a more liberal influence.

- 
- Information as evidence/truth (Dolmetsch, 1915)
 - Information and authenticity (Kenyon, 1988)
 - Information as advice and guidance (Menuhin, 1972)
 - Information and/or versus interpretation (Dart, 1954; Haynes, 2007)
 - Information as an element of dialogue and communication between theory and practice (Donington, 1965; Rosenstiel, 1972; Tureck, 1972)
 - Information as inspiration (Anderson, 1972; Haynes, 2007)
 - Information as stimulation (Menuhin, 1972)
 - Information as part of an experimental setting (Menuhin, 1972)
 - Information as liberation (Butt, 2002; Taruskin, 1995)

Next to a gradation of impact-ratio, the discourse-analysis in HIP also indicates pedagogical implications.

- Information offers new horizons (Tureck, 1972).
- Being informed should evolve into a work *ethos* – *Gesamt-Musiker* (Harnoncourt, 2004; Tureck, 1972).
- Information seeking as a new learning style (Kuijken, 2013).

A final observation concerns the style of representation with abundant textual references to primary sources is typical for the HIP-publications, especially for the pioneering ones. Its methodology (supposedly) breaths *Urtext*-authenticity and demonstrates a generic feature of an early stage engagement with a fresh repertoire of ideas and insights. However, presenting the bare facts without readily-available recipes for musicians is more than a question of writing-style. It points to a specific

⁶⁰ See for instance: "Evidence in musicology may be described, as in jurisprudence, as information discovered or provided in an investigation to establish conclusively the truth about something in question [...] the potential exists for a diversity of interpretations of the information acquired, as well as for more than one acceptable solution. And, of course, all the evidence in the world will never guarantee performances that are convincing and vivid" (Stowell, 2012, p. 63).

attitude towards information; by presenting facts as “a fund of reliable historical information that can be periodically revisited and reconsidered” (Haynes, 2007, p. 130), a formula is created that invites or even necessitates continuous personal interpretation, imagination, embodiment, selection, integrates and recombination.

2.2 ‘Scientifically Informed Performers’ Practice’ [SIPP]

2.2.1 *Situating SIPP*

‘Scientifically Informed Performers’ Practice’ [SIPP]⁶¹ is a label used here to refer to the innovative approaches to music performance that arose at the dawn of the 20th century and aimed at informing the instrumental didactics of the twentieth century with recent (late-nineteenth century) views on objectivity (Daston & Galison, 2010) and neuro-physiology⁶². Already in 1897, pianist Marie Jaëll (1846-1925) predicted that “the reform of musical education on a scientific basis is only a matter of time. Matters of fact, that have been established with certainty, challenge the rules of practice that are erroneous and insufficiently accounted for”.⁶³ This scientific outlook on instrumental technique is most visible and advanced in the domain of piano-playing and leads to a series of pioneering publications.⁶⁴ In the preamble to *The Act of Touch in All its Diversity*, pianist and pedagogue Tobias Matthay (Matthay, 1903) formulates the ambitions of SIPP and the role of information therein:

Evidently, teaching, as applied to Science, Harmony, or Language, does not here signify, that the discovery of the implicated Laws shall be left to each individual learner. On the contrary, the student is in each case informed of the already perceived laws and rules of procedure. Hence, he can in this case, at once ‘start fair’, and can make practical use of such information; and may even go further, and discover fresh truths ; instead of having to experiment for years, or maybe a lifetime, in his endeavours to rediscover for himself facts, already understood by others. (Matthay, 1903, pp. 2–3)

Initially, two distinctive schools develop.⁶⁵ The ‘anatomical-physiological school’ (Kochevitsky, 1967, p. 9) has Rudolf Maria Breithaupt (Breithaupt, 1905) and Tobias Matthay (Matthay, 1903; Matthay, 1932)

⁶¹ See 9.6 for an explanation with regard to the use of ‘Performers’ Practice’ rather than ‘Performance’.

⁶² German physiologist Emil Du Bois-Reymond (1818-1896) for instance had found that interaction (and thus motor coordination) between muscles was more important than sheer force and that by consequence the whole nervous system (including the central nervous system) should be taken into consideration in the debate on the development of instrumental technique.

⁶³ “*La réforme de l'enseignement musical sur une base scientifique n'est plus aujourd'hui qu'une question de temps. Des faits sûrement acquis s'opposent à ce qu'on persévère dans la pratique de moyens insuffisants, erronés*” (Jaell, 1897, p. v).

⁶⁴ Unlike their predecessors in the 19th century who expressed their ideas mainly by means of method-books and exercises.

⁶⁵ The distinctions ‘anatomical-physiological school’ and ‘psycho-technical school’ are adopted from the historical overview in *The Art of Piano Playing* (Kochevitsky, 1967). Kochevitsky refers to Gregori Kogan for coining these terms.

as its main representatives (Kochevitsky, 1967, p. 9) and looks in the periphery of the playing apparatus (shoulders, arms, hands) for solutions to practical problems that pianists encounter when playing a new and challenging repertoire on new instruments (*in casu* the modern piano). The proponents of this school seek to replace the mechanical finger-exercises that had been developed in the course of the 19th century (the ‘finger school’ – Clementi, Hummel, Kullak, Czerny, Hanon) with more conscious and insightful training methods. Relaxation, weight playing (by using the whole arm and not only the fingers), and different forms of instrument-directed movement are the key terms and main concerns. The second school, sometimes referred to as the ‘psycho-technical school’ (Kochevitsky, 1967, p. 14), situates the core of instrumental technique not so much in the peripheral motor system and gravitational forces but rather in the central nervous system, in the human psyche and in musical imagination. The ‘psycho-technical’ school founds its basic principles on “the idea that the strength of our musical conception plays the main role in technical development. The musician who possesses a bright and exact musical imagination, i.e., who has in mind a precise and clear musical image, will find the best way for the realization of his goal” (Kochevitsky, 2004, p. 123). This particular route of enquiry finds its clearest expression in *‘über die Physiologischen Fehler und die Umgestaltung der Klaviertechnik’* (Steinhausen, 1905).

Otto Ortmann, one of the central figures in the process of SIPP and Peabody Conservatoire professor, summarizes with noticeable cynicism and disappointment the challenges that both schools meet in the preface to his *The Physiological Mechanics of Piano Technique*:

‘ALLE Theorie ist grau.’ This Mefistofelian rejoinder of the philosophic Faust typifies, quite accurately, the usual attitude of the musician toward a scientific investigation of his art. The ‘whys’ and the ‘wherefores’ do not concern him; they are colourless superfluities, grey before the beginning, and, unfortunately, often grey after the investigation. [...] A few eminent and praiseworthy exceptions tend but to emphasize the prevalent view. This attitude is to be regretted. It has served to keep obscure a field of great theoretical interest and practical importance: the border-land where science meets art. (Ortmann, 1929, p. xiii)

Categories such as ‘relaxation’, ‘weight-playing’, ‘mental imagery’ and ‘imagination’ have been very influential through the initial teachings of these pioneering authors and their students^{66,67}, and are as such (as nominal categories) still widely discussed in piano-studios today. These topical influences generally do not refer back to the sense for detail and scientific understanding that characterizes the early writings of SIPP, and, in general terms again, performers prefer to look for technical assistance in

⁶⁶ “The Breithaupt doctrine spread wherever people studied the piano and reigned supreme for almost two decades” (Kochevitsky, 1967, p. 9).

⁶⁷ In a recent publication regarding the teaching by Claudio Arrau (1903-1991) ample reference is made to Breithaupt’s findings and didactics (Arx, 2014).

the realm of personal experience, alternative body-techniques (Alexander Technique, Feldenkrais) and the idiosyncratic know-how of guiding examples:

Performers and teachers have always sought the fastest, easiest, and most effective means by which to achieve technical and musical perfection in their performance. This empirical method has been dominant for centuries and, unfortunately, still is today. Great performers and teachers have found correct paths of development through intuition. (Kochevitsky, 2004, p. 121)

It is remarkable then that these early SIPP-writings, although clearly originating in musical practice, are hardly known among musicians but have been heartily welcomed in the libraries of scientists and are now more than often a point of departure for studies in the psychology of music and more recently also in the area of performance science (Furuya, Aoki, Nakahara, & Kinoshita, 2012; Goebel & Palmer, 2008; MacRitchie, 2015; Parncutt & McPherson, 2002). Performance scientists Richard Parncutt and Gary McPherson propose the following analysis:

Scientific thinking, methods, and results have influenced piano performance and piano teaching for well over a century, and innumerable piano-pedagogical publications have claimed scientific validity. On the one hand, artistic writers— often great pianists and piano teachers—have tended to fashion complex pseudo-scientific theories post hoc to match their beliefs, so that such theories can be controversial and unreliable. On the other hand, scientific writers tend to focus on simple hypotheses and assumptions that are easy to demonstrate and explain but are of limited interest to musicians. It is little wonder, therefore, that modern piano students are often unaware of the basic findings. (Parncutt & McPherson, 2000, p. 285)

So it seems that Ortmann's early complaint that the books, "when they are found in the teacher's library at all, too often still have their leaves uncut" (Ortmann, 1929, p. xiii) is still relevant.

With these general observations in mind we will now have a closer look at what the primary texts have to offer in terms of informational attitude.

2.2.2 A closer look at the *modus operandi*

A detailed report on the specific solutions that SIPP-musicians offer with regard to instrumental technique exceeds the limits of our enquiry. Our interest is rather information-focused and relates to the types of information used, the status that it is granted, and how the information is processed and used. We will analyse three source-texts⁶⁸ from this perspective.

⁶⁸ Steinhausen's seminal work on the physiological errors and reshaping of piano-technique (Steinhausen, 1905), is not included because, as a medical doctor without any piano-skills, he does not represent the musician's view, which is the focus of this chapter. However, it is worthwhile to note that the schools of Breithaupt and Matthay owe much to the groundwork done by Steinhausen. Breithaupt gives credit to Steinhausen for his discoveries and utilizes most of the technical terminology developed by the latter. Shortly after the publication of the first edition (1905), Steinhausen published his book *Die physiologischen Fehler und die Umgestaltung der Klaviertechnik* (1905). It led Breithaupt to publish a thoroughly revised edition in 1921. Pianist Donald V. Rupert

2.2.2.1 *The Act of Touch (Matthay, 1903)*

In 1903, Royal Academy of Music professor Tobias Matthay (1858-1945) publishes an encyclopaedic volume entitled *The Act of Touch in all its Diversity* which is a clear attempt to present a rational method for acquiring tone-production.

The highly-talented may happen to discover correct forms of tone-production, the less-talented will probably fail. Tone-production discovered by accident is easily forgotten; whereas, this is not likely, once the facts are understood. The rational method of acquiring Tone-production premises knowledge of the laws that govern it. (Matthay, 1903, p. 15)

Matthay embarks upon his project by first formulating an essential problem: according to Matthay, training is lacking the integration between ‘conception’, which he calls ‘musicianship’ and which has an emotional as well as an intellectual side, and ‘execution’ which aims at communicating the concept to others and implies artistic judgement and the art of tone production (Matthay, 1903, p. 40). It is in this latter category that Matthay situates his project that aims at figuring out how knowledge of the instrumental mechanics can be related to knowledge about biomechanics and muscular function. Matthay’s method is mainly one of keen observation, detailed description, experimentation and categorisation. No bibliography is included and the author draws on generic physics-related elements such as the physical nature of sound, string behaviour, key-resistance, impetus, rest, leverage to arrive at essential distinctions between weight- and muscular-touch, flat and bent finger-arm attitude, species of added-impetus-construction, key-surface and key-bed resting, and finger-, hand-, and arm-touches; these considerations ultimately lead to an extensive classification table of tone qualities and the means to produce them (Matthay, 1903, p. 254). Matthay’s work is very text-oriented, developing an idiosyncratic and highly complex vocabulary, complemented with figures that visualize the different hand positions and movement; no musical examples are included.

From an informational perspective, it can be said that Matthay’s effort is strongly focused on informing the technical aspect of pianism (not on ‘musicianship’ or ‘artistic judgement’); however, by explicitly situating his project within a bigger scheme of musicianship, he assumes an evident and productive relation between the realms of informed technique and imaginative musicianship.

To become pianoforte players, we must learn Music, and must acquire Taste, but we can only succeed in expressing what we feel musically, by means of the physical act of key-depression. (Matthay, 1903, p. vii)

notes: “Steinhausen’s book is written for pianists, in language that can be understood by individuals not familiar with anatomical terminology. Failure to limit the extent of such terminology has made many later works of a similar nature incomprehensible to those for whom they were intended” (Rupert, 1963, p. iii).

By applying a science-informed method of observation, experimentation, and classification, he comes to describe, in a rather hermetic way, the basic elements, the atoms as it were, of piano-technique. Matthay advocates this science-informed approach to solve 'problems', to make progress, but mainly to challenge ignorance and tradition in an orderly, systematic and authorial fashion.

2.2.2.2 Natural Piano Technique (Breithaupt, 1905/1921, 1909, 1916-1921)

Almost simultaneously with Matthay's *act of touch*, German pianist and pedagogue Rudolf Maria Breithaupt (1873-1945) starts publishing a series of three volumes dedicated to the development of a 'natural' piano-technique (Breithaupt, 1905/1921, 1909, 1916-1921).⁶⁹ Breithaupt's project is immense and wide-ranging with the first volume (674 pages) as the most impressive achievement. Focussing again on the informational *modus operandi*, it becomes clear from the outset that Breithaupt aims at forging a synthesis of piano-playing that includes only facts [*Tatsachen*] that rest on practical evidence [*praktisch beweisbar*] and that have shown their value in everyday practice [*20 jährigen Erfahrungen im täglichen Kunstleben*] (Breithaupt, 1905/1921, p. VI). As with Matthay, Breithaupt focuses on the technical aspect of piano-playing and gives technique a dedicated place in the larger framework of artistry:

Since the reproduction of the art-work — the sole object of our technic — exacts the greatest variety and multiformity in the means of expression, a "firmness, full of character" in the physical organism is an absolute essential. Those that would diffuse amongst others the fullness of life and their enormous wealth of tone and colours, i.e. those that would be artists and bear the name deservedly, must be in possession of means of expression, sufficient to meet every demand which art may lay upon them. (Breithaupt, 1909, p. 100)

To actually meet this demand, an information-strategy is fundamental. In Part I, Breithaupt presents a psycho-physiological basis of piano-technique in terms of anatomy, muscular function and nervous system and takes it as a point of departure for constructing a physiology of piano technique which includes a complex of instrument-directed movements (e.g. swing, throw, thrust, strike). The first volume concludes by applying these fundamentals to practical and musical instances. Akin to Matthay, Breithaupt develops an extensive and highly complex vocabulary illustrated by anatomical drawings and movement analyses. Unlike Matthay, Breithaupt provides concrete links between the theoretical work and practical examples (in staff-notation). Breithaupt's work also includes an extensive bibliography, which reflects his ambition to embed the practical work in a scientific and generic framework. The reference-list includes scientific disciplinary fields such as anatomy, physiology⁷⁰,

⁶⁹ In our analysis, we refer to the fifth edition of volume 1 (1921).

⁷⁰ Physiology is usually limited to the study of the functioning of living organisms, animal or plant, and of the functioning of their constituent tissues or cells. SIPP-authors generally use the term to include also anatomy and biomechanics (muscular function).

psychology, acoustics as well as cultural domains (aesthetics) and musical-practical areas (schools of piano-playing, counterpoint, composition).

2.2.2.3 *The Physiological Mechanics of Piano Technique (Ortmann, 1925)*

Peabody Conservatory professor Otto Ortmann (1889-1979) sets out to study and measure every aspect of making music at the keyboard in order to come to inform an informed, didactical approach to practical problems. Ortmann publishes two books: *The Physical Basis of Piano Touch and Tone* (Ortmann, 1925) and *The Physiological Mechanics of Piano Technique* (1929). In the first book, he limits himself to the mechanics of the instrument by reducing the poetic effects of music to mere variations in key-speed and time duration; the second book is dedicated to the mechanics of muscular action with occasional excursions into the psychological field. The latter publication is subtitled as "an experimental study of the nature of muscular action as used in piano playing, and of the effects thereof upon the piano key and the piano tone". Ortmann measures, examines, and observes driven by the conviction that, due to the way the human arm and hand are constructed, there are fundamental factors that every player must comply with in order to play the piano efficiently and productively. In 378 text-rich pages and 223 illustrations (including comparative photos of human arms and röntgenograms of hands), Ortmann explains principles of the physiological organism, physiological movement (action and reaction, activity and passivity, coordination, relaxation, weight-transfer, vertical and lateral arm-movement), to eventually come to the basic touch-forms of piano technique (arm-legato, tremolo, staccato, Finger-stroke, scales, arpeggio, miscellaneous movement). As with Breithaupt, Ortmann provides an extensive reference-list which he orders in terms of 'General Anatomy and Physiology', 'Muscles: Structure, Function, and Action', 'General Principles of Physiological Movement', 'Physiology of Piano Technique'. Ortmann's dedicates two chapters to individual differences:

Thus far the analysis of the physiological mechanics of piano technique was directed toward establishing the general laws upon which such movements are based. The conclusions drawn from the investigations of the various problems, both mechanical and physiological, hold for any non-pathological case. But the problems of the piano teacher are not only general problems, they are also, and preponderantly so, specific problems. And against the physiological constancy set up in preceding chapters, we have now to place the physiological variability that gives rise to the important question of individual differences. Musical talent would have no intelligent meaning were it not for this variability, which reaches into the finest fibres of man's nature. (Ortmann, 1929, p. 297)

One would expect Ortmann to leave some space for subjective application of his laws. However, in approaching the individual differences, Ortmann holds on to the same deterministic and classificatory

mindset and identifies individual differences and solutions with regard to the arm, hand, muscles, strength, neural circuit, metabolism.

Ortmann's approach to piano-technique combines insights in physiological fundamentals (the informational phase) which serve as a basis for tool- and lab-assisted experimentation (dynamograph, röntgen), and to the formulation of fundamental laws. The ultimate outcome of his investigations is an informed classification of piano-technique, which is to Ortmann only a first step. He is convinced that also the more imaginative and poetic aspects of music can be understood and reduced to basic and predictive mechanisms. In the citation below, he sets an agenda for the discipline of Performance Science⁷¹:

The experimental procedure adopted in the present study shows the need for getting away from the mere subjective reaction of the teacher or pupil by using the graphic recording method. In a field where emotional colouring and imagination play legitimate and important roles, the physical and physiological bases can be separated only by eliminating the psychological factors. [...] How the former lead into the latter, why the physiological facts are transformed into the colourful psychological effects is the next step in the investigation. Here we reach an interesting and formidable array of new problems. How does the imagination turn the mechanics of the piano into variegated pictures? How does the direction of the attention influence the performance of a passage? Is the whole or part method of practice better? Should both hands be practised from the beginning? When should pedal be added? Should the ear or the eye or neither come first? How can memory be improved? What will give the public performer more assurance? [...] The list could readily be extended. And these are questions which I dare say even the teacher to whom "all theory is grey" would like to have answered. (Ortmann, 1925, pp. 377–378)

2.2.3 Summarizing observations

From an informational perspective, the three examples of original SIPP-sources presented above share a number of characteristics.

Firstly, all three authors gather and produce what they consider to be objective or factual information as a stepping stone to explaining and predicting more complex phenomena; their sources of information are 'laws' that are subsequently processed via application, rationalisation or systematic experimentation into an accumulative set of 'rules of procedure' which are then made available to the individual learner.

Secondly, information is used as a means to challenge received views and the *status quo*, to rationalize the elements of piano-technique, and to set in motion a process of knowledge accumulation.

⁷¹ For more on performance science see Williamon, Pretty, & Buck (2009); Parncutt & McPherson (2002); Williamon (2004, 2013); Williamon, Edwards, & Bartel (2011).

Thirdly, within SIPP, the target domain of collecting, applying and producing information is proximally directed at the technical aspect of piano-playing. However, all three authors envisage and include a framework in which the proximal research outcomes are in service of more distal target domains such as ‘musicianship’, imagination, and conceptualization.

Finally, each author produces an exhaustive, rationalised catalogue of movements that leads to a variety of archetypical tone-production types. There is a claim to universality even when individual differences are discussed; this results in quasi-suffocating lists of possibilities, leaving almost no room for personal adjustment or interpretation.

Comparing SIPP with HIP, we encounter commonalities as well as differences.

Whereas both HIP and SIPP use information in an act of rebellion against tradition, a clear difference is manifest in their source and target domains and in the ways information is handled. In HIP the proximal source domain of information is extra-disciplinary since, in some cases at least, it implies the mediation of musicologists to present the source material; the distal source domain, however, is intra-practical since it involves the sayings, writings, and doings of bygone fellow musicians. In SIPP, the source domains of information are multiple and involve anatomy, neurology and physics; these fields of expertise are related to performers in the sense that every human has a brain, muscles, a skeleton, and lives in a physics-ruled environment, but the disciplines that investigate these elements of life are in terms of culture and discourse only distally related to the cultural practice of performing.

This situation has important consequences for the ways in which information is processed. In HIP, this is done by simply collecting and presenting the *Ur*-information, which can have a direct impact on interpretation and audible results. In SIPP, the first step is often to present (and if necessary also to translate) the *Ur*-information (anatomy, laws) and then to process it in rules, procedures and catalogues of tone production techniques. Although these outcomes are often presented as universal they are in fact an idiosyncratic interpretation of the informational elements. This observation can be substantiated by looking at the differential outcomes that are produced by SIPP-authors with regard to tone production. In Breithaupt’s scheme, relaxation and gravity are of prime importance; by consequence, he sees no reason to abrogate the gravity-induced down-force once a key on the piano has been hit. Matthay, on the contrary, takes the mechanics of the instrument, and more in particular the swing of the hammer, as an argument to strongly warn against such ‘key-bedding’ or the directing of unnecessary force pressure.

No greater Weight or Force than just suffices to prevent such rebound of the key in Tenuto and Legato, should ever be allowed to rest on the Key-bed. In fact it is unnecessary that more force than this, should ever even reach the key-bed. (Matthay, 1903, p. 87)

The focus of this chapter-section is not to arbitrate between these two views⁷² but to indicate that, based on the same fundamentals (gravity and instrumental mechanics), two of the SIPP-pioneers come to very different conclusions. From an information-perspective, SIPP is not so much about collecting and (re-)presenting primary information but rather an effort to present newly produced, *bearbeitete* (pre-processed) information and personal knowledge. Although the authors themselves show clear signs of an informational impulse towards primary, extra-disciplinary sources, by processing this information into a punctual didactic format, this initial appeal as basic and imagination-stimulating information is lost, at least to a significant extent. Moreover, the didactic format is often presented in a hermetically closed and idiosyncratic language and system that run the risk of confusing the reader. This is a clear difference between HIP and SIPP: whereas in the first context information is presented in its primary form (with an abundance of quotations), SIPP publishes pre-processed information without much cross-referencing to the scientific fundamentals.

A final difference between HIP and SIPP concerns the target domain of their work. Whereas, in HIP, the research outcomes flow directly into interpretation and musical practice, SIPP limits its target domain to instrumental technique and situates it in a broader framework of imaginative musicianship where technique is only one of the building blocks.

The question remains to what extent these differences correlate to the differential ways in which HIP and SIPP fared in the course of the past century in terms of enduring informational value and impact. A definite answer to that question requires more in-depth analysis of both movements but by the observations presented above, at least a few lines of thought seem to be warranted: 1/ the integration of extra-disciplinary information in musical practice is successful if the source domain is close to the target-domain with only marginal mediation; and 2/ pre-processed information (especially into idiosyncratic languages) seems to be less appealing in terms of information value for performers and is therefore probably more amenable to pass via the route of master-apprentice teaching.

2.3 'Mainstream Performances' [MSP]

2.3.1 *Situating MSP*

Mainstream Performances comes close to Danuser's *Traditioneller modus* in his taxonomy of performance styles (Danuser, 1996); it is an interpretative culture that draws mainly on performance tradition as a source of information while untying (to a certain extent) the links with a composer's culture and with a contemporary art culture. Backgrounding this performance mode is the idea that

⁷² Piano-technique is a central element in Chapter 12.

renowned performers (mainly of the 19th century) have handed down their understanding of stylistic and technical requirements to their students, who in turn passed the tradition onto the next generation in an unbroken flow of interpreting the opinions and insights of past masters (Fabian, 2000, p. 25). Accompanying this mode of performance is the influential master–apprentice model which is still the pedagogical cornerstone of many prestigious educational institutions. Next to its close connection with performance tradition, MSP is also very practically and technically oriented. In very generalising terms, it considers the musician as craftsman and a conduit of the composer rather than a creative artist.

2.3.2 *Sample survey*

The corpus of texts that pertain to the MSP-mode of interpretation is extensive and not confined to piano playing. For our purposes, which are of an exploratory nature, four contemporary texts on piano playing, authored by concert-pianists/teachers with a solid reputation in musical practice⁷³, are punctually examined (Berman, 2000; Fraser, 2003; Neuhaus, 1973; Sándor, 1981). This exercise has a dual purpose: firstly, exploring the semantic spectrum of the term information in these texts; secondly, and because of the technical inclination of MSP-texts, looking for references to a SIPP and assess the intra-disciplinary information-flow.

2.3.2.1 *The Art of Piano Playing (Neuhaus, 1973)*

Heinrich Neuhaus (1888-1964) is a prominent piano-pedagogue of the twentieth century. He taught at the Moscow Conservatory and counted among his students renowned pianists such as Sviatoslav Richter, Emil Gilels, and Radu Lupu. *The Art of Piano Playing*, published in 1958, near the end of his life, is a structured, personal reflection on the basic elements of piano playing. A central element in Neuhaus' pedagogical framework is the 'artistic image [*Bild*] of a musical composition' and its relation to technique. Akin to Dolmetsch (see 2.1.2.1.), Neuhaus identifies 'what'- and 'how'-questions but turns to other sources than historical information to address them. According to Neuhaus, the 'what' is conjured up by the imagination, emotion, inner hearing, and aesthetic and intellectual understanding (Neuhaus, 1973, p. 20) and precedes and determines technical development:

The 'what' determines the 'how', although in the long run the 'how' determines the 'what' (this is a dialectic law). [...] My method of teaching, briefly, consists of ensuring that the player should as early as possible [...] grasp what we call 'the artistic image', that is: the content, meaning the poetic substance, the essence of the music, and be able to understand thoroughly in terms of theory of music (naming it, explaining it), what it is he is dealing with. A clear

⁷³ Alan Fraser is less known as a concert-pianist than the other authors but as an author widely read. In 2011 a second revised edition appeared. A video-fragment that summarizes the main technical points had 31.848 views on September 8th 2016 (Fraser, 2010).

understanding of this goal enables the player to strive for it, to attain it and to embody it in his performance; and that is what 'technique' is about. (Neuhaus, 1973, p. 2)

Moreover, the artistic image is something that transcends reality:

It is only by demanding the impossible of the piano that you can obtain from it all that is possible. For the psychologist this means that imagination and desire are ahead of the possible reality. (Neuhaus, 1973, p. 66)

Neuhaus' understanding of the 'image' and its relation to 'technique' is interesting for several reasons:

1/ Neuhaus has (implicitly at least) a type of imagination in mind in a context where a (divine) creator/composer has created a perfect (fictional) world which can only be imagined mimetically by a performer: "whoever is moved by music to the depths of his soul, and works on his instrument like one possessed, who loves music and his instrument with passion, will acquire virtuoso technique; he will be able to recreate the artistic image of the composition; he will be a performer" (Neuhaus, 1973, p. 29); 2/ the score potentially grants information about the essential world created by a composer just as environmental information provides information about an actual world; and 3/ implicitly, Neuhaus' remark with regard to technique holds clear reference to the psycho-technical school of piano-playing⁷⁴: "the clearer what is to be done, the clearer, too, how it must be done" (Neuhaus, 1973, p. 83).

Neuhaus asserts that "it would be very interesting for young pianists to have more detailed information about the way in which prominent pianists prepare for recitals and about their concert work in general" (Neuhaus, 1973, pp. 214–215) but has a rather low esteem for information that lays down prescriptions in textbook manuals and by that expresses an implicit scepticism with regard to SIPP.

Textbook methodology, which mainly lays down prescriptions, so-called hard and fast rules (even if they are tested and reliable) will always be but a primitive, primary, simplified method, which at any moment when coming into contact with reality needs development, rethinking, clarifying, livening up, in short - a dialectic transformation. (Neuhaus, 1973, p. 62)

Truthful to his view, Neuhaus does not include any bibliography and also no explicit within-text references to SIPP-sources.

2.3.2.2 On Piano Playing (Sándor, 1981)

The monograph by György Sándor (1912-2005) offers an organised account of the author's perspective on piano technique. Unlike Neuhaus, Sándor does not take the artistic image of the composition as a point of departure, but reverses the sequential order and starts with overviewing the determining

⁷⁴ And in a way also close to the notion of action-effect coupling in psychology (Hommel, 1996) which will be discussed in Part III.

factors in piano technique (music/emotions/motions, the instrument, the human performing mechanism) and the technical patterns (free fall, finger-technique, rotation, staccato, thrust) before discussing the musical aspects of piano playing (see part three: “technique becomes music”): “[when] the technical solutions are available; the rest depends on our perseverance, imagination, and talent” (Sándor, 1981, pp. 208–209). From a systematic point of view, Sándor grants different roles to the unconscious, conscious and critical mind, implying that it is only in the latter capacity that information (as communicable knowledge) can play its role.

The conscious mind’s valuable role is irreplaceable, for it continues to enrich and develop us during our entire lifetime; it is in charge of learning. On the other hand, the creative processes are the product of the subconscious and unconscious mind⁷⁵; they produce the spontaneous and involuntary activities. All that has been said about the vital role of the conscious mind refers to the learning processes: creativity is not a function of the conscious mind. [...] The use of the conscious mind is limited to acquiring the skill of piano playing. [...] The critical mind is only helpful in establishing new habits and in eliminating bad ones. (Sándor, 1981, p. 188)

In his technical approach Sándor emphasizes the use of gravity, an “inexhaustible source of energy” (Sándor, 1981, p. 37), during playing and thereby explicitly refers to the SIPP-generation⁷⁶. However, the author is cautious about the practical impact related to the vocabulary and information that SIPP generated:

There was a need for new ideas because it was evident that the modern piano could not be mastered by sheer muscular force and especially not by the relatively weak forearm muscles that move the fingers. Breithaupt’s technical terminology spread rapidly, but it was employed in a rather confused and confusing way. (Sándor, 1981, p. 37)

In general, Sándor asserts that the totality of piano playing must be understood and described and not just some of its components. Sándor views information as a fragmented field of small facts lacking coherence and makes an effort to organize the abundance of information by establishing and describing basic concepts (anatomy, physics) and then adapt and refine them for use in a practical context.

Most books on piano playing have certain merits. Some of them, such as Rudolf Breithaupt's book *Die Grundlage der natürlichen Klaviertechnik* (1925), were quite a revelation in their day. Others present valid observations on technique, interpretation, and performance practice. Still

⁷⁵ “If the conscious mind is like a spotlight, the subconscious is similar to a large dimly lit cave; the spotlight can enter it and pinpoint small spots, but it can never illuminate the entire area at once. It is in the subconscious mind that we store most of our experiences, and it is also the place where most of our memories are submerged. There is still another region where most of the vital bodily processes are controlled by the unconscious and automatic nerve centers; the conscious mind has hardly any control over these centers” (Sándor, 1981, p. 187).

⁷⁶ A general assessment of SIPP is mentioned in the preface; Breithaupt is referred to in relation to ‘free fall’ and ‘relaxation’ (Chapter 4).

others are filled with impressive biological, chemical, and anatomical statistics and resemble nothing so much as scientific textbooks. Obviously all of these aspects must be considered in examining piano technique. But I believe that it is the totality of piano playing that must be understood and described and not just some of its components. (Sándor, 1981, p. x)

To accomplish that, Sándor chooses to start from common-sense observations and basic understandings (for instance about the human performing mechanism) instead of building on the work of predecessors. Akin to Neuhaus, Sándor is sceptic about the use of textbook-references in clarifying piano-technique and does not include a bibliography.

By the end of the book, Sándor addresses the notion of information in the context of musical communication and is clear about its incompatibility with this domain: “Music is about evoking feelings, not about communicating information” (Sándor, 1981, p. 198).

2.3.2.3 Notes from the pianist's bench (Berman, 2000)

Boris Berman (°1948) reflects on his experience as a teacher and a concert pianist and organizes his acquired understandings, accordingly, in two parts: 1/ *in the Practice Room*; and 2/ *Shaping Up a Performance*. Berman does not aim at being exhaustive or revelatory but rather at offering an addition to the primary instruction by a teacher. Berman's general view on the relation between practical (technical) and ideal (musical) aspects of music-making is that “these two areas cannot be addressed independently of each other; technical work should always have a musical goal in sight, and lofty ideas need to be supported by know-how to be put into practice” (Berman, 2000, p. x). In doing so, the main sources of information to Berman are his own experience and the experiences of other pianists to which he refers in endnotes. Berman's contribution is reflective rather than innovative; the instances where ‘information’, as a term, is explicitly used, point to an understanding in which information is an element of a decision process and to sensorial information in a feedback- and learning-process.

In passages containing different note values, stylistic considerations inform the performer's decision whether the differences between the note values should be clearly marked or blurred. (Berman, 2000, p. 77)

Tireless listening to one's own playing is the key to efficient practicing, because it informs the pianist about anything that may need improving. (Berman, 2000, p. 126)

[There are] two kinds of ‘musical ears’. One is the ‘subjective ear’, the pianist's image of the kind of sound he would like to produce. The more specific the image, the better the results will be. The other is the ‘objective ear’, which refers to the musician's ability to monitor the sound that actually comes from under his fingers. (Berman, 2000, p. 4)

Implicitly, the main source of information is the score which serves as a communication device between a creator and re-creator via a process of decoding. Berman's view on imagination in

performance is clearly a mimetic one; in chapter 7, with is very tellingly entitled ‘deciphering the composer’s message’, the author asserts that:

The work of a performing musician is not a creative process (in the sense of actually producing something new) but a *re-creative* one. [...] We are the medium through which [the] music becomes audible [...] the performer’s creativity lies principally in the area of musical expression in finding the right feeling [...] the performer’s freedom should never be denied; rather, it must be defined⁷⁷ (Berman, 2000, p. 139).

I believe that if a teacher succeeds in igniting the student’s imagination, the result is much more creative than anything that dry, albeit efficient, directives can accomplish. (Berman, 2000, p. 204)

Seeing the ‘big picture’ of a work is to be accomplished by familiarizing oneself with the composer’s entire output (chapter 8) and emotional identification with the piece (chapter 9).

Berman’s book does not include a separate bibliography; references are present in the notes to each chapter (Berman, 2000, pp. 211–213) and for the most part of an intra-disciplinary nature (e.g. Brendel, 1991; Leimer & Giesecking, 1972; Neuhaus, 1973; Sándor, 1981) with a few excursions into historical musicology (e.g. Drake, 1981; Eigeldinger, 2004), music theory (e.g. Schoenberg, 1911/1978) and related arts (e.g. Scully, 2009; Stanislavsky, 1948). Berman does not refer to any SIPP-sources.

2.3.2.4 The Craft of Piano Playing (Fraser, 2003)

Alan Fraser’s (°1955) career both as a concert-pianist and a pedagogue is more modest than those of the three preceding authors. Nevertheless, his publication, *The Craft of Piano Playing* (Fraser, 2003), and the accompanying video-fragments are frequently consulted by pianists. Fraser’s publication is technical in its purposes although primary importance is attached to musical imagination.

A musician’s art must grow not from technical concerns but rather be conceived in a world of fantasy and imagination, and be born of a burning desire to communicate something of that world through the medium of sound. (Fraser, 2003, p. 23)

Fraser explicitly refers to Neuhaus’ *the Art of Piano Playing*, stating that he envisages to lead pianists to greater success in implementing Neuhaus’ precepts by showing them more clearly *how* to fill the missing link between musical intention and physical execution (Fraser, 2003, p. 1). He organizes his effort by discerning foreground elements (movement – hand strength – wrist/arm/fingers), middle ground concerns (rhythm – phrasing) and background aspects (telling a story – emotion).

Next to intra-disciplinary sources authored by ‘great’ pianists and an observational fascination with the abilities of Vladimir Horowitz, Fraser explicitly calls in extra-disciplinary information to feed his

⁷⁷ Here, Berman, in true romantic style quotes pianist Grigory Kogan: “the musical score is Sleeping Beauty, the performer is the Prince releasing her from the spell” (Berman, 2000, p. 77)

practice with new insights. The sources that are drawn from do not pertain to the field of science but to 'alternative' body-techniques and perspectives on movement (T'ai Chi Chuan and Feldenkrais Method).

The more this analytical process [the analysis of Horowitz's pianistic ability] encompasses, the better chance it has of bringing relevant new information into the picture – thus my 20-year study of T'ai Chi Chuan and Feldenkrais Method. [...] the principles I learned away from my instrument allowed me to return to the piano with new insights. (Fraser, 2003, p. 4)

Fraser's book contains one brief reference to SIPP-pianists Breithaupt and Ludwig Deppe (Fraser, 2003, p. 47) and a critical review of Tobias Matthay's rotation technique.

In general, Fraser's vision on information is one in which informational elements are the (fragmented) bits of knowledge in a process of pragmatic integration. Fraser's pragmatism applies to extra-disciplinary information as well as to basic, sensorial information in a feedback-context.

The richer the sensory information being sent to your brain (the actual kinaesthetic or proprioceptive images), the better basis you have for organizing movement. (Fraser, 2003, p. 23)

This new view of movement [the author refers to the views by Tobias Matthay and Moshe Feldenkrais] as it relates to piano playing is rich in its substance and also in the myriad details of its application. But piano playing is a pragmatic undertaking – how can we possibly do justice to Beethoven or Chopin if our minds are preoccupied with all this new information? Well of course, we can't. All this must be integrated. We still are nowhere near the sophisticated simplicity of an evolved technique, the fusion of these many disparate elements into a unified gestalt. (Fraser, 2003, p. 53)

Fraser's bibliography contains 19 items mostly related pianist-authors (Giesecking, Hoffman, Horowitz, Neuhaus etc.) and also reference to *Awareness through Movement* (Feldenkrais, 1990).

2.3.3 Summarizing observations

The limited scope of this sample survey does not allow definite conclusions regarding the role of information in MSP, but at least some general characteristics can be inferred.

- All authors consider scored repertoire as primary sources of information and find informational guidance not so much in textbooks but rather in the guiding example of teachers and prominent musicians.
- A relation between information and decision-making is acknowledged (Berman, 2000).
- Information is used in the context of sensorial feedback in a learning process.
- Information processing requires integration, otherwise it can work inhibiting (Sándor, 1981).
- Music and information are not a fit in the domain of interpersonal communication, music is about evoking feelings, not about communicating information (Sándor, 1981).

- The topics of SIPP are still relevant (anatomy, free fall, relaxation, imagination) but punctual references to pioneers and primary sources of SIPP are rare.
- Bibliographies are either absent or contain intra-practical references related to colleagues and predecessors.

The limited interest of MSP in extra-disciplinary sources of information and the focus on intra-practical knowledge and tradition (score, teachers) is not surprising. The approach to music performance in MSP is largely based on 18th and 19th century views of music production and performance as an autonomous art practice which implies the establishment of a practice-specific canon of reference works (Goehr, 1992; Weber, 1994; Berger, 2000).

2.4 Information in music performance

Exploring information in the field of three performance orientations brings about a mixed picture with regard to its role and value.

HIP is directed at informing issues of interpretation⁷⁸, is connected to historical but still intra-practical information sources, and presents the elements of information in its *Ur*-form. The disciplinary field of historical musicology acts, in some cases at least, as a mediating agent. HIP succeeded in acquiring a valued status in musical life (dedicated departments in conservatories, journals, festivals) but the story of HIP over the last century has been one of negotiating an equilibrium between information as evidence, freedom, experimentation, and imagination.

SIPP is directed at informing instrumental technique and has the fields of anatomy, bio-mechanics, (neuro-)physiology, and physics as its main source domains of information. These fields are more distally related to the epistemic horizon of musicians and the information processing style is one in which the extra-disciplinary elements of interest are transformed into punctual, instrument-specific and extensive classifications of tone production techniques. The heydays of SIPP are to be situated at the beginning of the 20th century but nowadays, the insights and accomplishments are only indirectly present in instrument-related discourse of musicians and have quasi-vanished from the radar of performers in terms of the pioneering publications.

HIP and SIPP are specifically involved in constructing a bridge between a practical and extra-disciplinary theory via the route of information. MSP lacks such an intentional link to sources of information that are located outside the perimeter of the practical engagement with the instrument and musical scores. Here, the performer's own, score-based experience is coupled with a master-apprentice instruction

⁷⁸ Not all early music icons would agree on this formulation; baroque violinist Sigiswald Kuijken for example declares that 'interpretation' should be banned from a musician's vocabulary and be substituted by 'realisation' (MusicFrame Films, 2015).

model and the guiding examples of leading musicians which serve as the main road to interpretative and technical excellence.

From this, it can be inferred that, contrary to the polarizing statements presented by academics in Chapter 1, the role and value of information in a music performance context is multi-layered, significant, and can be discussed more systematically (but still tentatively) in terms of Information sources, information processing modes and information target domains.

2.4.1 Sources of information

What can be induced from our analysis is that in score-based performance, the score is looked upon as a primary source of information. It is a coded (re)presentation of compositional activity and therefore in need of decoding, interpreting, imagining, or experimenting in order to establish the sonic conditions for an actual musical experience. Next to its seminal role in representing a musical composition and providing interpretative cues, the score is also of primary importance in the context of skill development via a process of ‘deep learning’⁷⁹. The score contains latent information with regard to fingering, style, ways of phrasing and articulation; therefore, in instrumental musicianship, the didactic path is often one of ‘playing a lot of pieces’ in order to implicitly acquire from examples the building blocks of instrumental and musical technique⁸⁰.

A second context in which information surfaces in the discourse of music performance is as an element of sensorial feedback. Auditory and tactile feedback are essential features in a learning process but also in the act of a staged performance. Here the body and the sounding environment act as main sources of information.

A third fount of information concerns elements provided by teachers, peers, colleagues or guiding examples. The master-apprentice model is a highly valued and influential one in art education and artistic practice and centres around the common-sense pedagogy of learning by example and total immersion in a field of expertise which is holistically represented or embodied by an experienced master.

A fourth cluster contains written sources or theory as information. In HIP, written sources play a crucial role in establishing new/old ways of performing historical compositions. These sources are intra-practical: they pertain to the realm of musical practice in a wider sense (including instrument-making, for instance). Extra-disciplinary information is prominently present in SIPP but the journey of SIPP and

⁷⁹ Deep learning is connected to the concept of neural networks. In the sphere of Information Technology it refers to a particular way in which computers are trained and fine-tuned on the basis of lots of examples rather than by human programming. A well-known application of deep learning is the training of the most advanced chess-computers (Goodfellow, Bengio, & Courville, 2016).

⁸⁰ Such a focus on deep learning is especially apparent in piano methods which are almost always structured as a collection of graded pieces.

the quasi-absence of bibliographies in MSP show that informing practice with extra-disciplinary information is all but evident.

Modelling this variety of sources into a catalogue results in three categories:

- Sources of analogue information
 - Body & environment: sensory feedback from playing (tactile/motor/audio/emotional)
 - Co-players (body-language, gestures), audience
 - Examples, models (performances, DVD, audio)
- Sources of coded information
 - Score
 - Written sources:
 - intra-practical (historical performance practices, biographies, methods, music theory)
 - extra-disciplinary (e.g. physiology, anatomy, psychology)
- Sources of hybrid information (integrates coded and analogue information)
 - Teacher

2.4.2 Information processing modes

Sources of information imply differential modes of information processing: analogue feedback gives rise to a process of experience, embodied integration, imitation, while coded information requires an act of interpretation. A third adjoining context in which information is processed is the one of 'inspiration'. Inspiration can relate to any information source but is feeling- and emotion-directed, referring to an ineffable process of influence and implying a connection with a supernatural realm. Whereas in an information process, a single element of information often implies a bigger field, inspiration seems to be of a more independent, serendipitous and context-free nature that has the capacity of taking over the rational and predictable behaviour of the artist.

2.4.3 Target domains and impact

In function of the two main target domains that we encountered in our analysis – interpretation and instrumental technique (both on a systematic and a personal level) – information is sometimes seen as evidence producing universal 'laws' but can, in other circumstances, lead to freeing up corroded habits and traditions, or be a source of inspiration and further development. From an information-perspective a differential attitude can be traced between a tradition-based practice and more rebellious lines of thought. The latter group (HIP and SIPP) explicitly aims at shattering cherished beliefs and personal intuitions by invoking extra-disciplinary information, whereas the former one (MSP) seems to be primarily concerned with preserving music's autonomous status by preferring intra-

disciplinary routes of references and is therefore reluctant to open to potentially perturbing information.

We can conclude that the semantic spectrum of information in the realm of music performance is extended, free-floating, multifaceted and idiosyncratic. The use of 'information' as a term and the attitude that performers maintain with regard to its value refer to deep-felt and memetically acquired artistic dispositions. A more extended analysis imposes itself to come to a systematic understanding of the obstacles and opportunities that the relation between information and imagination yields. In the following chapter, an excursus into the history of ideas will be called into support of such a considered understanding.

Chapter 3: Coming to terms with information – spadework into the history of words and ideas

“A word never —well, hardly ever—shakes off its etymology and its formation. In spite of all changes in the extensions of and additions to its meanings, and indeed rather pervading and governing these, there will still persist the old idea.”
(Austin, 1961/1970, p. 201)

“You must realize that when you take a word in your mouth, you have not taken up some arbitrary tool which can be thrown in a corner if it doesn't do the job, but you are committed to a line of thought that comes from afar and reaches on beyond you. What we do is always a kind of changing back, which I want to call in a very wide sense ‘translation’.”
(Gadamer, 1960/2004, p. 552)

In the previous chapter an extensive panoply of understandings surfaced with regard to the role, status and use of ‘information’ in the field of score-based performance. These findings indicate a state of underdetermination and a predominantly intuitive handling of a term that serves multiple context- and orientation-dependent purposes. Taking into account information’s intrinsic affinities, either antagonistically or sympathetically, with powerful notions such as imagination, inspiration, learning, cognition, truth, authenticity, learning, liberation, a more grounded and systematic understanding of information’s genealogical background is mandatory in order to come to a considered, actualised and potentially game-changing role for information in the practice of performing. The spadework into the history of words and ideas presented hereafter is a means to that end and serves two more punctual purposes: 1/ challenging (and deconstructing) cherished beliefs with regard to ‘information’ and its incompatibility with the field of ‘imagination’; and 2/ offering a horizon of possibilities which hold the potential to contribute to sketching the contours of a considered understanding of the informed performer by the end of PART I. The genealogies of information and its alleged counter-term imagination are very rich and complex; in order to pursue our enquiry in a systematic way, we hold on to a terminological and discourse-oriented approach we initiated in the previous chapters and keep to John D. Peters’ four-fold, macro-historical analysis of information as a leading narrative structure as introduced in Chapter 1 and summarized in Fig. 1.1 (Peters, 1988, p. 10).

3.1 The reign of Forms (Antiquity – Late Middle-Ages)

A first form of life which is foundational in the development of information and imagination as conceptual spaces spans an extensive period starting in antiquity and continuing until the seventeenth century (with the Renaissance as a *stretto*-period). The unifying backbone is the Platonic Form-centred, cosmological worldview which dominates Greek-Roman philosophy for centuries, manages to survive

within the framework Christian creational metaphysics of the Church Fathers and the Scholastics (St. Augustine, Thomas Aquinas), and remains influential in Renaissance humanism. Antiquity's preoccupation with eternal 'Forms' and later with the process of *in-forma-tion*⁸¹ is strongly related to a mind-set that ignites in antiquity and quests for stable and eternal truths backgrounding the volatility of the phenomenal world; the preceding knowledge cultures in Egypt, Mesopotamia and Babylonia focused primarily on practical outcomes and religious integration rather than on causality and knowledge for its own sake (Guthrie, 1962, p. 35). It is with posing the all-important 'why?'-question that a demand for generalization, abstraction and universal principles comes to be of central importance in ontology, epistemology and education. Here, 'Form', presented as the ultimate essence of things, is discovered and sets the stage for a divergence between *Forms* and *Images*.

From a linguistic point of view, the histories of both 'information' and 'imagination' can be captured in three ensuing linguistic moments wherein the concepts acquire their formal statuses⁸².

1. The Greek notions 'τύπος/*týpos*' (shape, imprint), 'μορφή/*morphḗ*' (form), 'ἰδέα/*idēa*' (Idea/Form), 'εἶδος/*eîdos*' (essence) semantically precede the Latin '*forma*' (Ernout, Meillet, & André, 2001, p. 247) and dialogue with imagination's precedents: 'μίμησις/*mímēsis*' (imitation), 'εἰκών/*eikōn*' (image), 'εἰδωλον/*eidolon*' (phantom, image in the mind), 'φαντασία/*phantasia*' (appearance).
2. '*Forma*' gives rise to and its active derivations '*informare*' and '*informatio*' in Latin. '*Phantasia*' survives the translation from Greek into Latin and it is only in the post-classical era that its alter ego '*imaginatio*' enters the Latin vocabulary as "the action of picturing mentally" (Glare, 1968, p. 831)⁸³
3. 'Information' eventually enter the French, English and German vocabularies in the late Middle Ages and around 1200 CE '*imagination*' is found in French and later also in English and German vocabularies.

Taking these three linguistic moments as structural markers (3.1.2. to 3.1.4.), we will now zoom in on the semantic spectrum that is developed in these early days of information and imagination, with a view to arrive at a more nuanced assessment of the alleged information-imagination dualism.

⁸¹ In Latin, the prefix 'in-' in combination with 'forma' can mean either a negation or an action-oriented intensification (Capurro, 1978, pp. 51–52).

⁸² For future reference the numbers are preceded by an 'L' (linguistic moment).

⁸³ St. Augustine of Hippo (354-430 CE) is considered to be among the first to use '*imaginatio*' as an alternative to '*phantasia*'; the Lewis and Short dictionary (Lewis & Short, 1879) indicates that '*imaginare*' appears only post-Augustinus. St. Augustin posits three classes of images/phantasiae according as they originate with the senses (memory of a face), or the imagination (supposing things that have no existence – e.g. winged dragons,), or the faculty of reason (geometrical figures and musical harmonies) (St. Augustin, 1886, pp. 314–315).

3.1.1 Pre-classical roots

The tension between a perfectly formed and stable metaphysical order and the cognitive limitations of earthlings, longing to gain access to that sublime order, is already foreshadowed, pre-classically, in the books of the Old Testament (Kearney, 1988, p. 47). There, the idea of imagination is granted a role, both implicitly as well as explicitly, in a process of divine creation⁸⁴, and this qualitative differentiation between divine and human creation initiates the *Form-Image* dualism in antiquity. In the first chapter of *Genesis*, the relation between imagination, creation and Form-like, metaphysical constituents is still (and seemingly) unproblematic while being situated in a material context: God forms a habitable world by separating and ordering⁸⁵ the (chaotic) elements of an existing universe⁸⁶, followed by the creation of mankind, based on his own image⁸⁷. These initial acts of creation are both subsumed under the concept of '*bara*' in Hebrew⁸⁸. In chapter two of *Genesis* a new account related to the creation of humankind is posited and placed under a new denominator, '*yetzer*' or '*yatzar*': "Then the Lord God formed man from the dust of the ground and breathed into his nostrils the breath of life; and the man became a living being" (Coogan & Brettler, 2010, pp. 13–14). Although, according to rabbinical traditions, the second mode of creation (*yetzer*) is to a certain extent shared with mankind⁸⁹, creativity and the imaginary capacities are generally considered to be a divine prerogative. This becomes apparent in chapters two and eleven of *Genesis* ('the Garden of Eden'⁹⁰ & 'the Tower of Babel'), where humankind's epistemic and creative ambitions are abated. An explicit distrust in images and

⁸⁴ The relation between 'imagination' and 'information' in the Old Testament refers to more generic and contemporary understandings concerning the relation between 'imagination' and 'creativity': "Imagination is not the same as creativity. [...] To be creative you actually have to do something. It involves putting your imagination to work to make something new, to come up with new solutions to problems, even to think of new problems or questions. You can think of creativity as applied imagination." (Robinson & Aronica, 2009, pp. 89–90). See also (Stokes, 2016).

⁸⁵ 'creation as ordering'⁸⁵ (McGrath, 2012). This ordering principle refers to ancient Near Eastern mythology, in which creation is often depicted as the victory of order over the forces of chaos (Porter, 1993).

⁸⁶ Before God's interference, the earth was "a formless void" and "darkness covered the face of the deep".

⁸⁷ "So God created humankind in his image, in the image of God he created them; male and female he created them [Gen 1:27]" (Coogan & Brettler, 2010, p. 13). 'Image of God': b'tzelem Elohim (Hebr.), later translated as εἰκόνα Θεοῦ (Gr.), imaginem Dei (Lt.). For the source materials in Hebrew, Greek en Latin see: http://www.scripture4all.org/OnlineInterlinear/Hebrew_Index.htm; <http://www.ellopos.net/elpenor/greek-texts/septuagint/default.asp>; <http://www.latinvulgate.com>.

⁸⁸ In the Christian tradition, as in 2 Maccabees 7.28 (Porter, 1993) and in the texts by the Church Fathers (Pitruzzella, 2009, p. 3), the of creation in the first chapter (*bara*) is interpreted as the apex of creativity, namely a *creatio ex nihilo* (creation out of nothing) and to an exclusively divine prerogative; although the primary text is in fact more indicative for a *creatio ex materia*, *creatio ex deo* or *phantasia ex deo*. It is in a reaction to the Greek pagan and gnostic understanding of the world, where the divine architect is limited by the quality of the pre-existent matter, that Christian writers of the 2nd and 3rd centuries CE argue that everything (matter inclusive) had to be created by God.

⁸⁹ Can be used positively ('*yetzer hatov*') in a dialogue between man and his Creator, but also entails an evil variant ('*yetzer hara*').

⁹⁰ "You may freely eat of every tree of the garden; but of the tree of the knowledge of good and evil you shall not eat" [Genesis 2:16-17].

imagination finds its ultimate realization in the second commandment of the Decalogue where a strong admonition against the making of images is formulated: “You shall not make for yourself an idol⁹¹ whether in the form of anything that is in heaven above, or that is on the earth beneath, or that is in the water under the earth [Exodus 20:4]”.

In Greek mythology, suspicions and warnings against human imagination and creativity are present in the myths of *Icarus* and *Prometheus*, but it is when, in Classical ontology, Forms become the universal and everlasting essences that constitute a perfectly ordered cosmos (e.g. Plato’s *Timaeus*), that the role of imagination is further defined and curtailed. The floating, phenomenological presence of nature is considered to be the informed actualization of an eternal order⁹² and as such the middle-ground by which the human ambition to rise to the standard of the universal Ideas/Forms is being settled: Forms speak to nature by means of a process of information and man attempts to communicate with this universal order either directly or indirectly, equipped with a (hierarchical) range of faculties.

3.1.2 Three seminal traditions within the first linguistic moment

The first linguistic moment of information is centred around a cluster of ancient Greek terms that predate the Latin *forma* and relate to notions such as shape, form, and model⁹³. They migrate around the fourth century BCE from a more generic, material and everyday context (pottery, poetry, perception) into higher-level concepts that serve as cornerstones of antiquity’s philosophical system. The crucial terms are ‘ἰδέα/*idēa*’ (Idea/Form) and ‘εἶδος/*eîdos*’ (essence) and their link to ‘form’ is somewhat counterintuitive to us, moderns, for whom ‘idea’ is closely connected with notions at the psychological and mental level, such as ‘concept’ and ‘thought’⁹⁴. ‘*idēa*’ and ‘*eîdos*’, however, are derived from ἰδεῖν/*ideîn*, which means ‘to see’, and prior to Plato these terms were employed to refer to the visible and exterior form of things (Reale, 1990, p. 47), to ‘that what can be seen’. In this pre-Platonic sense there is still a close semantic connection with the precursors of ‘imagination’, such as ‘εἶδωλον/*eidolon*’ (phantom, image in the mind) and ‘φαντασία/*phantasia*’ (appearance). The demarcation line between the two semantic fields is whether or not the object is physically present and the compatibility of the fields is clear from the fact that an image of something can exist prior to

⁹¹ כּוֹסֵף *pesel* [Hebr.], εἶδωλον [Gr.], *sculptile* [Lat.]

⁹² See Plato’s dualistic ontology as a solution to the Parmenides (all is one) - Heraklitus (all is change - πάντα ῥεῖ) debate.

⁹³ Some authors claim that Greek culture is a culture of vision (and hence of the ‘form’ that is the object of vision) and in that respect opposed, for instance, to Jewish culture, in which ‘listening’ and ‘hearing’ are the dominant notions (Reale, 1990, p. 47). This particular interest in looking at things and observation is also manifest in the Greek roots of ‘theory’ (the verb ‘θεωρεῖν’ means ‘to consider, speculate, look at’. The issue of theory versus practice will be considered in chapter 3. It is remarkable that ‘information’ and ‘theory’ both have this visual affinity and that both concepts seem to have a troublesome relation with the field of the auditory arts such as storytelling (Benjamin, 1936/2007) and music.

⁹⁴ This subjective turn is part of information’s second form of life.

materially moulding it. These differential meanings get shattered when ‘*ἰδέα*’ and ‘*εἶδος*’ eventually come to refer to the interior form of a thing, to its essence, its metaphysical structure, its inner most reality⁹⁵.

3.1.2.1 Plato’s idealism as the standard-view

It is in Plato’s oeuvre that this influential semantic turn is effectuated and that the standard-view with regard to the information-imagination dyad is developed. Plato advocates an ontological framework in which a higher-order, intelligible, a-temporal, and a-spatial world of stable and universal Ideas (or Forms) *in-forms* the visible fleeting and imperfect representations of truth which are all that we encounter in this world.

In the *Timaeus* a picture is drawn of the way in which this world came into being. The main element in his account is that the divine creator’s *modus operandi* is analogous to the one of a craftsman or handworker who crafts a material object. The craftsman [δημιουργός/demiurge], gazes at the eternal ideas [ιδέαν], not at manifestations of them in our world, and uses it as a model [παραδείγματι] for his creation [Plat. Tim. 28b]⁹⁶. Plato draws on the terms ‘*ἰδέα*’ and ‘*εἶδος*’ interchangeably to refer to these ideal patterns or Forms. Knowledge of these eternal Forms (the epistemological challenge) is possible via the human soul (ψυχή/psyche), which is immortal, and re-enters mortal bodies over and over again. In-between its incarnations, the soul faces the eternal realities (Forms), but the memory of these fades when the soul is re-embodied. Partial recovery or reawakening then is possible via a process of recollection of that memory (ἀνάμνησις/anamnēsis)⁹⁷ but mainly via a rigorous process of questioning and answering (διαλεκτική/dialektikē)⁹⁸. Plato’s Socrates makes seminal epistemic distinctions in the *Republic*⁹⁹ between: 1/ rational intuition (νόσις/nóēsis)¹⁰⁰ and thinking (διάνοια/dianoia)¹⁰¹, which are considered to be the epistemic tools giving (partial) access to the

⁹⁵ Other terms that are used are οὐσία (nature, essence) and φύσις (-intelligible- nature) (Reale, 1990, p. 47).

⁹⁶ <http://www.perseus.tufts.edu/hopper/text?doc=Perseus%3Atext%3A1999.01.0180%3Atext%3DTim.%3Asection%3D28a>

⁹⁷ See *Meno*, *Phaedo*, *Phaedrus*.

⁹⁸ [Plat. Politeia VI, 511c–e]. In the *Phaedrus*, *Sophist*, *Statesman*, and *Philebus*, dialectic is identified with collecting and dividing (taxonomy). “The precise description of the dialectical method varies somewhat from dialogue to dialogue, but it is primarily critical; hypotheses are tested, and the presumption is that the true hypothesis will remain standing” (Preus, 2007, p. 308).

⁹⁹ See ‘Divided Line Analogy’ [Plat. Rep. 6.509d-511].

¹⁰⁰ *Nóēsis* leads to *epistēmē* (‘knowledge’) of the Forms by means of philosophical conversation, it is the faculty that brings man closest to the eternal forms. In some dialogues, notably *Meno*, *Phaedo*, and *Phaedrus*, Plato presents a theory that knowledge of the forms is innate, and that learning is a matter of recollecting the forms (anamnēsis) (Preus, 2007, p. 210).

¹⁰¹ *Diánoia* applies to (mainly mathematical) hypothetical- deductive reasoning which relies on tangeable objects and is concerned with reaching conclusions based on hypotheses and not so much in finding first principles [Plat. Rep. 6.510b]. Aristotle tends to apply the word to thinking in general (Preus, 2007, p. 88).

intellectual realm of knowledge and Forms; and 2/ belief (πίστις/*pístis*)¹⁰² and imagining¹⁰³ (εἰκασία/*eikasía*), which are of an inferior rank and relate to the visual world of opinion. ‘Imagining’ occupies the lowest rank in this construction¹⁰⁴ and Plato’s preoccupation with accessing real knowledge (which is knowledge of the Forms) through reason, leads him to look at imagination as an obstacle rather than as an asset. Imagination is unable to get to the intelligible world of Forms and can only mimic the appearance of things in the visible world. Therefore, painting and poetry are by Plato ideas through which alone truth may be approached (Egan, 1992, p. 14). This view is most famously expressed in the *Republic*, at the end of the sixth book in what is known as ‘the Divided Line Analogy’¹⁰⁵ [Plat. Rep.VI. 509d-511e], in the seventh book via ‘the Allegory of the Cave’ [Plat.Rep.VII.514a-520a], and summarized at the beginning of the tenth (and last) book of the *Republic* where Plato makes his framework more concrete by postulating three kinds of objects (couches and tables in his example):

- The first type is the original Idea of the object. These Ideas exist in the intelligible world of Forms and must be known in order to recognize something as for example a couch or a table [Plat. Rep. 10.596b]¹⁰⁶.
- The second type is present in the visible world and is made by the carpenter [ὁ τέκτων], who looks toward the Form in making a bed [Plat. Rep. 10.596b].
- The last one is made by an artist/painter [ὁ ζωγράφος], who does not look toward what is but toward what appears and thus imitates a phantasm [φαντάσματος] rather than the truth [ἡ ἀληθείας] [Plat. Rep. 10.598b].

From this, it is concluded that the artist, the painter, as well as the maker of tragic poems (who is the real thorn in Plato’s flesh) is an imitator [μιμητής] and that his work is of an inferior rank being at three removes from what is by nature [Plat. Rep. X.597].¹⁰⁷ Reason enough for Plato to banish poets from his ideal state and to give priority to rationality in education (Egan, 1992, p. 15).

¹⁰² *Pístis* offers beliefs that are sufficient for guiding concrete action but lack the knowledge of the reasons for such beliefs.

¹⁰³ *Eikasía* is directed at apprehending images and reflections in the visible world (εἰκόνες) [Plat. Rep. 6.510a] (Liddell & Scott, 1940, εἰκ-ασία, ἡ, IV).

¹⁰⁴ See also [Sophist 260c-264a; Theaetetus 152a-c, Rep. 509d–511e].

¹⁰⁵ In the analogy of the divided line, four ascending stages of cognition are being distinguished: *eikasía* (conjecture, imagination) [Plat. Rep. 6.511e]; *pístis* (confidence, belief, conviction) [Plat. Rep. 6.511e]; *dianoia* (thought, reasoning) [Plat. Rep. 6.511d]; *nous* or *noêsis* or *epistêmê* (knowledge, understanding, intellectual grasp) [Plat. Rep. 6.511d].

¹⁰⁶ If not indicated otherwise, the primary texts referred to will be the one’s that are listed in the Perseus digital library <http://www.perseus.tufts.edu/hopper/text?doc=Perseus%3Atext%3A1999.04.0094%3Abook%3D1%3Asection%3D327a>.

¹⁰⁷ A few paragraphs ahead, the *Republic*’s reader finds a second three-way distinction [Plat.Rep. X. 601c-602a] that criticizes imitation from another perspective. Plato’s Socrates distinguishes here between 1/ a user (of a flute or bridle) who knows; 2/ a maker (of flute or bridle) who has correct belief; and 3/ an imitator (of flute or bridle) who is ignorant. This new list is intriguing (especially for musical performers) but hard to make sense of in the context of Plato’s ontology (see also Pappas, 2013, pp. 207–208).

This *idealistic tradition* (Bundy, 1927, pp. 259–260) is characterized by an implicit distrust and lack of confidence with regard to the human faculty of imagination. However, Plato himself modifies his disparagement vis-à-vis imagination in some dialogues where meaningful epistemic openings toward imagination are created.

Under the concept of (divine) inspiration [ἐνθουσιασμός/*enthousiasmos* or μανία/*mania*] by visionary forms [φαντάσματα/*phantasmata*], Plato creates an opening for privileged access to the world of Forms. In the *Timaeus*, more particularly, imagination is granted the capacity to communicate with the gods. This is performed via parts of the soul located around the liver [Plat. Tim. 71d] and is only possible in a state of slumber, when rational and intellectual capacities [λόγου καὶ φρονήσεως] are put on hold. Following such an episode of inspiration, rationality re-enters the scene to reflect upon what has happened:

No man achieves true and inspired divination [μαντικῆς] when in his rational mind, but only when the power of his intelligence [φρονήσεως] is fettered in sleep or when it is distraught by disease or by reason of some divine inspiration [ἐνθουσιασμόν]. But it belongs to a man when in his right mind to recollect and ponder both the things spoken in dream or waking vision by the divining and inspired nature [ἐνθουσιαστικῆς φύσεως], and all the visionary forms [φαντάσματα] that were seen, and by means of reasoning to discern [λογισμῷ διελέσθαι] about them all wherein they are significant and for whom they portend evil or good in the future, the past, or the present. [Plat. Tim. 71e-72A]

In the *Meno* [Plat. Meno 99c] Socrates extends the impact of inspiration when claiming that some statesmen owe their success not to the possession of wisdom or knowledge but to inspiration [ἐνθουσιῶντες] and in the *Ion* and *Phaedrus* the power of divine inspiration is invoked to account for the knowledge of the poet and the rhapsode, a reciter of epic poetry. Inspiration [ἐνθουσιασμός] comes down from the Muses and compensates for the lack of skill [τέχνη/*technê*] and factual knowledge [ἐπιστήμη/*Epistêmê*] of the rhapsode. Inspiration is then further related to a process of interpretation (hermeneutics), where poets (makers of poetical texts) are considered to be the interpreters of divine messages and rhapsodes interpret the utterances of the poets: “and so you act as interpreters of interpreters [οὐκοῦν ἐρμηνέων ἐρμηνῆς γίγνεσθε] [Plat. Ion 535]”. In the *Phaedrus* four types of inspiration [μανία] are presented: prophetic madness (Apollo), ritual madness (Dionysos), poetic madness (Muses) and erotic madness (Aphrodite & Eros). Historian Penelope Murray relates this type of poetic inspiration by the Muses to ‘information’ when arguing that “the invocations in Homer are essentially requests for information, which the Muses, as daughters of Memory, provide” (Murray, 1981, p. 90)¹⁰⁸.

¹⁰⁸ This combination of inspirational imagination and information as external memory is something we will come back to when negotiating a role for information in an artistic process and offers an interesting perspective on the

A second instance of flexibility and openness towards imagination is situated in the *Laws* [*Νομοί*] a conciliation of *art as mimesis* and *art as inspiration* is forged, followed by an important differentiation between the fields of legislation and artistry. The poet can allow many truths in his art whereas the legislator can only allow one single truth:

[719c] There is, O lawgiver, an ancient saying—constantly repeated by ourselves and endorsed by everyone else — that whenever a poet is seated on the Muses' tripod, he is not in his senses [οὐκ ἔμψρων], but resembles a fountain, which gives free course to the upward rush of water and, since his art consists in imitation [τέχνης οὐσης μιμήσεως], he is compelled often to contradict himself, when he creates characters of contradictory moods; and he knows not which of these contradictory utterances is true. But it is not possible for the lawgiver in his law [719d] thus to compose two statements about a single matter; but he must always publish one single statement about one matter. [Plat. *Laws* 4.719c-d]

Finally, a third way out of Plato's *mimesis*-doctrine is provided posthumously, when authors of later conceptions of creative imagination notice a paradox between Plato's epistemic position and his own image-laden writing and counter Plato's own condemnation of poetry and poets (Engell, 2012).

3.1.2.2 A psychological/empirical tradition¹⁰⁹

Aristotle also aims at understanding the universal, but unlike Plato, who situates the universal Forms in a separate realm, Aristotle places the universal in the things themselves. In technical terms: immanent forms¹¹⁰ take the place of the transcendent Forms of Plato. In Aristotle's *hylomorphism*, every natural object is a compound of matter [ὑλη/*hūlē*] and form [μορφή/*morphē*]¹¹¹ [Aristot. *Metaphysics*. VII.1029a] and is determined by two intrinsic principles: the principle of potentiality [δύναμις/*dunamis*], namely, primary matter, and the principle of actuality [ἐνέργεια/*energeia*], namely, substantial form. The trajectory from potentiality to actuality follows an inner impulse towards the development of an own specific form (from seed to plant, or from embryo to adult) and constitutes Aristotle's perspective on the (in)-formation-process. Matter and form cannot exist or act independently, they exist and act only within and by the composite and can therefore be known only indirectly, by intellectual analysis, by studying particular phenomena, and rising to the knowledge of essences. Knowing for Aristotle is mainly a process of induction, it does not begin with knowledge of universal Forms (or Ideas) which then descends to knowledge of particular imitations of these (as in Plato's deductive method) but follows the opposite trajectory from particular to universal form. For

dilemma Peter Walls faced when titling his book. Concerning this dilemma see p.25 (Walls, 2003, p. 10).

¹⁰⁹ See Bundy (1927, pp. 259–260).

¹¹⁰ Because of this immanent character, no capital 'F' will be used when 'form' appears in the context of Aristotle's ontology.

¹¹¹ Unlike *idea* and *eidos*, which are explicitly related to visible form, *morphē* tends to imply touchable shape.

Aristotle, 'form' is part of his general account of causality [Aristot. Metaphysics. V.1013a]¹¹² such as the form of a statue.¹¹³

Aristotle's ontology (hylomorphism) and epistemology, where thinking of an abstract universal without having access to all its instances is impossible, comes with a psychology that is equipped to perform the challenges that humankind is faced with. Here, imagination comes to the fore, to play a pivotal role. In *De Anima* [Περὶ Ψυχῆς/on the soul]¹¹⁴, Aristotle grants *phantasia* a role as the mediator between *nous* and *aesthesis*, between our thinking capacities and our perceiving senses.¹¹⁵ In the second book, Aristotle uses the wax-metaphor to explain that perception is concerned with the form of things and not with the materiality of it:

[Aristot. De Anima II, 12] Universally, however, concerning every sense, one must understand that the sense is that which is receptive of the sensible forms [αἰσθητῶν εἰδῶν] without the material, as wax receives the seal of the signet-ring without the iron or gold: if it takes a gold or bronze seal, it does so not insofar as the seal is gold or bronze.¹¹⁶

In the third book of *De Anima* the role of imagination is further determined. According to Aristotle, *phantasia* is an independent capacity not belonging to perception [αἴσθησις] nor to thinking [διάνοια] but always in need of perception in order to exist and always providing material for different ways of conceptual thinking and judging (knowledge [ἐπιστήμη], opinion [δόξα], understanding [φρόνησις]). In the latter capacity it is the source of thinking, it provides the mind with something about which to think and know; it reactivates appearances so that intellect can discover, grasp, and thus think the forms of intelligibility implicit in them. For Aristotle, there's no thinking without *phantasia*.

Phantasia is the state in which we are presented with a phantasma or appearance, either in perception, dreams, thought or imagination, either when an external object is present or when it is absent, Whenever the mind is active, in waking life or in sleep, in thought or in any other mode, in calm or in desire, phantasia is all-pervasive. (White, 1990, p. 13)

However, Aristotle still holds on to the view that imagination is for the most part false and is reluctant to permit *phantasia* any freedom in its own right; it is still closely and technically tied to perception [Aristot. de anima III, 3].

¹¹² Also in [Aristot. Physics. II.3].

¹¹³ Aristotle explicitly mentions the ratio 2:1 as the cause of the octave (but also considers mathematics in general as a formal cause).

¹¹⁴ With regard to the primary text, three editions were consulted : an old edition with English translation by Edwin Wallace (Aristotle, 1882), a more recent English edition by Mark Shiffman (Aristotle, 2012) and a Dutch edition by Ben Schomakers (Aristotle, 2013).

¹¹⁵ Aristotle identifies roles for *phantasia* in a variety of activities: in sensory experience, in memory and dreaming, in thinking and in acting. Our interest here is in the relation information-imagination. The role of imagination in action will be revisited in chapter 3.

¹¹⁶ English translation (Aristotle, 2012, p. 72), Greek text (Aristotle, 1882, p. 124).

3.1.2.3 A (proto-) creative tradition

The impact of Aristotle's thinking on artistic practice is twofold. Firstly, Aristotle considers artistic activity as a knowledge-driven, poetic art (*technè*), which has "its own methodology of proceeding and its own body of knowledge that underwrites it" (Curran, 2016, p. 24). Within that context there is no need to take recourse to notions such as divine inspiration and particular states of mind. Secondly, Aristotle affirms in the first chapter of the *poetics*, the *art as mimesis* doctrine (with inclusion of instrumental playing):

Epic poetry, then, and the poetry of tragic drama, and, moreover, comedy and dithyrambic poetry, and most flute-playing and harp-playing, these, speaking generally, may all be said to be 'representations of life' [μυμήσεις]. [Aristot. Poet. I.1447a]¹¹⁷

He argues, however — against Plato — that the artistic imagination is not simply portraying copies of copies of things but rather showing through the particulars something a more generally truth about the world.

The real difference [between history and poetry] is this, that one tells what happened and the other what might happen. For this reason poetry is something more scientific [φιλοσοφώτερον] and serious [σπουδαιότερον] than history, because poetry tends to give general truths [καθόλου] while history gives particular facts [ἐκαστον]. [Aristot. Poet. IX. 1451b]¹¹⁸

With this new view on *mimesis*, artistic activity as such is far better off in Aristotle than in Plato.

This line of thinking is continued in Stoic philosophy where the denial of an immaterial realm of *Ideas* leads to postulating an internal realm in which mental activity can take place. Through the internal language constructed from *phantasiai*, humans have available the psychic domain in which to manipulate what they sense in order to construct new, more perfect objects through mental operations of the imagination (Flory, 1996, pp. 154–155). The Hellenist sophist¹¹⁹, Flavius Philostratus¹²⁰ (ca. 170–245 CE) develops in *The life of Apollonius of Tyana* [Τὰ ἐς τὸν Τυανέα Ἀπολλώνιον] (Philostratus, 1912) a perspective on artistry that surpasses the commitment to *mimesis*. Answering the question of his interlocutor about how artists realise their work: do they go up to heaven and make a copy of the forms or the gods and reproduce or is there any other influence which guides their moulding (Philostratus, 1912, p. 77), Apollonius states:

¹¹⁷ <http://www.perseus.tufts.edu/hopper/text?doc=Perseus%3Atext%3A1999.01.0055>.

¹¹⁸ <http://www.perseus.tufts.edu/hopper/text?doc=Perseus%3Atext%3A1999.01.0055%3Asection%3D1451b>.

¹¹⁹ Belonging to the Second Sophistic School.

¹²⁰ Philostratus was well-acquainted with the history of Greek thinking and art. He wrote on the life of the Sofists [Βίοι σοφιστῶν] and authored a book on art called *Images* [Εἰκόνες].

Imagination [φαντασία] [...] wrought these works, a wiser and subtler artist by far than imitation [μίμησις], for imitation can only create as its handwork what it has seen [εἶδεν], but imagination equally what it has not seen; for it will conceive of its ideal with reference to the reality, and imitation is often baffled by terror, but imagination by nothing; for it marches undismayed to the goal which it has itself laid down. [Philost. VI chapter 19] (Philostratus, 1912, pp. 78–79).

Plotinus (204-270 CE) is a Neo-Platonist philosopher and although one would expect him to be primarily concerned with understanding and promoting Platonic thought, he presents in the *Enneads* a treatment of *phantasia* in which the Platonist and Aristotelian views are thoroughly mixed.

The background ontology of the six *Enneads* is thoroughly Platonic but the psychology is quasi-Aristotelian: material related to the memory of sense-objects is furnished to the imagination, but unlike with Aristotle, imagination does not provide material to reason or intellect, on the contrary, reason has the function of receiving thought and transmitting it to the imagination (Welch, 1935, pp. 37–38). This leads Plotinus to revise the case for *mimesis* by granting that the artist is not an imitator, but is capable of conceiving the very *idea* of the bed. The artist might then inform the real with the ideal. The eighth tractate of the fifth *Ennead*, titled *on the intellectual beauty* [Περὶ τοῦ νοητοῦ κάλλους], considers the power of imagination and draws the following conclusion:

Still the arts are not to be slighted on the ground that they create by imitation of natural objects; for, to begin with, these natural objects are themselves imitations; then, we must recognise that they give no bare reproduction of the thing seen but go back to the Ideas [λόγουι]¹²¹ from which Nature itself derives, and, furthermore, that much of their work is all their own; they are holders of beauty and add where nature is lacking. [Plotinus, *Enneads*, V]¹²²

For Plotinus the imagination of artists does not derive from eternal Forms and the imitation of its manifestations, but from the Ideas within the artist and by that, transcends nature. Plotinus's concept of soul is superior to nature because of the power of phantasy which enables man to see in nature its inherent capacities. This particular subjective view on creation and imagination naturally invites us to consider Plotinus as a forerunner of romantic imagination (Bundy, 1927, p. 262; Schlutz, 2009).

3.1.3 Challenge and consolidation in the second linguistic moment

The second linguistic moment¹²³ is connected to authors who discuss the antique concepts related to information and imagination, and translate the original Greek words into Latin. In terms of the history of ideas, the second linguistic moment epitomizes the intellectual symbiosis between Greek thought

¹²¹ Plotinus uses λόγος instead of ἰδέα; 'accounts' would be a more precise translation in English.

¹²² For the English text: <http://classics.mit.edu/Plotinus/enneads.html>; for the text in Greek: <http://remacle.org/bloodwolf/philosophes/plotin/enneade58.htm>.

¹²³ In a chronological sense this second linguistic moment partly precedes authors like Philostratus and Plotinus. This cross-chronological situation is to be linked to the influence of hellinism.

(Plato, Aristotle) and the Christian doctrine, challenged by the pragmatic concerns of the rhetoric school.

Cicero (106-43 BCE) occupies a distinctive place in this history. His oeuvre is vital in transforming the Greek vocabulary into a Latin one, but also his position as an orator, a man of practice and of words, leads him to develop a particular creative and lingual perspective on both information and imagination in which the *status quo* is being challenged in a technical and lexical context. Cicero uses the notion of information in a context of perception where the form of entities that present themselves to our senses coincides with a representation (*rei informationem*), that is already present in the soul¹²⁴ (Capurro, 1978, p. 83). Moreover, he activates information by stating that entities which cannot rely on a preconception in the mind can be actively formed into a mental presentation (Capurro, 1978, p. 85). This perspective of 'information as mental presentation' is subsequently extended to mean the explicitation and communication of implicit thoughts via images and language (Capurro, 1978, pp. 86–87) and occupies a central place in the realm of education where it allows for knowledge transfer via language (*ad humanitatem informari*) (Capurro, 1978, p. 90).

Looking at *informo*¹²⁵ in the *Oxford Latin Dictionary* [OLD] (Glare, 1968) we clearly detect Cicero's influence, especially in the third definition where *informo* comes to mean, quite paradoxically, 'to imagine' (see: def. 3).

Informo [OLD, p.903]

1. To give a shape to, fashion, form (foetus, material)
2. To give an outline or plan of, sketch (in words) (Cicero, Quintilianus)
3. To form in the mind (ideas); to form an idea of (something), imagine
4. To mould (a person, his mind) by instruction

As a man of practice Cicero shows a special interest in how the transfer of knowledge is done in a convincing and effective way. Here, the stories of information and imagination coincide again. In Cicero's view, the communication of knowledge/information is facilitated by the use of images since figurative language has the quality of granting privileged access to the minds and memories of audiences: "One must employ [...] images [*imaginibus*] that are effective and sharply outlined and distinctive, with the capacity of encountering and speedily penetrating the mind [Cic. de orat. II.6.358]"

¹²⁴ Technically it does not concern the doctrine of Innate Ideas, but Cicero makes reference here to the Epicurian notion of *prolepsis* (πρόληψις), a preconception, put together from repeated experiences of the same thing, either something external, or of ourselves (Preus, 2007).

¹²⁵ '*informatio*' receives only a limited treatment in the OLD.

(Cicero, 1942, p. 471). Cicero's poetics¹²⁶ has therefore been labelled as *pragmatic* (Abrams, 1953; Pieters, 2007) rather than *mimetic*, because of its primary focus on the effect of words on the audience.

As a counterbalance to Cicero's challenging, and pragmatic concerns, this second linguistic moment is also characterized by a number of authors who further interpret the Form-related philosophies in function of Christianity. Augustinus of Hippo (354-430 CE), further referred to as St. Augustine, bends the Platonic tradition to the service of Christian theology and invokes Divine illumination in order to come to real knowledge (Capurro, 1978, p. 105): "The mind needs to be enlightened by light from outside itself, so that it can participate in truth [*veritas*], because it is not itself the nature of truth. You will light my lamp [*tu illuminabis lucernam meam*], Lord. [Aug. Conf. IV.xv.25]".¹²⁷ His interest in the power of imagination however is remarkable. St. Augustine is considered to be among the first to use '*imaginatio*' as an alternative to '*phantasia*' and posits three classes of images/*phantasiae* according as they originate with the senses (memory of a face), or the imagination (supposing things that have no existence – e.g. winged dragons), or the faculty of reason (geometrical figures and musical harmonies) (St. Augustine, 1886, pp. 314–315). The Roman philosopher and mathematician Boethius (480-525 CE) is another transitional writer who fully seconds Plato's theory of Forms¹²⁸; at the same time however, he develops an early version of faculty psychology in which imagination figures in a context where Platonic Forms, an Aristotelian psychological framework, and divine intelligence meet (Boethius, 1973). The framework implies the following faculties: *Sensus* (sense) which considers the shape set in the underlying matter; *Imaginatio* (imagination) which is concerned with the shape alone without matter; *Ratio* (discursive reason) which looks at the form which is in singulars from a universal point of view; and *Intelligentia* (divine intelligence)¹²⁹ which gazes on the pure form in itself. Boethius then asserts a continuum but makes the point that the superior type of knowledge includes the inferior, whereas the inferior, cannot rise to the superior level (Watson, 1988, p. 153).

¹²⁶ A contemporary of Cicero, who is seldom mentioned with regard to the evolution of imagination, is the Roman poet Horace (65-8BC). This negligence is probably related to the fact that in Horace's most influential work, the *Ars Poetica*, the term 'phantasia' or 'imagination' is absent. Both Horace and Cicero, however represent pragmatic theories of imagination, theories that focus on the effect on an audience, rather than the correspondence to reality, the expressivity of the author, or the auto-ontology of the work (Abrams, 1953, p. 14)

¹²⁷ <http://faculty.georgetown.edu/jod/conf/frames4.html>

¹²⁸ In *De Institutione Musica*, the archaic meaning of information as the process of imbuing the phenomenal world with eternal Forms, is instantiated in the realm of music. The primacy of speculative science over the sensuously perceivable art of music making is endorsed by subdividing three orders [*tres esse musicas*] built on the same ordering principle [Boethius, DIM, I, 2]: *Musica Mundana* (music of the spheres), *Musica Humana* (music of the human body and spirit), and *Musica Instrumentalis*, which is of the lowest order and deals with the physical properties of sound.

¹²⁹ *Humana ratio vs. divinam intelligentiam* [Boet.cons.V.4.40]

By the end of the second linguistic moment, Thomas Aquinas (1225-1274 CE) represents the mature scholastic perspective on information and imagination. Situated in the late Middle-Ages, his onto-theological framework is profoundly influenced by the revival of Aristotle's insights. The concept of information is key in Thomas Aquinas' epistemology and ontology. Ontologically, he translates Aristotle's *hylomorphism* as the process of 'in-forming' matter [*Informatio materiae*] and from the background of Christian creational metaphysics introduces the crucial distinction between physical/biological 'in-formation' processes [*per modum informationis*] and divine creational activity [*per modum creationis*]. This difference between *informatio* and *creatio* is alien to Greek thought. Plato's demiurge merely informs (informing as a *creatio ex materia*) while the Christian God is considered to be a transcendent cause who creates things —out of nothing (*creatio ex nihilo*).

In epistemology, Aquinas advances and refines a five-part faculty psychology which includes sense perception [*informatio sensus*], common sense, imagination, reason and intellect [*informatio intellectus*] (Capurro, 2009, p. 127). The order and epistemic veracity of knowledge acquisition ascends, from the lowest – sense perception – to the highest – intellect. Imagination is thus (again and very Aristotle-like) considered to be a kind of mediator between mind and body in a process where it delivers images, taken from perception, to reason which then purifies these images into abstract ideas. An extra element added by Aquinas is that he opens the way for information in the context of linguistic communication (Capurro, 1978, p. 138). In the *Summa* Aquinas sketches two scenarios where the sentient part of the soul is involved: firstly, the sensory powers are affected [*immutatio*] by a sensible thing; secondly, the power of imagining forms for itself an image [*idolum*] of an absent thing or even of a thing that has never been seen. In the former case the passive intellect is informed by the intelligible species [*passio intellectus possibilis secundum quod informatur specie intelligibili*] and once the passive intellect is formed in this way, it forms a definition by using words. These words do not signify the intelligible species themselves, but represent the things that have been formed by the intellect in order to make judgements about exterior things [Aquinas. *Summa Theologiae*, I, question 85.2 reply to objection 3]. Here a two-step process of (in-)formation and abstraction is assumed, the forming of images by the intellect and then the formation of communicable words and sentences that represent these images (and indirectly also the primary affection). However, despite its essential role in thinking, the imagination is still a faculty to be looked at with caution and distrust because of its susceptibility to confusion between images and reality.

Falsity is attributed to the imagination to the extent that it presents the likeness of a thing even when it is absent. Hence, when someone turns to the likeness of a thing as if to the thing itself, then falsity results from such an apprehension. [Aquinas. *Summa Theologiae*, I, question 17,2 reply to objection 3]¹³⁰

¹³⁰ <http://www3.nd.edu/~afreddos/summa-translation/Part%20I/st1-ques17.pdf>.

Notwithstanding this cautious attitude, imagination keeps its privileged status as a channel that can forges direct contact with metaphysical entities (God in this particular case) via a process of inspiration which is called 'grace' [*per revelationem gratiae*]¹³¹ here.

We have a more perfect knowledge of God by grace than by natural reason. Which is proved thus. The knowledge which we have by natural reason contains two things: images derived from the sensible objects; and the natural intelligible light, enabling us to abstract from them intelligible conceptions. Now in both of these, human knowledge is assisted by the revelation of grace. For the intellect's natural light is strengthened by the infusion of gratuitous light; and sometimes also the images in the human imagination are divinely formed, so as to express divine things better than those do which we receive from sensible objects, as appears in prophetic visions.[Aquinas. *Summa Theologiae*, I, question 12, article 13]

3.1.4 *Everyday usage in the third linguistic moment*

With the third linguistic moment, the terms that orbit information and imagination make their formal entrance into the European languages. They first appear in French (with parallel developments in Spanish and Italian¹³²), then in English, and from the 15th century on in German. This phase in the development of information and imagination coincides roughly with the transition from Thomism into its first serious adversary, the humanism of early Renaissance. Intellectual authority from ecclesiastics gives away to education by courtiers and literary men and the gradual ascendancy of a spirit of scientific enquiry takes root. The main characteristic of this third moment however is that scholarly terms such as imagination and information enter everyday language and are as such also recorded in historical dictionaries.

The persisting influences of Plato and Aristotle are still evident in Giovanni Pico della Mirandola's *on the Imagination* [*De imaginatione sive phantasia*], written (still in Latin) at the beginning of the sixteenth century. Mirandola (1463-1493) is a humanist in the larger sense of the term; he is as theocentric as any scholastic and affirms the Platonic epistemic hierarchy: "imagination conforms with intellect, in being free, unfixed, and devoted to no special object. But it is surpassed by intellect, since it conceives and fashions the sensible and particular only, while intellect, in addition, conceives and fashions the universal and intelligible, and such things as are purified from all contact with matter" (Mirandola, 1500/1930, p. 33). Mirandola also integrates Aristotle's psychology in his views: "imagination itself is midway between incorporeal and corporeal nature, and is the medium through which they are joined" (Mirandola, 1500/1930, p. 37).

¹³¹ <http://www.corpusthomisticum.org/sth1003.html>.

¹³² See Capurro, 1978, p. 141.

Various Renaissance movements of mystical and hermetic orientation however, force a break with scholastic thinking and can be considered as precedents to the German idealist culture of productive imagination. Giordano Bruno (1548-1600), an Italian thinker of the sixteenth century (also writing in Latin), draws from gnostic thinking and hails the human imagination as the creative source of the 'forms' of thought. According to Bruno, mortals can transcend their worldly life and unite with the cosmos via the *spiritus phantasticus*. Man's imaginative power (*vis imaginativa*) is the privileged vehicle of the Holy Spirit and is there to transform the material world in accordance with a hidden cosmic design (Kearney, 1988, pp. 159–160). In the realm of poetry and literary criticism, the resemblance between a divine creator and the poet is forged by Sir Philip Sidney's *Apology for Poetry* (Sidney, 1595/1890). For Sidney poetry privileges perception, imagination and modes of understanding and is able to create a separate reality.

The cluster of terms that are of interest to our enquiry with regard to the entrance of information and imagination in everyday language are listed in Appendices 1-9 with their pre-1600 definitions. What we observe then is in the first place a continuity with meanings that information and imagination acquired in the first two linguistic moments complemented with particular meanings that refer to the reality-delusion and the objective-subjective dualism that classically encircle the fields of information and imagination.

As second aspect of the introduction of information in the modern languages is that information is transformed and used in an everyday context primarily in its epistemological meaning, as the communication of knowledge (Capurro & Hjørland, 2003, p. 354). The shift from the conception of information as an objective process to an (inter-)subjective one is common to European languages deriving from Latin and anticipates the subjective turn in philosophy after 1600. Next to these general trends, some particular evolutions in each of the three languages however, are worth mentioning.

In French '*Idée*', retains the meaning of 'form of things' but also comes to refer to a representation in the mind. In the latter sense, it comes very close to '*imaginer*' in the sense of '*concevoir*'. Another element is that the direction of information is inversed in the sense that '*soit informer*' implies that the action starts with an individual and is directed towards the external world, instead of vice versa. The fact that the term is also used in the realm of juridical inquiries is related to that inversion (Capurro, 1978, p. 235). The use of information in a legal context where written documents have a particular value in terms of objectivity and burden of proof drives information's meaning further in the direction of objectivity and written fixedness (Capurro, 1978, p. 279). Finally, the use of '*informer*' as notifying and updating refers to the role of information in the imparting and communication of knowledge, with a special interest in novelty and uniqueness.

In German, ‘*informieren*’ in the sense of ‘*Bildung*’ is notable. In *Information über die Information* (Seiffert, 1971), Helmut Seiffert stresses the importance of *Bildung* as information: “it is well-known that the word *Bildung* can hardly be surpassed in Germany. Everything that is sacred is concentrated in this word” (Seiffert, 1971, p. 27). *Einbildungskraft* is rarely used before 1600 but that is about to change, as we will see in the next form of life (see Kant). A new adjective surfaces in this second form of life, one that is close to the meaning of ‘informed’ in its pedagogical meaning as it appeared around 1500 CE in the context of *Bildung*. The OED dates the first appearance of the adjective ‘educated’ in 1611 CE and defines it in its second meaning as:

that has been acquired through education; resulting from education. Also: (of an opinion, etc.) based on an understanding of relevant facts or issues; informed. [OED, *educated*, 2]

The relation between facts, information, understanding and education expressed in the second part of the definition is significant for a new vision on pedagogy that challenges the medieval approach¹³³. The minds of people are informed/educated but not on the basis of eternal Forms but rather relying on matters of fact.

Finally, in English, the traditional areas of application with regard to information (artificial, philosophical, pedagogical) are clearly present. Defining ‘imagination’ as “the tendency to form ideas which do not correspond to reality, deluded thinking” is relevant because of its contrast with “the imparting of the knowledge of a fact” which is a meaning that is attributed to ‘information’¹³⁴.

During the Renaissance the term ‘fancy’, connoting free play and mental creativity, often eclipses imagination which is considered to be merely reproducing sense impressions (primarily visual images) (Preminger & Brogan, 1993, p. 599).¹³⁵ At the end of this first form of life, the first signs of a semantic turn surface: around 1500 CE ‘informed’ as an adjective and in relation to a person or a mind is for the first time registered, meaning “instructed; educated about or acquainted with a fact, subject, etc.; knowledgeable” [OED, *informed*, 1a]. This new meaning replaces ‘informed’ in its archaic meaning as “put into form; formed, created, fashioned” [OED, *informed*, 2] which is still reported at the end of the 16th century but then disappears from the semantic spectrum.¹³⁶ The *forming* of *minds* rather than *matter* is a key aspect of information’s second form of life that will be discussed hereafter.

¹³³ An ‘educated guess’, as “a guess based on knowledge and experience and therefore likely to be correct” is registered for the first time only in 1896 CE.

¹³⁴ A detail: for both meanings the OED refers with regard to the first use to the same source-text (Gower, 1393/1979).

¹³⁵ By ca. 1700CE, empirical philosophy will cast suspicion on *fancy*; imagination will take over because of its rootedness in the concrete evidence of sense data.

¹³⁶ Around 1900CE ‘informed’ as an adjective will yet again undergo a significant shift as far as semantics is concerned; it will then be linked to a new action, opinion, decision, etc.: “based on or influenced by knowledge or by an understanding of a particular situation; enlightened; (of a work) characterized by or demonstrating

3.1.5 Section summary

This first form of life is dominated by the influential standard-view provided mainly by Plato, who posits a superiority of Forms vis-à-vis the phenomenological reality; in this context, artistic images are mere copies of reality and not a solid basis to come to true knowledge and civic education. The conflation of classical and biblical cultures gives rise to distrusting and to censoring imagination because it threatens the natural order of being, the order of Forms. A closer look at Plato's oeuvre however, reveals several epistemic openings with regard to a dogmatic dualism between Forms and images: by mediation of dreams or via inspirational contact with the Muses, (partial) access can be gained to the realm of Forms and in the latter case also access to an external memory can be involved (the theme of divine illumination will be revisited by St. Augustine and the Schoolmen).

Imagination in its mediating role is more explicitly present in Aristotle who introduces *phantasia* in the realm of psychology and is foundational to the development of faculty psychology by the scholastics who come to situate imagination as a faculty alongside reason and memory. In the realm of artistic images, Aristotle elevates the concept of mimesis from its marginal status by considering it as a tool to forge more general truths about the world, but downplays the role of imagination as inspiration by focusing on artistic activity as a craft, an activity that can be accounted for.

The more rebellious visions on the information-imagination dualism are authored by 'practice-based' thinkers (Philostratus, Plotinus, Cicero), who allow imagination a superior, artist-centred and creative quality, and also grant 'words' the capacity to represent images (although this last quality is also found in Aquinas). So, in a very early phase in Western history, we encounter already discipline-specific, artistic understandings of information.

In the European languages, from the 12th century on, the juxtaposition of reality (information) and illusion (imagination) is to a great extent relegated to everyday language. An additional perspective here is the directional inversion of the informational process; the need for information can find its onset in an individual (and not in realm of Forms); man is not a passive receiver of information but can actively inform oneself (Fr: *s'informer*). Near the end of this first form of life, information finds its way to a new intentional object: the human mind.

3.2 The dissolution of information (17th-18th centuries)

During the seventeenth and eighteenth centuries, classic cosmology from the first life gradually loses terrain in favour of a modern, scientific perspective based on observable facts. This shift away from metaphysical Forms to the indications and signals of the senses, is decisive in grounding a new meaning

knowledge or learning" [OED, *informed*, 1b]. By then 'informed' will have travelled as formative factor from matter, via minds to actual decisions and actions.

for information. Instead of an all-encompassing ordering principle (empiricism does not allow pre-existing intellectual forms outside of sensations), information comes to mean the sending and receiving of atomistic, small-scale reports about the world. As scientific observation and experimentation impose themselves as a new method to produce precise answers to particular questions, the universe reveals itself to be far more complex than anyone had ever 'imagined'. Information loses its inherent metaphysical and unitary structure and orderliness and gets to be linked to the realm of isolated, sensory impulses: "the fragmentary, fluctuating, haphazard stuff of sense" (Peters, 1988). Within this new context, (eternal) 'souls' become individual 'minds' (*ego, cogito*) and direct contact with the 'Forms' yields its place to more neutral and detached 'perceptions' and 'impressions'. For empiricists, this stream of impressions is the raw material from which genuine knowledge can be built. However, the recurring challenge for empiricism is how to bridge the gap between sensation and mind? How can sensing a universe, devoid of intelligible essences or forms (as in Aristotle) lead to accountable and scientific knowledge?

Empiricists like David Hume (1711-1776) chose to abandon the quest for such ordering principles altogether. Rationalists, like René Descartes (1596-1650), for whom sensation has a rather doubtful status, consider these impressions as a veil of illusion, to be pierced by logic and reason. By positioning 'ideas' between intellect and nature, Descartes addresses the particular problem of giving structure to experience and includes an intermediate element in the epistemic process. Next to empiricism and rationalism, a third strategy with regard to the ordering problem (next to rationalism and empiricism) is the one provided by Immanuel Kant. Kant's transcendental idealism places the sources of intellectual organization in the universal, *a priori* structures of the human mind. The mind ceases to be matter-informed, and becomes the storehouse of forms that shape and order the chaotic material of sensation. Kant thereby advocates a process of out-formation.¹³⁷

It is in this setting that the role of imagination as *Einbildungskraft* begins to grow into the place vacated by the soul and that a delicate balance between information and imagination is reached. Departing from the received wisdom of classical and medieval philosophers, Kant rescues imagination from its servile role as an intermediary faculty between our sensible and intelligible experience and grants it a central place in epistemology and psychology.

Hereafter, four pivotal moments in the history of ideas will be discussed that contribute to a repositioning and new understanding of the relation between information and imagination.

¹³⁷ The notion of 'out-formation' is mentioned by Peters (Peters, 1988, p. 13) and he refers to a personal communication with David Ritchie for the coinage of the term.

3.2.1 A new science based on facts

In the work-plan for *the Great Instauration* (Bacon, 1620/1989), Francis Bacon (1561–1626) preludes on a subjective turn constituting a new perspective with regard to knowledge, a subjective turn that is wary about common sense perception and logic and therefore in need of additional filters and touchstones:

The sense fails in two ways. Sometimes it gives no information, sometimes it gives false information. [...] For the testimony and information of the sense has reference always to man, not to the universe; and it is a great error to assert that the sense is the measure of things. (Bacon, 1620/1989, p. 24)

In *Novum Organum* (Bacon, 1620/2000) – the second part of the *Instauration* – Bacon sets out to challenge the inadequacies of the *a priorism* which he associates with the traditional Aristotelian logic of the *Organon*.¹³⁸ He argues that the Aristotelian logic is only a means of arriving at the logical consequences of what is already known (axioms) and has a purely classificatory character. Instead of unreliable sense perception and axioms designed to draw on and illuminate common occurrences by rhetorical demonstration, Bacon advocates the use of ‘experiments’, which elicit from nature those ‘singular instances’ capable of disclosing truths about nature that are otherwise hidden [Bacon, *NO*, part 2, aphorism 2 8]] (Poovey, 1998, p. 98). As an alternative to Aristotelian science, he proposes a programme in which universal laws are induced from the observed, singular instances – objective facts:

The human understanding is ceaselessly active, and cannot stop or rest, and seeks to go further; but in vain. [...] This indiscipline of the mind works with greater damage on the discovery of causes: for though the most universal things in nature must be brute facts, which are just as they are found, and are not themselves truly causable, the human understanding, not knowing how to rest, still seeks things better known. [F. Bacon.Nov.Org.book 1, XLVIII] (Bacon, 1620/2000, p. 44)

Foreshadowing Kant’s synthesis between rationalism and empiricism, Bacon further aims at promoting a pragmatic alliance between the empirical and the rational faculty.

Those who have treated of the sciences have been either empiricists or dogmatists. Empiricists, like ants, simply accumulate and use; Rationalists, like spiders, spin webs from themselves; the way of the bee is in between: it takes material from the flowers of the garden and the field; but it has the ability to convert and digest them. [F. Bacon.Nov.Org.book 1, XCV]” (Bacon, 1620/2000, p. 79)

In Bacon’s plan of a great renewal, imagination does not fare well:

¹³⁸ The *Organon* (Greek: “*ὄργανον*”, meaning “instrument, tool, organ”) is the standard collection of Aristotle’s six works on logic: *Categories*, *On Interpretation*, *Prior Analytics*, *Posterior Analytics*, *Topics* & *Sophistical Refutations*.

The whole secret is never to let the mind's eyes stray from things themselves, and to take in images exactly as they are. May God never allow us to publish a dream of our imagination as a model of the world, but rather graciously grant us the power to describe the true appearance and revelation of the prints and traces of the Creator in his creatures. (Bacon, 1620/2000, p. 24)

Notwithstanding his low esteem for imagination, Bacon grants it a prominent place in Book II of *The Advancement of learning* (Bacon, 1605/1863) where he outlines a renewed division of human knowledge and positions imagination alongside reason and memory¹³⁹ associating these fundamental faculties with respectively with three categories of knowledge: Poesy, Philosophy and History. Within this framework, philosophy – mainly Baconian Science – is promoted above the other two branches of knowledge. History is defined as the mere accumulation and collection of facts, and art is appropriated the status of 'feigned history' discharged from the laws of nature.

Poesy is a part of learning in measure of words for the most part restrained, but in all other points extremely licensed, and doth truly refer to the imagination; which, being not tied to the laws of matter, may at pleasure join that which nature hath severed, and sever that which nature hath joined. (Bacon, 1605/1863, p. 80)

While the development of Bacon's outcome-oriented (pragmatic) method remains speculative and incomplete, his thinking enables in the course of it a departure from the antique traditions and a focus on experimentally obtained facts.

3.2.2 *The subjective turn*

We saw already in the transition from the Middle Ages to Modernity that in everyday language the objective meaning of information (giving essential form to matter) lost ground in favour of a subjective one (communicating something new to someone). This shift can be formally detected in the philosophy of Descartes, who considers *ideas* as 'forms of thought' not in the sense of pictures of reality in the brain but more as products of thinking (Lalande, 1992, p. 514). Descartes separates radically, in opposition to Aristotelian and Scholastic philosophy, the sensory processes from the unmediated and conscious knowledge of *ideas* (Capurro, 2009, p. 129).

It is notably in the *Meditations* (Descartes, 1641) that this subjective turn in philosophy is instantiated. Descartes' radical doubt leads him to a first of three certainties: *cogito* (I think).¹⁴⁰ In Descartes' terminology 'thinking' is an attribute of the substance 'mind' and one of the modes of that attribute is

¹³⁹ This division of human knowledge is not revolutionary however, it is largely inspired by the faculty psychology such as it was the taxonomy of human knowledge presented in Diderot's and d'Alembert's *Encyclopédie, ou dictionnaire raisonné des sciences, des arts et des métiers*, published in France between 1751 and 1772, is inspired by Francis Bacon's classification. The three main branches of knowledge in the *Encyclopédie* are: "Memory"/History, "Reason"/Philosophy, and "Imagination"/Poetry.

¹⁴⁰ The existence of God and of a material world are the other two certainties.

that it produces 'ideas'.¹⁴¹ By this, 'Ideas' leave Plato's separate realm of eternal Forms and come to be situated within the minds of people instead. According to Descartes, these ideas are usually 'clear and distinct' but it is unsure if they really do correspond to the reality of things; human's imagination is abundant (also in dreams) and the hypothesis of an omnipotent deceiver is for the doubtful Descartes at least a possibility. In order to make some progress in the matter, Descartes considers three kinds of ideas, things that people can imagine: *innate ideas* (source: own nature), *adventitious ideas* (source: things existing outside me), and *factitious ideas* (combination of ideas that are already present in the mind). The main challenge is with the second kind of ideas, the ones that have their him to conclude that there is in fact an external and objective reality that can be perceived clearly and distinctly¹⁴²; our interest is rather in the way Descartes sees the relation between mind (*res cogitans*) and this objective reality (*res extensa*) in terms of information and imagination.

In the *Second Meditation*, Descartes describes the four faculties of thought: intellect, will, imagination¹⁴³, and sensation. The intellect deals with 'pure' thought, *a priori* truths that are accessible to thought alone. The imagination is concerned with the images of material things, finds its origin in sense perceptions and derives *a posteriori truths* derived from experience. In the *Sixth Meditation*, Descartes is more explicit about the relation between imagination, intellect, and information from the senses:

- Information from the senses is practical but it can be deceptive and it is not a reliable touchstone for judgements about the essential nature of things¹⁴⁴.
- Pure intellect [*puram intellectionem*] is mathematical and geometrical and can correct the mistakes of the senses.
- Imagination (for instance imagining a triangle) is simply a certain application of the cognitive faculty [*facultas cognoscitiva*] to an element of the environment which is not immediately present to it. Imagination requires a special effort of the mind, yet it is not necessary to man's nature.

Descartes makes a clear distinction between intellect and imagination and does this by means of an example: a triangle can be conceived [*intelligo*] as a figure comprehended by three lines, but it is also something that presents itself immediately to the mind, as an image; however, if one thinks of a

¹⁴¹ Ideas are not the only modes of thought. For example, doubting and judging are modes of thought.

¹⁴² Its true nature is guaranteed by God's goodness.

¹⁴³ Descartes uses the terms *imaginatio*, *imagination*.

¹⁴⁴ "For the proper purpose of the sensory perceptions given me by nature is simply to inform the mind of what is beneficial or harmful for the composite of which the mind is a part; and to that extent they are sufficiently clear and distinct. But I misuse them by treating them as reliable touchstones for immediate judgements about the essential nature of the bodies located outside us; yet this is an area where they provide only very obscure information" [Descartes.Med.VI.15] (Descartes, 1641/1996, pp. 57–58).

chiliogon (a figure composed of thousand sides), it can easily be conceived but it is impossible to imagine. Descartes thus perpetuates the classical superiority of reason over imagination situating the basis for reasoning not in an external realm but in the mind instead.

Within the same vain of rationalism Gottfried Wilhelm Leibniz (1646-1716) constructs his *Dissertatio de Arte Combinatoria* ("Dissertation on the Art of Combinations" or "On the Combinatorial Art") which builds on the Cartesian concept of an alphabet of human thought; here, all concepts are nothing but combinations of a small number of simple, primary concepts, just as words are combinations of letters. Whereas in empiricism truths are expressed as the association of percepts, in rationalism truth consists of the appropriate combinations of concepts which are amenable to decomposition and analysis into simple ideas. This view provides also a logic of invention and imagination, an *ars combinatoria* (Iser, 1991/1993, p. 171) that comes to typify imagination in this second life.

3.2.3 Atomic impressions

Empiricism adds to the concept of information that it is gained from experience and more in particular from the fragmentary quality of sensory impressions. Within the generation following Descartes, empiricist John Locke (1632–1704) develops a rival account of the world, incorporating scientific developments from England, associated more in particular with physicists Robert Boyle (1627-1691)¹⁴⁵ and Isaac Newton (1642-1727). Locke's *Essay concerning Human Understanding* (Locke, 1690/1999) sets an agenda that empiricist David Hume (1711-1776) would follow in his *Treatise* (Hume, 1739/1896) and *Enquiry* (Hume, 1748/2008). Locke argues that all our 'ideas' (the constituents of our thoughts) derive from experience, and that experience is, by consequence, constitutional for the overwhelming bulk of our knowledge.¹⁴⁶ Locke attacks the theory of 'innate ideas' (as found the Scholastics and Descartes) and adopts an atomistic approach in which complex ideas are composed of simple ones, and the simple ideas themselves are not *a priori* but directly derived from experience. Locke recognizes imagination as an important power of the mind: "Is there anything so extravagant as the imaginations of men's brains?", but a few sentences later abates its value:

But of what use is all this fine knowledge of men's own imaginations, to a man that inquires after the reality of things? It matters not what men's fancies are, it is the knowledge of things that is only to be prized: it is this alone gives a value to our reasonings, and preference to one man's knowledge over another's, that it is of things as they really are, and not of dreams and fancies. (Locke, 1999, pp. 553–554)

¹⁴⁵ Boyle's corpuscularianism (matter as composed of small particles, see also Democritus's atomism) becomes philosophical orthodoxy in Britain through the work of his friend John Locke.

¹⁴⁶ "Knowledge is the perception of the agreement or disagreement of two ideas" [Locke.essay.book IV.chapter 1. §2].

Despite their fundamental differences with regard to the primary material necessary to knowledge production, Descartes and Locke still share an important assumption, namely a view of a divinely created world that is potentially intelligible to human reason. Hume can be considered as the first great philosopher to profoundly challenge this pervasive assumption. He relates human thinking to that of the other animals¹⁴⁷, based on instinct, belief and habit rather than on a quasi-divine insight into things based on metaphysical theorizing and a priori speculation. As a representative of (late) empiricism, Hume presents his epistemological framework in book I of *A Treatise of Human Nature* (Hume, 1739/1896, 1739/2007).

According to Hume “all the perceptions of the human mind resolve themselves into two distinct kinds”, which he calls “Impressions and Ideas” [Hume. A treatise. I.1.§1]. With *Impressions* is meant the sensations, passions and emotions that directly reach and appear in the soul; Hume confirms thereby the fragmentary character of these informative impressions, as can be deduced from a general proposition in paragraph seven of the treatise: “That all our simple ideas in their first appearance are derived from simple impressions, which are correspondent to them, and which they exactly represent”. In a commentary on this principle the translator of Hume’s work in Dutch, Frits van Holthoorn comments: “Hume uses this principle to indicate that external reality reaches us in well-delineated atomic particles. Above all, it has a negative function because it denies that complex ideas have as their counterparts complex realities in the external world” (Hume, 2007, p. 15). *Ideas*, then, are the faint images of these impressions that are used in thinking and reasoning. Hume distinguishes between three faculties that process these perceptions: Memory, Imagination, and Reason (see Bacon). When a repetition of a new appearance retains a considerable degree of its first vivacity, then the faculty of memory is involved; when a repetition of an appearance loses that vivacity, and is a perfect idea, the faculty of imagination is at work [Hume. A treatise. I.1.iii.§1]. Memory necessarily preserves the original form and order, in which its objects were presented, whereas imagination (also called ‘fancy’) has the liberty to transpose and change its ideas (here Hume refers explicitly to the arts). Fancy is “a kind of magical faculty in the soul, which, tho’ [*sic*] it be always most perfect in the greatest geniuses, and is properly what we call a genius, is however inexplicable by the utmost efforts of human understanding” (Hume, 1739/1896, p. 19). It is in the analysis of the human mind undertaken by Hume and his Scottish successors, that imagination as a creative power linked to genius, is generalized from the suggestions of writers on literature and the arts into a fundamental principle of human nature (Welch, 1935, p. 69). Imagination in Hume designates all the processes of the mind as distinguished from the processes of Nature.

¹⁴⁷ Over a century before Charles Darwin’s *Origin of Species* of 1859.

It is impossible for us so much as to conceive or form an idea of anything specifically different from ideas and impressions. Let us fix our attention out of ourselves as much as possible: Let us chase our imagination to the heavens, or to the utmost limits of the universe; we never really advance a step beyond ourselves, nor can conceive any kind of existence, but those perceptions, which have appeared in that narrow compass. This is the universe of the imagination, nor have we any idea but what is there produced [Hume. A treatise. I.2.vi.§9]. (Hume, 1739/1896, p. 42)

Imagination is the power of the mind to organize and combine its materials in various ways according to the universal principles of the association of ideas. It concerns all acts of the mind which are not logical operations of reason. All beliefs, passions, and moral conceptions turn out to be produced by the imagination and reasoning itself is but a particular case of the functioning of the imagination. The order of things, in so far as its is dependent on human nature, is made dependent on imagination and its principles.

In all compositions of genius, therefore, it is requisite, that the writer have some plan or object; [...] the events or actions, which the writer relates, must be connected together, by some bond or tie: They must be related to each other in the imagination, and form a kind of Unity, which may bring them under one plan or view. (Hume, 1772/2008, p. 178)¹⁴⁸

Hume insists, however, that if reality is no more than a bundle of fictions, we must nonetheless cling to these fictions as if they were real. For without them, our everyday lives would lack all sense of 'unity and continuity'; the only legitimate role left to reason then is one of vigilant but discreet scepticism. And since reason itself can only play the negative role of shattering fictions, a profound choice confronts humankind, one between the exigencies of reason which make life impossible but 'real', and those of imagination which make it possible but 'unreal'?

For if we assent to every trivial suggestion of the fancy; beside that these suggestions are often contradictory to each other, they lead us into such errors, absurdities and obscurities that we must at last become ashamed of our credulity. Nothing is more dangerous to reason than the flights of the imagination, and nothing has been the occasion of more mistakes among philosophers [...] If we embrace this principle and condemn all refined reasoning, we run in to the most manifest absurdities. If we reject it in favour of these reasonings, we subvert entirely the human understanding. We have therefore, no choice but betwixt a false reason and none at all. For my part I know not what ought to be done in the present case. (Hume, 1739/1896, p. 141)

Imagination is one way to create a (false) coherence out of impressions. The other recourses that humans have at their disposal to take on the problem of induction are custom and habit, which

¹⁴⁸ In 1748 Hume revised the abstruse epistemology of the *Treatise* in essay form, as the *Enquiry concerning Human Understanding*, the definitive statement of his mature theoretical philosophy. This text is part of the 1772-edition of the *Enquiry*.

eventually result in belief, an instinctual and much stronger function than imagination alone (Poovey, 1998, p. 199). So, with Hume we end up with a framework of isolated impressions which function as information to the fiction-producing imagination (scepticism) and give in a pragmatic sense rise to powerful customs and beliefs.

3.2.4 Transcendental idealism

Immanuel Kant (1724-1804) operates in the same intellectual context where Hume stumbles upon the problem of induction (or how to relate impressions to knowledge by a human mind). Kant however, assimilates the achievements of his predecessors and contemporaries and proceeds by revolutionizing the perspective on accountable knowledge with his renowned 'Copernican turn' in philosophy. He thereby reformulates the impact of information and imagination. The fundamental shift that Kant effectuates is formulated at the beginning of the *Critique of Pure Reason*:

It has hitherto been assumed that our cognition must conform to the *objects* [*alle unsere Erkenntnis müsse sich nach den Gegenständen richten*]; but all attempts to ascertain anything about these objects a priori, by means of conceptions, and thus to extend the range of our knowledge, have been rendered abortive by this assumption. Let us then make the experiment whether we may not be more successful in metaphysics, if we assume that the objects must conform to our cognition. (Kant, 2010, p. 13 [KrV, preface to the second edition, 1787])

Here, Kant abandons a line of thought wherein order and form are situated in the external environment and locates them instead in the faculties of the human mind which impose their inherent order and forms onto the world. Within this context information keeps its link with sensory impressions (as in empiricism) but is now also involved in a process of 'out-formation' whereby the forms that are located in the mind are enforced on the material world. The terms '*information*' and '*imagination*' are frequently found in the English translations of Kant's critical works, but are not used in the German *Ur-texts*¹⁴⁹, there we have to look for the German equivalents such as:

- *Eindrücke der Sinne* (Kant, 1956, p. 371): impressions of the senses. Sensorial information in the empirical sense but also referring to the antique origins (to imbue with form)
- *Sinnlichkeit*: sensibility
- (*reine*) *Formen der Anschauung*: forms (time, space) that inform (or outform) sensorial input
- *Bildung*: the concept of information in the realm of education
- *Einbildungskraft*: imagination

¹⁴⁹ The term 'facultas imaginandi' is used in the *Anthropologie* "*Die Einbildungskraft (facultas imaginandi), als ein Vermögen der Anschauungen auch ohne Gegenwart des Gegenstandes*" [Kant.anthr.§28] (Kant, 1798, p. 167).

- *Phantasie*: imagination (especially in relation to Poetry)¹⁵⁰
- *Nachmachung*: copy (Kant, 2000, p. 188 [KU §47])
- *Nachahmung*: imitation (Kant, 2000, p. 188 [KU §47])

Kant presents his philosophical system in three critical works: *the Critique of Pure Reason* (Kant, 1787/1956, 1787/2004, 1787/2010), the *Critique of Practical Reason* (Kant, 1788/1986a, 1788/2006), and *the Critique of Judgement* (Kant, 1790/1986b, 1790/2000, 1790/2009).

In the *Critique of Pure Reason*¹⁵¹, Kant famously reconciles (or transcends) the viewpoints of empiricism and rationalism and advances the concept of a ‘transcendental imagination’¹⁵² as an essential component in a framework of transcendental idealism that aims at understanding the phenomenal world¹⁵³. Here, the imagination is primarily a synthesizing power which orders and classifies experiences according to rules that exist in the mind and which are independent of the external world. Therefore the imagination is labelled ‘transcendental’, referring to the *a priori* character of its constitutive elements (*Formen der Anschauung*)¹⁵⁴. According to Kant, “imagination is a blind but indispensable function of the soul” and a *condition sine qua non* for the acquisition of knowledge. The order and regularity that is perceived in nature is not present in the appearances themselves but is introduced to nature by the categories of the human mind which basically apply two ‘forms’ of intuition — space and time — to all sensory aspects of our experience. The exact function and *envergnue* of imagination has been an issue of debate, but Kant summarizes his perspective on this particular faculty in the post-critical *Anthropology from a pragmatic point of view* (Kant, 1798/1974).

¹⁵⁰ Kant provides his definition in the *Anthropologie* “Die Einbildungskraft, so fern sie auch unwillkürlich Einbildungen hervorbringt, heißt Phantasie. Der, welcher Diese für (innere oder äußere) Erfahrungen zu halten gewohnt ist, ist ein Phantast” [Kant.anthr.§28] (Kant, 1798, p. 167).

¹⁵¹ The *Critique of Pure Reason* has been published in an A (1781) and a B edition (1787). The primacy of imagination established is most prominent in the first edition of the Critique. In the second edition, the role of a limiting reason is more pronounced. For this paragraph the following editions were used : in German (Kant, 1956), in English (Kant, 2010) and in Dutch (Kant, 2004).

¹⁵² ‘Transcendental imagination’ is – to my knowledge – not a concept that is found (as such) in Kant. It is used a.o. by Richard Kearny in *The wake of imagination* (Kearney, 1988b, p. 155) and Gary Banham (Banham, 2005). Indirect references are of course traceable. E.g. “Beide äußerste Enden, nämlich Sinnlichkeit und Verstand, müssen vermittelt dieser transzendentalen Funktion der Einbildungskraft notwendig zusammenhängen” (Kant, 1956, [182a]) [“these two poles, namely sensibility and understanding, by necessity have to correlate by means of this transcendental capacity of the imagination”] (own translation, since this particular passage from the A edition is absent in the English edition (Kant, 2010).

¹⁵³ An important and limiting consequence of Kant’s empiricist point of departure in the Critique of Pure reason is that the operational field of our understanding [Verstand] is constrained to the realm of phenomena or appearances. According to Kant, we have to accept to be ignorant of the things in themselves (Dinge-an-sich) which are situated in the *noumenal* realm. The *noumenal* realm which allows for freedom will be the topic of the Kant’s second critique: the *Critique of Practical Reason* [*Kritik der praktischen Vernunft*], which was published in 1788.

¹⁵⁴ “I apply the term transcendental to all knowledge which is not so much occupied with objects as with the mode of our cognition of these objects, so far as this mode of cognition is possible a priori” (Kant, 2010, p. 40).

To avoid construing imagination as a mimetic model of representation or as a mere mediation between mind and body (as in Aristotle's model), Kant introduces here the distinction between imagination's 'productive' and 'reproductive' aspects. Reproductive imagination operates according to the laws of association and calls to mind earlier perceptions, thereby forming a sequence of perceptions; the productive imagination is more fundamental, constructing its own reality and operating according to principles that are prior to experience. The productive imagination is guided by rules and transforms in an autonomous act of synthesis the manifold of sense impressions into forms that can be recognized by the understanding¹⁵⁵. The difference and the interference between the two modes of imagination has been an issue of debate and interpretation (Furlong, 2014, p. 116). For our purposes it suffices to note that Kant's particular balance between the process of out-formation, in which the imagination structures the impressions from the external world via *a priori* forms before these are amenable to be processed by the understanding, is the historical meeting-point *par excellence* for the realms of information and imagination. In Kant's schema, *Einbildungskraft* must conform to rules of the understanding in order to be functional in the acquisition of knowledge and therefore implicitly lacks the freedom that we usually relate to imagination.

When we now turn our attention to Kant's aesthetic theory where the productive imagination is concerned in judgments of beauty, we still find that there is a conformity to rules, but in very specific circumstances.

In the *Critique of Judgement* [*Kritik der Urteilskraft*]¹⁵⁶, Kant presents imagination in the context of art reception ('taste') and production ('genius'). 'Judgement' [*Urteilskraft*] is defined by Kant as a faculty which participates in reason as well as in understanding, links particular cases to the general laws that apply to those cases, and connects universal laws with the particular cases that instantiate those laws. If the universal law, rule or principle is given, then judgment's task is 'determinant' and simply one of subsuming the particular case under the given universal (see the first critique). If, on the contrary, only the particular is given, then the faculty of judgment is 'reflective', not directed at an object but concerned with itself: it has to look for the universal for that particular instance. The *Critique of Judgement* is dedicated to the latter type of judgement and proposes two areas of application: the field of the Beautiful and the Sublime (aesthetic judgement), and a field where reflective judgement is

¹⁵⁵ Terminological note: 'Understanding' [*Verstand*] in Kant is the faculty whereby scientific concepts are applied to the (phenomenal) experience of nature; its modus operandi is the object of investigation in the *Critique of Pure Reason*. 'Reason' [*Vernunft*] generates a special kind of concepts, which have no analogue in experience (example of such ideas or notions are God or the Soul). 'Reason' applies (moral) principles to our experience of freedom, is linked to a noumenal realm, and its specific character is presented in the *Critique of Practical Reason*.

¹⁵⁶ The primary reference texts that were used are : in German (Kant, 1986b) ; in Dutch (Kant, 2009); quotations are derived from the translation in English (Kant, 2000). Next to the page-references, also the section will be indicated [KU §].

reconnected with the phenomenal world via the concept of purposiveness (teleological judgement). We will limit our discussion to the first type of judgement.

In part I of *the Critique of Judgement*, Kant delineates the target domain of the reflective judgement to the terrain of the Beautiful and the Sublime. If we consider something to be beautiful, according to Kant, we pronounce a judgement of taste, and such a judgement is different from knowing. Knowledge is acquired by synthesizing impressions in light of linking particular concept to an object; when a judgement of taste is at stake, focus is not on the object, but rather on the way in which our mind is charmed by the presentation of an impression, it is about a subjective state of mind. In a judgement of taste, no interest is involved (as is for instance the case in the moral action or in the delight which is related to the agreeable arts) and it is pure in the sense that in the judgement as such the senses are not involved¹⁵⁷. Kant further claims that the experience of beauty is based on the experience of purposiveness without purpose [*Zweckmäßigkeit ohne Zweck*]; this purposiveness, which is the *a priori*¹⁵⁸ principle of the aesthetic judgement that is created in the subject (not the object) arises out of a free play between imagination and understanding which are in process of figuring out how to put together the manifold of impressions. So, in judging the work as beautiful, one detects a purposiveness without an applicable concept:

In order to decide whether or not something is beautiful, we do not relate the representation by means of understanding to the object for cognition, but rather relate it by means of the imagination (perhaps combined with the understanding) to the subject and its feeling of pleasure or displeasure¹⁵⁹. The judgment of taste is therefore not a cognitive judgment¹⁶⁰, hence not a logical one, but is rather aesthetic, by which is understood one whose determining ground cannot be other than subjective. (Kant, 2000, p. 89 [KU §1])

Next to being involved in judgement and taste, the aesthetic imagination is also an active and creative capacity and this aspect appears in Kant's analysis of genius¹⁶¹. According to Kant, genius is a talent¹⁶² for producing original and exemplary works that cannot be explained scientifically (Kant, 2000, pp.

¹⁵⁷ Kant adds to the list of characteristics of experiencing beauty that 1/ it pleases universally 2/ it has purposiveness without purpose (the purposiveness is present in the subject, not the object).

¹⁵⁸ Not prior to experience however, but a priori because we assume it also is valid for other humans.

¹⁵⁹ The feeling of pleasure is its immediate aim (unlike the mechanical arts).

¹⁶⁰ It is still linked to cognition and not merely to sensations (as in the agreeable arts) (Kant, 2000, p. 184 [KU §44]).

¹⁶¹ "For the judging of beautiful objects, as such, taste is required; but for beautiful art itself, i.e., for producing such objects, genius is required" (Kant, 2000, p. 189 [KU § 48]).

¹⁶² "for Kant, talent, spirit, and genius do not represent distinct faculties; rather they comprise ways of setting in motion one's other ordinary faculties, especially imagination" (Crawford, 2003, p. 160). "*Unter Talent (Naturgabe) versteht man diejenige Vorzüglichkeit Des Erkenntnißvermögens, welche nicht von der Unterweisung, sondern der natürlichen Anlage des Subjects abhängt. Sie sind der productive Witz (ingenium strictus s. materialiter dictum), die Sagacität und die Originalität im Denken (das Genie)*" (Kant, 1798, p. 220, [Anthr.§28]).

186–187 [KU §46]) and that are entirely opposed to the spirit of imitation (Kant, 2000, p. 187 [KU §47]). It functions via “the inborn predisposition of the mind (*ingenium*) through which nature gives the rule to art” (Kant, 2000, p. 186)¹⁶³ and via the productive imagination which is “very powerful in creating, as it were, another nature, out of the material which the real one gives it” (Kant, 2000, p. 192 [KU §49]). Unlike in the use of the imagination for cognition, where it is limited to being adequate to its concept, imagination in an aesthetic respect is free to provide, beyond that concord with the concept, undeveloped material for the understanding (Kant, 2000, pp. 194–195 [KU § 49]). A third essential attribute to genius (next to imagination and understanding) is identified by Kant as ‘spirit’ [*Geist*], a quasi-ineffable element closely linked and refers to the antique notion of *enthousiasmos* (Kant, 2000, pp. 194–195 [KU §49]). Having identified artistic creativity as an inspired, free play between imagination and understanding that operates according its own rules, Kant makes in §49 of the third Critique, the influential claim about the fruition of genius. He asserts that genius cannot be learned through science [*Wissenschaft*] or diligence [*Fleiß*] and that moreover, a scientist like Newton, although possessing ‘a great mind’, is not a genius since Newton’s discovery can be recounted in stepwise fashion, and can be learned on the basis of codified rules. By contrast, great art, Kant says, although based in some fundamental skill, falls under no determinate rules and so cannot be imitated, taught, or learned. Kant’s bold assertions are somewhat counterbalanced by three preceding passages in which he suggests that genius as such is not enough for the production of beauty. In a first instance, Kant states that

for beautiful art in its full perfection much science [*Wissenschaft*] is required, such as, e.g., acquaintance with ancient languages, wide reading of those authors considered to be classical, history, acquaintance with antiquities, etc., and for that reason these historical sciences, because they constitute the necessary preparation and foundation for beautiful art” (Kant, 2000, p. 184 [KU §44]).

Secondly, taking into consideration the fact that the rule of art cannot be couched in a formula to serve as a precept, it can nevertheless and ‘probably’ (Kant is very cautious here) serve as a model not for copying [*Nachmachung*], but for imitation [*Nachahmung*] (Kant, 2000, p. 188 [KU §47]): “the ideas of the artist arouse similar ideas in his apprentice if nature has equipped him with a similar proportion of mental powers” (Kant, 2000, p. 188 [KU §47]). Finally, Kant admits that “genius can only provide rich material for products of art; its elaboration and form require a talent that has been academically

¹⁶³ “*Genie ist das Talent (Naturgabe), welches der Kunst die Regel gibt. Da das Talent, als angeborenes produktives Vermögen des Künstlers, selbst zur Natur gehört, so könnte man sich auch so ausdrücken: Genie ist die angeborene Gemütsanlage (ingenium), durch welche die Natur der Kunst die Regel gibt.*” (Kant, 1790/1986, p. 241, [KU § 46]). [“Genius is the talent (natural gift) that gives the rule to art. Since the talent, as an inborn productive faculty of the artist, itself belongs to nature, this could also be expressed thus: Genius is the inborn predisposition of the mind (*ingenium*) through which nature gives the rule to art” (Kant, 1790/2000, p. 186, [KU §46]).

trained [*Schulgerechtes*], in order to make a use of it that can stand up to the power of judgment”¹⁶⁴ (Kant, 2000, p. 189 [KU §47]).

Notwithstanding these attenuating circumstances, the general claim – that creativity is inexplicable, ineffable if not magical – is to be of great influence on romantic theorizing about creativity in the two centuries that follow the third critique, resulting in the creation of an autonomous status for art and accordingly discouraging theorists of an analytic, naturalistic, or generally scientific approach (Stokes, 2016, p. 248).

Still adding to that elevated status of autonomy is Kant’s notion of *the Sublime* [*das Erhabene*]. Whereas the experience of *the Beautiful* results from the imagination’s freedom to create images, that of *the Sublime* results from surpassing the concepts of understanding and the images of imagination itself: “the pleasure the imagination takes in the sublime is one of challenge, defiance, risk, excess, even shock” (Kearney, 1988b, p. 175). Whereas the experience of the beautiful is a result of a play between imagination and understanding [*Verstand*], in experiencing *the Sublime* an interaction between imagination and the faculty of reason [*Vernunft*] is suggested; the faculty that links art to moral freedom and the noumenal world. Philosopher Samantha Matherne (2016) calls it the ‘moral imagination’. Unlike Plato, Kant sees art and imagination as compatible with the moral good. *The beautiful* is not only the symbol of the morally good (Kant, 2000, p. 227 [KU §59]), but the position of imagination, spanning across the domains of nature and freedom confirms our freedom to rise above the constraints of necessary causality. The moral imagination mediates between nature and freedom and encourages us to see the transformational potential within the constraints of the natural world.

By all of this, Kant effectively circumscribes the conditions for a truly creative role of imagination and situates its full freedom within the boundaries of art. The balance between information and imagination is most balanced in coping with an everyday, phenomenological environment, there the imagination is a *conditio sine qua non* for channelling and giving adequate form to a bombardment of sensorial information ; in the context of beautiful art a first dissociation takes places by postulating a non-determinant, not discursively transmittable, and genius-driven free play between imagination and understanding; when ultimately, *the Sublime* gets involved the relation between imagination and information from the ‘real’ world further degenerates in order to establish a realm of artistic autonomy and freedom. The tendency to separate the world of artistic creativity from the world of social reality and industrialized nature is affirmed and gets an impetus from Kant’s work. Art becomes something to be felt and not something to be conceptualized: “by dissociating reason from the life of feeling, Kant

¹⁶⁴ “Das Genie kann nur reichen Stoff zu Produkten der schönen Kunst hergeben; die Verarbeitung desselben und die Form erfordert ein durch die Schule gebildetes Talent” (Kant, 1986b, p. 244 [KU §47]).

is ultimately reducing imagination to the latter and thereby anticipating the romantic opposition between science and art" (Kearney, 1988, p. 174).

3.2.5 Dictionary definitions

At the end of this second form of life new sources of reference become available: Diderot's and d'Alembert's *Encyclopédie ou Dictionnaire raisonné des sciences, des arts et des métiers, par une Société de Gens de lettres* (Diderot & d'Alembert, 1751-1765) and Samuel Johnson's *Dictionary of the English Language* (Johnson, 1755/1785). The lemma on 'information' in the *Encyclopédie* is restricted to its juridical meaning: "information is a juridical act which consists of the declarations of witness" and while Johnson also refers to information as "charge or accusation exhibited", he lists as a first definition the modern, communicative take on information as "intelligence given; instruction". Here information is formally linked to intelligence, not one that is produced within the mind (logic, rationalism) but intelligence with an external origin. If we look at Johnson's treatment of 'inspiration' and 'to inspire', we detect the same original 'otherness' but not linked to intelligence but rather to fancy¹⁶⁵ and intuition¹⁶⁶. 'To inspire' – in its metaphorical meaning - is defined as "to infuse into the mind ; to impress upon fancy; to animate by supernatural intuition" and 'inspiration' as "intuiting ideas into the mind by a superior power". 'Fancy' and 'imagination' are quasi-synonyms in Johnson's dictionary; both terms refer in a first instance to a of forming images or pictures in the mind with the subtle nuance that with imagination these pictures are said to be 'ideal' whereas fanciful images are rather linked to pleasure and entertainment; next to the forming of images for both terms also meanings are listed with regard to their untrustworthy, opinion-like quality.

So, by the end of the second life we arrive in Johnson's dictionary at a situation where information comes to refer to intelligence that is derived from an external source (person or 'reality') serving as the basis for further processing by reason, and inspiration, which akin to information is linked to external elements but seems to imply supernatural origins and seems to feed fancy and imagination rather than reason.

With regard to imagination the *Encyclopédie* is more differentially nuanced and close to Kant's ultimate perspective on *Einbildungskraft*. Voltaire's article *Imagination, Imaginer* in volume eight of the *Encyclopédie* (1765) offers the following opening definition:

Imagination is the power which every being, endowed with perception and reason, is conscious he possesses of representing to himself sensible objects. This faculty is dependent

¹⁶⁵ "1. imagination: the power by which the mind forms to itself images and representations of things, persons, or scenes of being; 2. An opinion bred rather by the imagination than the reason; 8. False notion; 9. Something that pleases and entertains without real use or value" (Johnson, 1785).

¹⁶⁶ "1. immediate knowledge; 2. knowledge not obtained by deduction or reason" (Johnson, 1785).

upon memory. We see men, animals, gardens, which perceptions are introduced by the senses; the memory retains them, and the imagination compounds them. On this account the ancient Greeks called the muses, 'the daughters of memory'.¹⁶⁷ (Diderot & d'Alembert, 1751-1772/2002)

The imagination here is understood according to an empiricist model of the mind: experience is acquired through the senses in bits and pieces, and imagination is part of the faculty by which sentient beings process the raw, fragmented data of experience in order to produce a picture of, or knowledge about the world. Voltaire distinguishes the passive and the active imagination. The former is common to human beings and to animals and is "the source of our passions and our errors". Most of the section on the active imagination concerns the "inventive" imagination in the useful and fine arts.

Active imagination is that which joins combination and reflection to memory. It brings near to us many objects at a distance; it separates those mixed together, compounds them, and changes them; it seems to create, while in fact it merely arranges; for it has not been given to man to make ideas — he is only able to modify them. [...] This gift of nature is an imagination inventive in the arts — in the disposition of a picture, in the structure of a poem. It cannot exist without memory, but it uses memory as an instrument with which it produces all its performances.¹⁶⁸ (Diderot & d'Alembert, 1751-1772/2002)

Images are essential in mechanical invention, while in the fine arts, imagination requires sound judgment and taste in order to avoid fantastic imagination that lack order and good sense. The artistic imagination for Voltaire is classical: it associates or combines only those objects which 'naturally' go together, whereas a bizarre imagination will seek to combine the incompatible. We see clearly that with the fragmentation of information, a new kind of imagination is introduced, one that is able to make sense of the stuff that reaches our senses and imaginatively recombines these separate elements into new possible worlds.

3.2.6 Section summary

This second form of life is critical in the relation between information and imagination. We discussed four pivotal moments. Firstly, Bacon forges a break with the dogmatic and axiom-based tenets of Aristotelian philosophy. He promotes a focus on 'digesting' objective matters of fact obtained via a

¹⁶⁷ "L'imagination/imaginer: c'est le pouvoir que chaque être sensible éprouve en soi de se représenter dans son esprit les choses sensibles; cette faculté dépend de la mémoire. On voit des hommes, des animaux, des jardins; ces perceptions entrent par les sens, la mémoire les retient, l'imagination les compose; voilà pourquoi les anciens Grecs appellerent les Muses filles de Mémoire" (Diderot & d'Alembert, 1751-1772).

¹⁶⁸ "L'imagination active est celle qui joint la réflexion, la combinaison à la mémoire; elle rapproche plusieurs objets distans, elle sépare ceux qui se mêlent, les compose & les change; elle semble créer quand elle ne fait qu'arranger, car il n'est pas donné à l'homme de se faire des idées, il ne peut que les modifier. [...] Ce don de la nature est imagination d'invention dans les arts, dans l'ordonnance d'un tableau, dans celle d'un poème. Elle ne peut exister sans la mémoire; mais elle s'en sert comme d'un instrument avec lequel elle fait tous ses ouvrages" (Diderot & d'Alembert, 1751-1772).

process of experimentation as a basis for human understanding and action. Secondly, Descartes reformulates the term 'idea' by situating it in the human mind instead of relegating it to a separate realm of Forms. 'Ideas' are considered as pure products of the mind that are amenable to combinational activity (Leibniz); imagination is human cognition's link to the external world, but it is inferior to reason and is potentially deceptive. Locke and Hume epitomize the rival view to Descartes' rationalism. Experience is for empiricism the foundational element in the acquisition and accumulation of knowledge and 'Ideas' are only faint images of impressions (a complete reversal of Plato's view). Experience however does not present itself as an ordered whole and this atomistic quality of information prompts the problem of induction, especially in Hume, who considers two opposing, organizing principles: Habit/belief and imagination. Kant addresses the problem by re-introducing *a priori* forms of understanding that impose themselves on sensible information. A central (and not a mediating) role is attributed to imagination, which has the power to form (not only to represent) an image of the world. Kant's notion of productive imagination finds its ultimate freedom and realization in the production of art which, by its alliance with genius and moral imagination, is now set to claim autonomy and superiority over the constraints that the phenomenological world must endure. In Kant, we find the ultimate balance between information, out-formation and imagination but also the seeds for a new order in which the free imagination of possible worlds comes to supersede the analysis of a phenomenological world.

3.3 The triumph of creative imagination (19th century - first half 20th century)

Within the third form of life the trajectories of information and imagination are parting again and fuel the opposition between science and art anticipated by Kant. Information transcends the realm of personal experience via the instrument of statistics and extends its horizon of objectivity; imagination in turn becomes the epitome of an artistic and humanistic counter-culture, attributing to the (sub-conscious) subjectivity of the artist a god-like creative power. There's no complete separation however, in developmental approaches a trade-off between the two domains is suggested, and within the phenomenological tradition, imagination is instrumentalized in a renewed quest for essences [*eidoi/εἶδοι*].

3.3.1 Statistical information

The empiricism of the second life situated information in the sensorium of an individual knower, in the 19th century (already anticipated in the second half of the 18th century), a new knower enters the stage: the state, which senses by means of bureaucracy and is informed via statistics (Peters, 1988, p. 14).¹⁶⁹

¹⁶⁹ The first national institutes for statistics develop in the 19th century. Belgium: 'Het Bureau voor de Statistiek'

The scale of the modern state in the 19th century presents its leaders and stakeholders with a problem: a state is something difficult to imagine and to grasp and rulers do not want to rule over an imaginary state when they need to make policy, control populations, tax-incomes, raise armies. They need facts. And so, statistics arise as the study of something too large to be perceptible – states and their climates, their rates of birth, marriage, death, crime, their economies, and so on – and secondly, as a set of techniques for making those processes visible and interpretable. Here, information, which in empiricism meant the experience of an individual, comes to mean the experience of the state. Statistics enable the acquisition of knowledge beyond the range of one's personal experience and grant access to knowledge intellectually apart from any 'real' embodied, sensory experience. In the 1902 edition of the *Encyclopedia Britannica*, the following definition is provided:

The Statistical Method. - This method is a scientific procedure (1) whereby certain phenomena of aggregation not perceptible to the senses are rendered perceptible to the intellect, and (2) furnishing rules for the correct performance of the quantitative observation of these phenomena. The class of phenomena of aggregation referred to includes only such phenomena as are too large to be perceptible to the senses. It does not, e.g., include such phenomena as are the subject-matter of microscopy. Things which are very large are often quite as difficult to perceive as those which are very small.¹⁷⁰

By studying something too large to be perceptible by an individual's senses (climate, birth-rate, death, crime, economics), "statistics offer a kind of gnosis, a mystic transcendence of individuality, a tasting of the forbidden fruit of knowledge" (Peters, 1988, p. 15). Peters summarizes the process as follows:

Empiricism took the forms out of information, leaving it the chaotic stuff of sensory experience. But it remained anchored in the human mind and senses. With state empiricism – statistics – the old scale of the human mind and body is shattered. Information accumulates at rates and in quantities that can be processed by no single person. Techniques of data-reduction and analysis of central tendency arise to interpret that information. Information, the stuff of sense, qualitatively mutates as it increases in quantity: it becomes objectified, exterior, and alien to human senses. (Peters, 1988, p. 15)

From an epistemological point of view, statistics offer an opening vis-à-vis the limits that Hume encountered with regard to the modern fact (Poovey, 1998, pp. 194-213) and the ensuing problem of induction: how to relate matters of fact to human ideas, how to bridge the gap between fact and theory? Hume rejected *a priori* assumptions about systematic knowledge and overarching systems (e.g. divine providence, universal human subjectivity) and concluded that the only grounds one can have for assuming that future observations of particulars will continue to resemble past observations

(1826), 'Centrale Commissie voor de Statistiek' (1841); Netherlands: 'Commissie voor de Statistiek' (1826), Bureau voor de statistiek (1849) (Bie, 2009, p. 9); International Statistical Institute [ISI] (1885).

¹⁷⁰ From the *Encyclopedia Britannica*, 1902. <http://www.1902encyclopedia.com/S/STA/statistics.html>.

is some species of habit or belief. With belief at the heart of systematic knowledge the modern fact becomes vulnerable and is close to an implosion. While Hume himself turns to other modes of writing – such as the essay – to overcome this *aporia*, and Kant develops the model of transcendental idealism, alternative theories and conceptual abstractions are devised in the 19th century to resolve the tension between theory and observation. It is here that statistics come in, deriving meaning from a quantified and extended horizon based on the collection of ‘neutral facts’. This type of perspectival objectivity becomes the credo of scientists, not because it necessarily mirrors reality more accurately, but because it serves the ideal of communicability, especially across barriers of distance and distrust. Non-perspectival objectivity is “the ethos of the interchangeable and therefore featureless observer – unmarked by nationality, by sensory dullness or acuity, by training or tradition; by quirky apparatus, by colourful writing style, or by any other idiosyncrasy that might interfere with the communication, comparison, and accumulation of results” (Daston, 1999, p. 118).

From a sociological point of view, it is argued that the collection, processing, and use of information becomes from the 19th century onwards, a powerful tool in the hand of states that replace absolutist rule by fear and violence with a regime of surveillance and monitoring.

This ideal of objectivity and self-effacing cooperation is sharply contrasted to the subjective individualism of the artist: “*l’art, c’est moi, la science, c’est nous*”.¹⁷¹ Statistical data function as a new divine intelligence, one that is omnipresent and gives a new order to the world. Statistics make the invisible visible, and take the place of what previously could only be imagined in novels and stories.¹⁷² Moreover, they get to be related to real action and decision-making.

Around 1900 CE ‘informed’ as an adjective undergoes a significant shift as far as semantics is concerned; it is now definitionally linked to elements such as a new action, opinion, decision: “based on or influenced by knowledge or by an understanding of a particular situation; enlightened; (of a work) characterized by or demonstrating knowledge or learning.” [OED, informed, 1b]. ‘Informed’ has now travelled from informing matter (first form of life), to informing minds – based on facts – (second

¹⁷¹ “*la méthode expérimentale puise en elle-même une autorité impersonnelle qui domine la science. [...] Les progrès de la méthode expérimentale consistent en ce que la somme des vérités augmente à mesure que la somme des erreurs diminue. Mais chacune de ces vérités particulières s’ajoute aux autres pour constituer des vérités plus générales. [...] Pour les arts et les lettres, la personnalité domine tout. Il s’agit là d’une création spontanée de l’esprit, et cela n’a plus rien de commun avec la constatation des phénomènes naturels, dans lesquels notre esprit ne doit rien créer*” (Bernard, 1865, p. 47). [the experimental method implies an impersonal authority which dominates science. [...] The progress of the experimental method is one in which the sum of truths increases to the same extent as mistakes decrease. Every particular truth adds to the others to form a more general truth. [...] For the arts and letters, personality is an all-dominating factor. It is about a spontaneous creation of the spirit, and it has nothing in common anymore with understanding natural phenomena, where creation by spirit is irrelevant]” [own translation].

¹⁷² See Benjamin’s *storyteller* who introduces this section (Benjamin, 2007).

form of life), to finally reach the status of a powerful element that contributes or determines actual decisions and actions.

3.3.2 *Creative imagination*

As this culture of science, the putative realm of truth and facts, dissociates itself from an all-encompassing philosophy and humanistic culture, a powerful counterculture comes about, one that challenges the imperialist claims of the scientific culture (Lee, Wallerstein, & Aytar, 2004, p. 4). A central term in this countermovement is 'imagination', and the 'creative imagination' more in particular. Quite outspoken and very confident, artists, poets and critics start promoting imagination as the chief creative faculty, as a magical power, that is capable of synthesis (contra science's concern with analysis) and that is the motor of invention and originality: "imagination, once regarded at best as a useful intermediary between sensation and reason, at worst as a dangerous and delusive power, has now become the prime faculty of the human mind" (Cocking & Murray, 1991, p. v). The aphorisms bearing witness to this turning of tables are abundant and most of them intend to hierarchically oppose imagination and reason:

- "Art only begins where Imitation ends." (Oscar Wilde, *De Profundis*)
- "Reason is to imagination as the instrument to the agent, as the body to the spirit, as the shadow to the substance." (Shelley, 1821/1904, pp. 11–12). In the opening of his *Defense of Poetry*, Shelley discerns two classes of mental action, reason and imagination¹⁷³. Reason contemplates the relation between thoughts by means of analysis, imagination colours those thoughts and creates new ones by synthesizing "those forms which are common to universal nature and existence itself [...] Reason is the enumeration of qualities already known; imagination is the perception of the value of those qualities, both separately and as a whole" (Shelley, 1821/1904, pp. 11–12)¹⁷⁴. Shelley, who is very familiar with Plato's work formulates a new, reversed mimetic order: "A poem is the very image of life expressed in its eternal truth... A story of particular facts is as a mirror which obscures and distorts that which should be beautiful: poetry is a mirror which makes beautiful that which is distorted" (as cited in Abrams, 1953, p. 127)
- In his annotations to Berkeley's *Siris*, English poet William Blake (1757-1827), grants imagination a divine status when comparing imagination to "the Divine Body in Every Man" (Blake, n.d.-a). In

¹⁷³ "The one is the *το ποιειν*, or the principle of synthesis and has for its objects those forms which are common to universal nature and existence itself; the other is the *το λογιζειν* or principle of analysis and its action regards the relations of things, simply as relations; considering thoughts, not in their integral unity but as the algebraical representations which conduct to certain general results" (Shelley, 1821/1904, p. 12).

¹⁷⁴ See also William Butler Yeats' passionate declaration "By reason and logic we die hourly, by imagination we live!".

another *annotation*, Blake provides the requisites for “Imagination, the Divine Vision”, “the One Power alone that makes a Poet”, and these are: first, those of observation and description and second, sensibility (Blake, n.d.-b).

- Darwin is not one to be expected in this club of imaginophiles. Nevertheless, he characterizes imagination as “one of the highest prerogatives of man. By this faculty he unites, independently of the will, former images and ideas, and thus creates brilliant and novel results” (Darwin, 1871/1981, p. 45). According to Darwin, dreaming is the involuntary manifestation of the power of imagination but he also provides a link to the notion of information as impression: “The value of the products of our imagination depends of course on the number, accuracy, and clearness of our impressions; on our judgment and taste in selecting or rejecting the involuntary combinations, and to a certain extent on our power of voluntarily combining them” (Darwin, 1871/1981, p. 46).

On a more systematic level, philosopher Friedrich Wilhelm Joseph von Schelling (1775-1854) builds on Kant’s notion of ‘*Einbildungskraft*’ and posits that imagination is both human and divine. God possesses the power of imagination in all its fullness, the human imagination shares in this faculty, though on a lower level. Common people take part in the power of imagination by perceiving unity in the multiplicity of our experience. The creative genius, however, possesses the ability to create new unity out of existing things (*creation ex materia*). Imagination is a power in nature, with the *natura naturans* being the active power of imagination itself, and the *natura naturata* the created sensible object, the product of the creative act. Schelling’s philosophy of art aims at connecting the philosophies of nature and of mind by recognizing in the works of art, the unity of man’s conscious and free intelligence with nature’s material and objective reality. The art created by the artist’s imagination is considered to be the most comprehensive symbol of knowledge.

In chapter 13 of his seminal critical work, *Biographia Literaria* (Coleridge, 1817), literary critic Samuel Taylor Coleridge (1772-1834) similarly divides imagination into two main levels. Primary imagination is the involuntary act of receiving impressions and sensations from the external world through the senses, imposing some sort of order on those impressions so that the mind is able to form a clear image of the outside world. The primary imagination is universal; it is possessed by all humans. The secondary imagination, however, is the peculiar and distinctive attribute of the artist. Secondary imagination is more active and conscious in its working. Primary imagination supplies its material to the secondary imagination which selects, orders, re-shapes and re-models it into models of beauty. Coleridge calls it a magical, synthetic power that unifies perception, intellect, will and emotion and is the basis of all poetry. It links the internal with the external, the subjective with the objective, and the spiritual with the physical or material. Coleridge advances a further division between Imagination and

Fancy. Whereas primary and secondary imagination only differ in degree, Imagination and Fancy are activities of two different kinds. Fancy is about combining perceptions into beautiful shapes, but unlike the imagination, it does not fuse and unify. In imagination elements lose their individual characteristics in order to create something new, while Fancy is merely a bringing together of a number of separate elements.¹⁷⁵ This separation of Fancy and Imagination, where Fancy is relegated to the realm of ornamental and mimetic activities, was key to allow for the association of imagination with the centres of creativity (Engell, 1981, pp. 329–366).

In *The World as Will and Representation* (Schopenhauer, 1818/1844)¹⁷⁶, philosopher Arthur Schopenhauer builds on Kant's bifurcation of experience into *noumena* and *phenomena*. He claims however, unlike Kant, that the noumenal (metaphysical) world is not completely unknowable. According to Schopenhauer, the metaphysical realm, which is singular and indivisible in its own existence, manifests itself phenomenally when it is transformed in terms of time and space. The human mind generally tries to make sense of the world, pragmatically, by categorizing and delineating in concordance with the order imposed by phenomena, thereby trying to create stability out of the instability. In order to escape this enforced and artificial order and to discover the noumenal order, Schopenhauer makes an appeal to the 'Will' as the noumenal aspect that is the thing-in-itself but is also present in humans. The Will can give us a glimpse of the transcendental order and it can express itself through a medium that is entirely transcultural: music. In its non-representational quality, music comes closest of the chaotic noumenal world manifesting itself in the world of ordered phenomena.

3.3.3 Psychodynamic approaches

At the beginning of the twentieth century imagination is granted an additional perspective: in the psycho-analytical work of Sigmund Freud (1856-1939) a new source for imaginative activity is brought to the centre of attention: the unconscious. Poetic imagination and creativity are typically presented in terms of phantasy, daydreams and nocturnal dreaming and considered to be a substitution for the pleasure of childhood play. Free play is allowed to children as part of their motivation to become grown-ups; by contrast, adults must keep some wishes hidden since they already know what is expected of them and are controlled by intersubjective rules: "so when the human being grows up and ceases to play he only gives up the connection with real objects; instead of playing he then begins to

¹⁷⁵ 'Fancy' does not equal 'Fantasy'. In *Fantasy: the liberation of imagination* Richard Mathews situates Fantasy in the context of a poetic and prozaic genre at the end of the eighteenth and beginning of the 19th century and "the mythical process unlocks imagination from the chains of reason" that typifies these works (Mathews, 2002, p. 11).

¹⁷⁶ It was first published in 1818 and extended in 1844; next to the primary text in German, also the translation in Dutch (Schopenhauer, 2012), and English (Schopenhauer, 1909) have been consulted.

create phantasy" (Freud, 1908/2009, p. 46). Imagination then, according to Freud, involves a flight from reality and feeds on frustrations and situations where pleasure-oriented imaginings escape from the fertile unconscious.

The general schema is one in which the pleasure-unpleasure [*Lust-Unlust*] principle, or more shortly the *pleasure principle*, strives towards gaining pleasure (Freud, 1911/1956, p. 2553) and seeks to discharge the drive tensions via hallucinations. In its striving, the pleasure principle meets up with the *reality-principle*, which is the psyche's necessary awareness of information concerning a given reality. In an evolutionary context, Freud claims that "it was only the non-occurrence of the expected satisfaction, the disappointment experienced, that led to the abandonment of [the] attempt at satisfaction by means of hallucination. Instead of it, the psychical apparatus had to decide to form a conception of the real circumstances in the external world and to endeavour to make a real alteration in them" (Freud, 1911/1956, p. 2554). Poetic imagination and creation are the expression of these universally experienced psychological complexes where the artist reveals deeply (dark) secret wishes beyond the status of hallucinations or day-dreaming. These expressions would normally repel us if they were to be communicated in an ordinary, non-artistic fashion (Freud, 1908/2009, p. 53), however, "when a man of literary talent presents his plays, or relates what we take to be his personal day-dreams, we experience great pleasure arising probably from many sources. How the writer accomplishes this is his innermost secret¹⁷⁷" (Freud, 1908/2009, p. 54). The underlying assumption is that everyone resists revealing contents of the unconscious while secretly daydreaming and wishing for the unthinkable. The neurotic person is unable to utilize this tension in a creative way; the poet/artist is saved from neurosis by an ability to give expression to pleasure-reality tension in a work of art.

Art brings about a reconciliation between the two principles in a peculiar way. An artist is originally a man who turns away from reality because he cannot come to terms with the renunciation of instinctual satisfaction which it at first demands, and who allows his erotic and ambitious wishes full play in the life of phantasy. He finds the way back to reality, however, from this world of phantasy by making use of special gifts to mould his phantasies into truths of a new kind, which are valued by men as precious reflections of reality. (Freud, 1911/1956, p. 2557)

Following a turning away from reality, the poet thus returns to it with revelations of other possibilities. Freud distinguishes between two different types of poets, "[the ones who] like the bygone creators of epics and tragedies, take over their material ready-made, and those who seem to create their material spontaneously" (Freud, 1908/2009, p. 550). It is in the latter type of creative work that something new and unique is revealed by venturing into the dark unknown of the unconscious, bringing light to shine

¹⁷⁷ As with Kant's ineffable concept of genius, Freud also resists a functional analysis of poetic creation.

upon some universal experience of human conflict. Influenced by Freud's thesis on spontaneous creation, artists, and more in particular writers and surrealist painters, have aimed at showing the richness of the unconscious by exploring, since the 1920s, the richness of spontaneous action.

Freud's student, psycho-analyticus Carl Gustav Jung (1875–1961) further extends these seminal insights into the concept of the *collective unconscious*. According to Jung, this collective unconscious is formed by instincts and archetypes which are physically inherited from our ancestors and are present in symbols, signs, patterns of behaviour, and thinking and experiencing. These archetypal themes and images are the same for all cultures and encompasses the soul of humanity at large. Jung refers in the context of archetypes to universal 'categories of imagination',¹⁷⁸.

My thesis then, is as follows: in addition to our immediate consciousness, which is of a thoroughly personal nature and which we believe to be the only empirical psyche (even if we tack on the personal unconscious as an appendix), there exists a second psychic system of a collective, universal, and impersonal nature which is identical in all individuals. This collective unconscious does not develop individually but is inherited. It consists of pre-existent forms, the archetypes, which can only become conscious secondarily and which give definite form to certain psychic contents. (Jung, 1959/1968, p. 43)

The collective unconscious serves as a basis from which humans establish through a process of individuation a *persona*, which represent the embodiment of a small portion of the collective psyche.

We can summarize that with the turn to the unconscious late in this third form of life, imagination further distances itself from the information elements that pertain to an external or metaphysical reality and focusses instead on the barely accessible depths of the human psyche as the main source of inspiration/information. The structures that seem to form the basis of imagination are considered to be universal and trans-historical, yet the crucial processes that lead to the production of particular artworks does not seem to be open to a functional analysis and remain an uninformed mystery.

3.3.4 *New perspectives on the information-imagination alliance*

3.3.4.1 *Experience and imagination in pragmatism*

Philosophical pragmatism, developed initially by Charles Sanders Peirce (1839–1914), William James (1842–1910), and John Dewey (1859–1952), emphasizes the practical consequences that follow from the acceptance of a belief, and claims that the value and meaning of a proposition is in the practical consequences that follow upon accepting it. This practical and adaptive perspective leans heavily on Darwin's theory of natural selection (1859) and the naturalistic approach to the theory of knowledge

¹⁷⁸ Jung hereby refers to sociologists Henri Hubert and Marcel Mauss as the authors of the concept.

that it implies. Darwin's theory renounces metaphysical explanations of the origins of species by considering the morphology of living organisms as a product of a natural, temporal process of the adaptation of lineages of organisms to their environments as well as the active construction of these environments. In a similar way, pragmatists (especially John Dewey) maintain that a productive, naturalistic approach to the theory of knowledge must begin with a consideration of knowledge as an adaptive human response to enviroing conditions aiming at actively restructuring these conditions. Thought and thinking are not essential primitives but the product of the interaction between organism and environment, and knowledge is practical instrumentality in the guidance and control of that interaction. This new epistemic outlook has far-reaching consequences on the status of sensorial information.

We are only just now commencing to appreciate how completely exploded is the psychology that dominated philosophy throughout the eighteenth and nineteenth centuries. According to this theory, mental life originated in sensations which are separately and passively received, and which are formed, through laws of retention and association, into a mosaic of images, perceptions, and conceptions. The senses were regarded as gateways or avenues of knowledge. Except in combining atomic sensations, the mind was wholly passive and acquiescent in knowing. Volition, action, emotion, and desire follow in the wake of sensations and images. The intellectual or cognitive factor comes first and emotional and volitional life is only a consequent conjunction of ideas with sensations of pleasure and pain. The effect of the development of biology has been to reverse the picture. Wherever there is life, there is behaviour, activity. In order that life may persist, this, activity has to be both continuous and adapted to the environment. This adaptive adjustment, moreover, is not wholly passive; is not a mere matter of the moulding of the organism by the environment. Even a clam acts upon the environment and modifies it to some extent. It selects materials for food and for the shell that protects it. (Dewey, 1920, pp. 83-84)

Instead of sensorial, atomistic impressions pragmatists advance the notion of 'experience' to account for the interaction between agent and environment.

When experience is aligned with the life-process and sensations are seen to be points of readjustment, the alleged atomism of sensations totally disappears. With this disappearance is abolished the need for a synthetic faculty of super-empirical reason to connect them. Philosophy is not any longer confronted with the hopeless problem of finding a way in which separate grains of sand may be woven into a strong and coherent rope or into the illusion and pretence of one. (Dewey, 1920, p. 90)

In different ways, all pragmatists argue that experience is far richer than it is portrayed in the tradition and that 'experiences' or 'sense data' cannot be identified as separable constituents of cognition.

In James' radical empiricism the fundamental postulate is advanced that "the only things that shall be debatable among philosophers shall be things definable in terms drawn from experience" (James, 1909, p. xii). This requires experience to be far richer than in early philosophies, and indeed, James claims that our experience is not just a stream of data, but a complex process that is full of meaning.

He further asserts that “the relations between things, conjunctive as well as disjunctive, are just as much matters of direct experience, neither more nor less so, than the things themselves” (James, 1909, p. xii), and that “the parts of experience are held together from next to next by relations that are themselves parts of experience. The directly apprehended universe needs, in short, no extraneous trans-empirical connective support, but possesses in its own right a concatenated or continuous structure” (James, 1909, p. xiii).

But it is Dewey’s account which is most innovative, not at least because of its reference to a Darwinian, naturalistic understanding of experience. Dewey uses the term ‘experience’, found throughout his philosophical writings, to denote the broad context of the human organism's interrelationship with its environment, not the domain of human thought alone.

In his seminal article ‘The Reflex Arc Concept in Psychology’ (1896) Dewey argues that the dominant conception of the reflex arc in psychology, which begins with the passive stimulation of the organism, causing a conscious act of awareness eventuating in a response, is a remnant of the old, and dis-functional, mind-body dualism. Dewey advances an alternative view: the organism interacts with the world and builds experiences through self-guided activity that coordinates and integrates sensory and motor responses, the world is not passively perceived and thereby known; active engagement with the environment is involved integrally in the process of learning from the start. In this particular article Dewey does not mention the term information but rather sensory stimulus; in *Reconstruction in Philosophy* (1920) however, the reference to information is more explicit:

To an animal an affection of the eye or ear is not an idle piece of information about something indifferently going on in the world. It is an invitation and inducement to act in a needed way. It is a clue in behaviour, a directive factor in adaptation of life in its surroundings. It is urgent not cognitive in quality. [...] As a conscious element, a sensation marks an interruption in a course of action previously entered upon. (Dewey, 1920, pp. 87–88)

Dewey sees in the active engagement with information as a constituent in (re-)constructing experience a special role for philosophy and experimental science: philosophy must play the role of analysing and distinguishing between better and worse perspectives and modes of accomplishment, thereby pointing the way forward when the proper path seems unclear: “The prime function of philosophy [informed by science] is that of rationalizing the *possibilities* [Dewey’s emphasis] of experience, especially collective human experience” (Dewey, 1920, p. 122). The relation between informed experience and imagination is suggested in the last pages of *Reconstruction in Philosophy*:

Conceptions of possibility, progress, free movement and infinitely diversified opportunity have been suggested by modern science. But until they have displaced from imagination the heritage of the immutable and the once-for-all ordered and systematized, the ideas of mechanism and matter will lie like a dead weight upon the emotions, paralyzing religion and distorting art. [...] When philosophy shall have co-operated with the course of events and made

clear and coherent the meaning of the daily detail, science and emotion will interpenetrate, practice and imagination will embrace. Poetry and religious feeling will be the unforced flowers of life. (Dewey, 1920, pp. 211-213)

Dewey advances here a new vision on artistic imagination, one that is based on reconstructing the possibilities of experience and an active engagement with information via new insights coming from science and meditated by philosophy.

3.3.4.2 'Eidetic analysis'

A final example of a specific relation between information and imagination is offered by philosopher Edmund Husserl (1859-1938). Husserl studies the structures of experience and consciousness and is considered to be the founding father of the philosophical school of phenomenology. One of the central points in his considerations is the one of *eidetic analysis* or *reduction*. Husserl thereby revisits the notion of *eidos* that we encountered early in Platonic and Aristotelian philosophy in reference to the essence of things in the world. Husserl's *eidetic reduction* is a technique in the study of essences that aims at identifying the essence of a mental object, with the intention of drawing out the absolutely necessary and invariable components that make the mental object what it is. This reduction is done with the intention of removing what is perceived, and leaving only what is required. The methodological technique that Husserl proposes to arrive at these essences is one of imaginative variation by which mentally changing different elements of a practical object lead to an assessment with regard to the characteristics that are necessary for it to be it without being something else. If a characteristic is varied, and the object *as such* remains unchanged and identifiable, the characteristic does not belong to the essence of the object, and vice versa. The steps of an *eidetic analysis* are threefold: 1/ choosing a specific object; 2/ vary it imaginatively; and 3/ figuring out that which cannot be eliminated for the object to remain itself. The essence is that what can not be eliminated.

The basic steps of an *eidetic reduction* are threefold: first, you must choose some specific example (e.g., Descartes' wax); then, you vary the example imaginatively; the third step involves figuring out that which cannot be eliminated while the example remains itself. That which cannot be eliminated is part of the example's essence.

Starting from [a] table-perception as an example, we vary the perceptual object, table, with a completely free optionalness, [...] Perhaps we begin by fictively changing the shape or the color of the object quite arbitrarily, keeping identical only its perceptual appearing. [...] We change the fact [*das Faktum*] of this perception into a pure possibility, one among other quite "optional" pure possibilities but possibilities that are possible perceptions. We, so to speak, shift the actual perception into the realm of non-actualities [*Unwirklichkeiten*], the realm of the as-if, which supplies us with "pure" possibilities, pure of everything that restricts to this fact or to any fact whatever. As regards the latter point, we keep the aforesaid possibilities,

not as restricted even to the co-positing de facto ego, but just as a completely free "imaginableness" of phantasy. Accordingly from the very start we might have taken as our initial example a phantasying ourselves [*Hineinphantasieren*] into a perceiving, with no relation to the rest of our de facto life. Perception, the universal type thus acquired, floats in the air, so to speak in the atmosphere of pure phantasiableness [*Erdenklichkeiten*]. Thus removed from all factualness, it has become the pure "eidos" perception, whose "ideal" extension is made up of all ideally possible perceptions, as purely phantasiaable [sic] processes. [...] every fact can be thought of merely as exemplifying a pure possibility. (Husserl, 1950/1999, pp. 70–71)¹⁷⁹

With the *eidetic reduction*, Husserl fundamentally rethinks and revolutionizes the view on how essential knowledge can be obtained and how the world of facts can fruitfully interact with the realm of possibilities. In the context of our overview, we can summarize that Husserl's method involves factual information (second form of life) and creative imagination in order to arrive at essential information in its archaic meaning (first form of life).

3.3.5 Section summary

The central factor in this third form of life is the notion of 'neutral' or 'objective' information; information that transcends personal experience and thereby extends the informational horizon of humankind. Accompanying and in a way fortifying this alienating trend in information is the fruition of the notion of 'creative imagination' which is embedded in a counter-positivistic movement. Without any doubt the heydays of imagination are to be situated within this third form of life. Kant's (rather brief) treatment of aesthetic, artistic and moral and imagination inspires the disciples of romanticism to raise the anchor which connects humankind with the factual world of information and discover the uncharted terrain of idealistic, (im)possible worlds. Plato's dualism comes back with a vengeance and turns the tables for information and imagination in favour of the later one. A more functional and purposeful relation between information and imagination is reached in Husserl's phenomenology where information and imagination cooperate to arrive at the essence of things.

An important 'new' source of imagination is discovered in this third life; inspiration does not reside in a metaphysical or a strictly rational realm but rather in the deep subconscious and hardly accessible layers of our human existence and engagement with our surroundings.

3.4 A flood of information (second half of the 20th century - 21st century)

A final and important turn is taken in the mid-twentieth-century, after the second World War, when information starts to be a crucial factor in the coding and signalling of messages (Shannon, 1948;

¹⁷⁹ The German text, posthumously published in 1950, is available at <http://oopen.org/pub-109001>; this first publication is based on the lectures that Husserl gave at the Sorbonne in 1929.

Shannon & Weaver, 1949), and in the study of communication and feedback-control (Wiener, 1948/1985). In the fourth life, information is looked at from a technical and an engineering point of view and this technical breakthrough opens the gates for an unparalleled information flood (Gleick, 2011). By disconnecting the concepts of information and message from their ancient (ontological) and modern (epistemological and subjective) context, Shannon opens new vistas towards an objective, formal and ubiquitous use of information. Within the context of post-modern philosophy this information turn leads to the hope of a transparent society (Vattimo, 1989/1992) and the dismantling of grand narratives and elite truths (Lyotard, 1979/1984).

In 2016, Oxford Dictionaries chose 'post-truth' as term of the year; 'post-truth' refers to "relating to or denoting circumstances in which objective facts are less influential in shaping public opinion than appeals to emotion and personal belief". In a recent publication Yale-historian Timothy Snyder relates a politics of resisting objective and shared facts to conditions for tyranny and the collapse of freedom.

You submit to tyranny when you renounce the difference between what you want to hear and what is actually the case. This renunciation of reality can feel natural and pleasant, but the result is your demise as an individual—and thus the collapse of any political system that depends upon individualism. To abandon facts is to abandon freedom. If nothing is true, then no one can criticize power, because there is no basis upon which to do so. If nothing is true, then all is spectacle. The biggest wallet pays for the most blinding lights. (Snyder, 2017, pp. 65–66)

Snyder (referring to philologist Victor Klemperer) discerns four sequential modes that lead to such a situation:

The first mode is the open hostility to verifiable reality, which takes the form of presenting inventions and lies as if they were facts. [...] The second mode is shamanistic incantation [...] The next mode is magical thinking, or the open embrace of contradiction [...] Accepting untruth of this radical kind requires a blatant abandonment of reason. [...] The final mode is misplaced faith. (Snyder, 2017, pp. 66–67)

This situation where information is omnipresent and easily accessible but at the same time also contested and subject to inflation goes hand in hand with a crisis in the creative imagination of romantic idealism and the postulation of a better world 'out there'. Mankind is confronted with and informed about the realities of everyday life (critical theory, existentialism) and access to a rhizomatic web of interdepending sources and influences leads to the devaluation of the old model based on original contributions and strong narratives. The realms of information and imagination become permeable (in theory at least): on the one hand, scientific and informational thinking is very influential and pervasive but is at the same time relegated to the realm of literature and storytelling by post-modern analysis (Rorty, 1979); artistic imagination and creativity, on the other hand, have difficulties in maintaining their autonomous and superior creative position in an age of mechanical reproduction

(Benjamin, 1935/2003) and become informational in the sense that they always refer to one source or another.

Hereafter, in some more detail the main characteristics of the fourth form of life.

3.4.1 *The informational turn*

Claude E. Shannon (1916-2001), a Bell Laboratory scientist, and co-author Warren Weaver (1894-1978) are considered to be the godfathers of the informational turn (Gleick, 2011, chapter 8). They develop and disseminate a mathematically based theory of communication that serves as a model for the understanding and optimization of signal-communication and use probability theory to construe a method for determining the optimal number of binary-coded signs needed to send any given signal. A reformulation of 'information' is at the core of the enterprise: "information must not be confused with meaning", Weaver says, "information in communication theory relates not so much to what you *do* say, as to what you *could* say" (Shannon & Weaver, 1949, pp. 4–5). In the seminal papers by Shannon and Weaver (Shannon, 1948; Shannon & Weaver, 1949) the notion of a 'bit' or 'binary digit' is introduced as the smallest unit for measuring information and is primarily associated with a two-choice situation which has unit information (Shannon & Weaver, 1949, p. 5).

Hereafter, a nutshell-summary of their argument:

- The amount of information is defined, in the simplest cases, to be measured by the logarithm of the number of available choices. (When $m^x=y$ then x is said to be the logarithm of y to the base m).
- Shannon and Weaver consider it 'convenient' to opt for 2 as a base, which implies that the information, when there are only two choices, is proportional to the logarithm of 2 to the base 2. A two-choice situation is characterized by information of unity.
- This unit of information is called a 'bit' (a condensation of 'binary digit').
- When numbers are expressed in the binary system there are only two digits. Zero and one may be taken symbolically to represent any two choices, as noted above; so that 'binary digit' or 'bit' is logically associated with the two-choice situation which has unit information. One bit of information is the amount of information that we need to make a decision between two equally likely alternatives. Two bits of information enable us to decide among four equally likely alternatives... and so on (Miller, 1956, p. 344).
- An example: If one has available 16 alternative messages among which to be equally free to choose from, then since $16=2^4$ so that $\log_2 16=4$, one says that this situation is characterized by 4 bits of information.

By means of this quantification, a bridge is built between information and uncertainty; between information and entropy (disorder); between information and chaos (Gleick, 2011, p. 16); and finally also between information and freedom:

Information, in communication theory, is associated with the amount of freedom of choice we have in constructing messages. Thus for a communication source one can say, just as one would also say it of a thermodynamic ensemble, 'this situation is highly organized, it is not characterized by a large degree of randomness or of choice—that is to say, the information (or the entropy) is low'. (Shannon & Weaver, 1949, p. 7)

Greater freedom of choice, greater uncertainty, and more information go hand in hand.

The quantification has another, hidden, mind-setting aspect: the use of a *bit* as the measure of information and the choice for a binary system in which questions are entitled to a 'yes-' or 'no-' answer is an element that sets in motion a vision on information as something to act upon in a very determinate manner. If technical actions are coded in yes-no decisions, then this certainly influences human thinking which controls these actions¹⁸⁰.

With this view on information, Shannon and Weaver develop a universal communication model, or better a model of signal transmission, where information is linked to the notion of 'source'. An information source produces "a message or sequence of messages to be communicated to the receiving terminal" (Shannon, 1948, p. 2). (see Fig. 3.1)

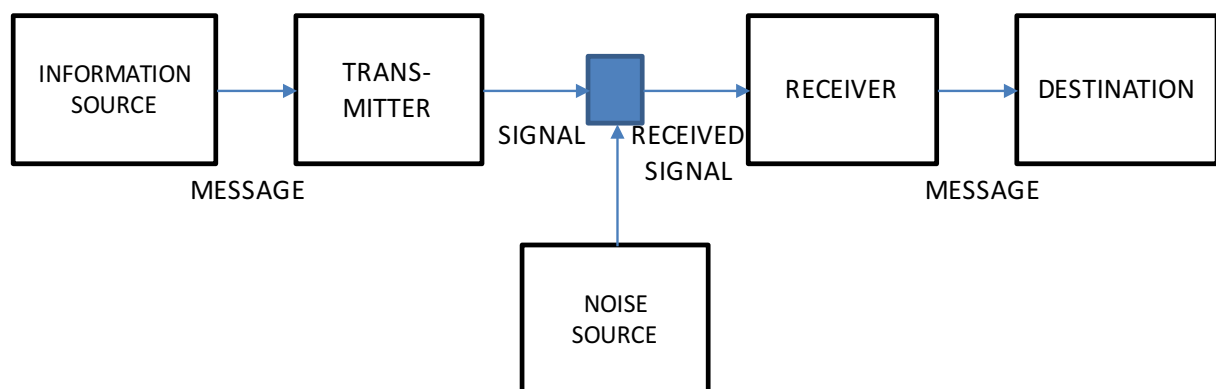


Figure 3.1. The Shannon-Weaver model of communication.

¹⁸⁰ "Und so wie die technisierbaren Handlungen in technisch vollziehbare Ja-Nein-Entscheidungen aufgelöst werden können, so wird das Wissen, das diese Handlungen steuert, durch den oder unter dem Informationsbegriff aufgelöst in die Ja-Nein-Entscheidungen, die der Verstand zu treffen vermag" (Weizsäcker, 1973, p. 14).

Almost simultaneously with Shannon and Weaver, the American mathematician Norbert Wiener (1894-1964), advances a statistically based theory about control systems and communications. His theory is initially linked to trajectory-studies of artillery shells but his investigations are also strongly imbedded in a culture of transdisciplinary research; he and his co-workers share “the conviction that the most fruitful areas for the growth of the sciences [are] those which had been neglected as a no-man’s land between the various established fields” (Wiener, 1948/1985, p. 9). As far as the transdisciplinary potential is concerned, ‘information’ takes the cake and Wiener employs an understanding of information which amounts to a view in which the unit amount of information is “that which is transmitted as a single decision between equally probable alternatives” (Wiener, 1948/1985, p. 9). To this universal notion of information, Wiener adds the principle of (negative) feedbackloops resulting in a *cybernetics* that is applicable to computing machines, nervous systems, organisms and society at large.

A note on entropy¹⁸¹. ‘Entropy’ has its origins in the physical sciences, in thermodynamics more in particular, and is associated with a situation where it measures the degree of randomness or disorder of the situation and with the tendency of physical systems to become less and less organized, and thus to become more and more perfectly “shuffled” (Shannon & Weaver, 1949, p. 7). Both Shannon and Wiener use the concept of entropy and link it to information but in opposite senses. Shannon & Weaver equal information to entropy: “The quantity which uniquely meets the natural requirements that one sets up for ‘information’ turns out to be exactly that which is known in thermodynamics as entropy” (Shannon & Weaver, 1949, p. 7); Wiener opposes information to entropy : “just as the amount of information in a system is a measure of its degree of organization, so the entropy of a system is a measure of its degree of disorganization; and the one is simply the negative of the other” (Wiener, 1985, p. 11). This difference in views and definitions between Wiener and Shannon is based on their different research topics. Shannon considers information and signals in communication channel as pure data, without any meaning and value; Wiener attaches meaning to these signals by considering their use in control. Shannon’s entropy of signals/data can be seen as potential information, Wiener’s entropy is useful information (at least for the receiving information processing system). These rather technical issues do not concern us directly but indirectly point to an ambivalent relation towards information: information can be a measure of order as well as of disorder, it can provide certainty as well as uncertainty, freedom but also constraint.

¹⁸¹ Jean-Paul Van Bendeghem published an essay entitled *Hamlet en Entropie : De twee culturen, een halve eeuw later. Een pamflettair essay* (Bendegem, 2009) where he examines the difficult communication and relation between the humanities (Hamlet) and the natural sciences (Entropy) and where Hamlet and entropy epitomize the discrepancy between two cultures.

A prosperous career in a vast area of disciplines is already forecasted by the authors who proclaim that their theories can account for “all of the procedures by which one mind may affect another” including “not only written and oral speech, but also music, the pictorial arts, the theatre, the ballet, and in fact all human behaviour” (Shannon & Weaver, 1949, p. 1). And indeed, spin-offs of the quantitative definition of information quickly spread to the field of artificial intelligence, genetics (DNA), physiology (hormones and enzymes as messages), music theory and psychology. It is hypothesised by some (enthusiastic) authors that “all natural systems (matter/energy) are Information Processing Systems (IPSs). Each IPS can receive, store, process and transmit information. Information processing is an essential internal feature of all systems. The universe as a whole may be viewed as a gigantic IPS” (Haefner, 1992, p. 4). It is beyond the scope of this terminological overview to trace the differential approaches to information in all the disciplines that absorbed and validated in one way or another this new view on information¹⁸². It will suffice to say a few words on the latter two disciplines in order to illustrate the wave of interest that was generated by information theory.

In music theory, Leonard B. Meyer (1918-2007) grounds his influential definition of musical meaning in information theory and formulates it as follows: “Musical meaning arises when an antecedent situation, requiring an estimate as to the probable modes of pattern continuation, produces uncertainty as to the temporal-tonal nature of the expected consequent.” (Meyer, 1957, p. 416). Music is thus considered as the communication of information in a framework of probabilities wherein expectations are created (often in a redundant manner).¹⁸³

In psychology, and in experimental and cognitive psychology in particular, the terms information and the information-processing become central concepts shortly after the Shannon & Weaver publications. In the mid-twentieth century, cognitive psychology overcomes the decades-long focus on conditioned, externally observable behaviour and turns the focus on innate mental capacities and thought processes.

The term ‘cognition’ refers to all the processes by which the sensory input is transformed, reduced, elaborated, stored, recovered, and used. (Neisser, 1967/2014, p. 4)

Within the structural pattern of information processing¹⁸⁴, which involves topics such as attention, perception, learning, memory (short-term, working, long-term memory), problem solving, decision

¹⁸² See Capurro & Hjørland (2003).

¹⁸³ See also: Narmour’s implication-realization model (Narmour, 1990) and Huron’s psychology of expectation (Huron, 2006).

¹⁸⁴ This is unlike dynamic psychology which takes subject’s goals, needs, or instincts as initiating elements.

making, action, and language, information is the first domino to drop in the course of these transformations. Inspired by the advances in computer programming, cognitive models usually contain:

1/ a control system consisting of a number of memories, which contain symbolized information and are interconnected by various ordering relations. [...] 2/ a number of primitive information processes, which operate on the information in the memories. [...] 3/ a perfectly definite set of rules for combining these processes into whole programs of processing. (Newell, Shaw, & Simon, 1958, p. 151)

In *The magical number seven, plus or minus two: some limits on our capacity for processing information* (Miller, 1956), psychologist George A. Miller equals the 'amount of information' to 'variance', a term more familiar in the realm of statistics and probability where it measures how far a set of (random) numbers are spread out from their mean. In technical terms and via experimental methods, he anticipates the reality of information overload by drawing two conclusions:

1. the span of absolute judgment¹⁸⁵ and the span of immediate memory impose severe limitations on the amount of information that we are able to receive, process, and remember.
2. Second, the process of recoding is a very important one in human psychology, in particular, the kind of linguistic recoding that people do. Recoding is the technical term for 'chunking', the grouping or organizing of the input sequence into units or chunks, whereby within the limits of human information processing capacity, the number of bits is increased by building larger and larger chunks, each chunk containing more information than before.

Psychologist Donald Broadbent (1926-1993) contributes to the study of information by adding filters to the process. Aiming at modelling certain aspects of selective listening, Broadbent's filter theory (Broadbent, 1958, pp. 297–299) asserts a cybernetic system whereby information first reaches a short term store via the senses, is then selectively filtered before flowing into a system that he calls a limited capacity stage of perception (P-system).

In *Cognitive Psychology* (1967/2014), Ulric Neisser (1928-2012) captures the central tenets of the new psychological paradigm but also addresses the flaws of the information-process perspective.

¹⁸⁵ In experiments on absolute judgment, the observer is considered to be a communication channel and the aim is to measure the relation between input and transmitted information. The experimental problem is to increase the amount of input information and to measure the amount of transmitted information as judged by the observer.

Information, in the sense first clearly defined by Shannon (1948), is essentially choice, the narrowing down of alternatives. [...] I do not believe, however, that this approach was or is a fruitful one [in the field of psychology]. We shall see throughout this book that human beings behave very differently, and are by no means neutral or passive toward the incoming information. Instead, they select some parts for attention at the expense of others, recoding and reformulating them in complex ways. (Neisser, 1967/2014, p. 7)

By explicitly pointing out the active character of information selection where sensory systems do not just present information to the higher mental functions but are also capable to focus on particular aspects of the external world, Neisser anticipates ecological psychologist James J. Gibson's (1904-1979) theory of information pickup. Gibson advances the idea that observers sample information from the outside visual world using an active perceptual system rather than passively receiving unprocessed input through their senses. According to Gibson, information is an inherent feature of the world, and humans and animals are attuned to pick up 'invariant' information via 'direct perception'. With Gibson and the school of ecological psychology, form and information are relegated to the environment (see Plato, Aristotle) and information departs from its familiar dictionary meaning of knowledge communicated to a receiver: "the assumption that information can be transmitted and the assumption that it can be stored are appropriate for the theory of communication, not for the theory of perception." (Gibson, 1979/2015, p. 231). In the appendix of his monograph he clarifies by noting that "information is provided by sound-fields, by odour-fields, and above all by illumination. Information, in this terminology, is not transmitted but is simply available" (Gibson, 1979/2015, p. 294).

The informational turn opens also new perspectives for philosophy. In *La Condition Postmoderne: Rapport sur le Savoir* (1979), philosopher Jean-François Lyotard (1924-1998) proposes a new way of learning, one that is not based on *Bildung* and the transmission of knowledge, but rather on the development of information literacy skills. The following fragment is remarkable, and therefore quoted at length, since it includes performativity, information and imagination.

Didactics does not simply consist in the transmission of information; and competence [...] does not simply reduce to having a good memory for data or having easy access to a computer. [...] what is of utmost importance is the capacity to actualize the relevant data for solving a problem "here and now," and to organize that data into an efficient strategy. As long as the game is not a game of perfect information, the advantage will be with the player who has knowledge and can obtain information. By definition, this is the case with a student in a learning situation. But in games of perfect information, the best performativity cannot consist in obtaining additional information in this way. It comes rather from arranging the data in a new way, which is what constitutes a "move" properly speaking. This new arrangement is usually achieved by connecting together series of data that were previously held to be independent. This capacity to articulate what used to be separate can be called imagination [*On peut appeler imagination cette capacité d'articuler ensemble ce qui ne l'était pas*]. [...] It is possible to conceive the world of postmodern knowledge as governed by a game of perfect

information, in the sense that the data is in principle accessible to any expert: there is no scientific secret. Given equal competence, what extra performativity depends on in the final analysis is "imagination," which allows one either to make a new move or change the rules of the game. (Lyotard, 1979, p. 85, 1984, pp. 51–52)

In this passus, written in 1979, Lyotard suggests a new way of learning, one that cuts through all terrains disciplinary knowledge and includes objective information and creative imagination in function of performativity which, in Lyotard, very pragmatically means “the best possible input/output equation” (Lyotard, 1979/1984, p. 46). Lyotard’s notion of perfect information [*information complète*] is the weak link in his analysis. Perfect information with regard to all there is to know is at best a utopian idea¹⁸⁶. Nevertheless, with this perspective on a transconceptual cooperation between information and imagination, a new, productive phase in the dialectic between the two fields is reached; one that overturns the disbalanced positions in antiquity and the 19th century, and sees pragmatic, down to earth opportunities and alliances.

3.4.2 Definitions for an IT- generation

The proliferation of knowledge and omnipresence of information positions information at the centre of society in the 20th century (see chapter 6 on the Information Age). Although Shannon & Weaver’s deracinated definition is not always embraced, it nevertheless marks the beginning of a heightened awareness with regard to information: new theories and approaches crop up with a view to summarize, categorize and structure the state of information in this fourth form of life. Below five innovative perspectives are briefly presented (see also Bates, 2010).

3.4.2.1 Making a difference...

Within a cluster of definitions that approach information from a signalling point of view, anthropologist Gregory Bateson (1904-1980) famously advances the idea that “information is a difference that makes a difference” (Bateson, 1987, p. 321). Bateson revisits the word ‘idea’ and suggests that, in its most elementary sense, ‘idea’ is synonymous with ‘difference’. Kant’s *first Critique* is taken as a point of departure to account for the seminal aphorism:

The *Ding an sich*, the piece of chalk [for instance], can never enter into communication or mental process because of this infinitude. The sensory receptors cannot accept it; they filter it out. What they do is to select certain facts out of the piece of chalk, which then become, in modern terminology, information. I suggest that Kant’s statement can be modified to say that there is an infinite number of differences around and within the piece of chalk. [...] Of this infinitude, we select a very limited number, which become information. In fact, what we mean by information—the elementary unit of information—is a difference which makes a difference,

¹⁸⁶ At the end of this chapter and throughout the dissertation it will be argued that the coexistence of *Bildung* and information is advantageous and even necessary because of their mutual incompleteness.

and it is able to make a difference because the neural pathways along which it travels and is continually transformed are themselves provided with energy. The pathways are ready to be triggered. We may even say that the question is already implicit in them. (Bateson, 1987, p. 321)

Bateson's eight eight-words approach is rooted in the mathematical idea of the single difference as the elementary unit of amount of information, the single bit, the zero or one; then again, the definition also requires the presence of a sensing being who is potentially responsive and attuned to these differences. Thus, whereas the objective, observer- and situation-independent view on information proclaims that 'any difference is information', Bateson's perspective is subjective in that information has to make a difference to somebody or someone: "what is information for one person in one situation needs not be information for another person or in another situation" (Hjørland, 2007, p. 1449). Bateson's point of view is validated in information scientist Donald Case's standard reference-work *Looking for Information*, which recently saw its fourth edition (Case & Given, 2016): "unless otherwise stipulated, in this book 'information' will be taken to mean any difference that makes a difference to a conscious, human mind. In other words, information is whatever appears significant to a human being, whether originating from an external environment or a (psychologically) internal world" (Case & Given, 2016, p. 56).

3.4.2.2 Informing an Image...

The approaches sometimes referred to as activity-based (Bates, 2010a), are implicitly or explicitly indebted to interdisciplinary philosopher Kenneth E. Boulding's concept of 'the Image' (Boulding, 1961). According to Boulding (1910-1993), each individual holds a personal world-view with regard to the things that surround him and it is exactly this mental construction, this 'Image'¹⁸⁷, which is affected by an act of information, delivered by a signal defined as "a non-random event set in the middle of a succession of random events (noise)" (Boulding, 1955, p. 104). Prior to using 'the Image' as a central target-domain Boulding speaks more generally of 'Knowledge' (Boulding, 1955) but in the ensuing monograph (Boulding, 1961), he intentionally changes the vocabulary: "knowledge has an implication of validity, of truth. What I am talking about is what I believe to be true; my subjective knowledge. It is this Image that largely governs my behaviour" (Boulding, 1961, pp. 5–6). Boulding's view on the relation between information and knowledge/Image is quoted hereafter because of the clearness of thought and argument and because his distinctions will be revisited when discussing the relation between information and knowledge (see 2.2.5.3).

We cannot regard knowledge as simply the accumulation of information in a stockpile, even though all messages that are received by the brain may leave some sort of deposit there.

¹⁸⁷ For the remainder of this text 'Image' will be capitalized when it refers to Boulding's conception of it.

Knowledge must itself be regarded as a structure [...] Messages are continually shot into this structure; some of them pass right through its interstices (in at one ear and out the other) without effecting any perceptible change in it. Sometimes messages 'stick' to the structure and become part of it. [...] There is, however, another possible impact of messages on knowledge which might be called 'reorganization'. Occasionally a message does not merely stick to the structure, but hits some 'nucleus' that knocks the props out of a large area of the structure and effects a very radical reorganization of the mental structure itself. [...] In this way a very small 'cause' can produce very large 'effects' if the conditions are right. (Boulding, 1955, pp. 103–104)

Piaget's notion of 'accommodation', Bateson's 'difference', and definitions of information such as "that which is capable of transforming structure" (Belkin & Robertson, 1976, p. 198), or "that which does logical work on the organism's orientation"¹⁸⁸ (MacKay, 1969, p. 96) are all on par with Boulding's Image-centred approach. In *Information of the Image* (Pratt, 1977, 1998), library and information scientist Allan Pratt resonates with Boulding's view but adds the notion of freedom. Frustrated with the deterministic and scientific premises that dominate information science, Pratt takes the hypothesis that man is free as a point of departure for discussing the communication- and information-process:

If man is free, he must be free to make decisions. To make decisions requires an antecedent value structure. Otherwise there is no basis on which to decide that alternative A is preferable to alternative B. The origin of this value structure, a scale of the "goodness" or "badness" of things, is clearly not wholly genetic. It is at least partially determined by the environment in which man exists. (Pratt, 1977, pp. 207–208)

In order to safeguard freedom and undermine a direct influence of environment on action, Pratt positions an entity between stimulus and action: Boulding's Image.

My Image of the world, and my relationships to it, which includes my perception of cause and effect, of time, of space, of values, of everything which impinges on my consciousness, is different from yours, and from that of every other person in the world. [...] All portions of one's Image would remain private evermore if it were not possible for one person to communicate with another, to attempt to share some portion of one's Image with another. But if I do communicate with you, I affect your Image in some manner. [...] the purpose of communication is to affect another's Image. To communicate with someone is to change his Image; to alter it; to affect it. (Pratt, 1977, p. 208)

Pratt equals the meaning of a message with the change it causes in the Image and therefore refers to the archaic meaning of *informare* ('giving form to'). He draws an analogy between information and an explosion, they both occur at some unique point in time and space, to some particular individual and cause a change/difference (Pratt, 1977, p. 215). With the metaphor of an explosion in mind, Pratt

¹⁸⁸ MacKay advances an ecological perspective on behaviour, one in which the organism is viewed as a system with a certain repertoire of basic acts (both internal and external) that in various combinations and sequences make up its behaviour and is in relation to the environment based on a matrix of probabilities. MacKay speaks about 'the impact of information on the organism' (MacKay, 1969, p. 95).

identifies different three forms of impact: 1/ the 'explosion' may have no impact whatever; 2/ it may make an incremental change by adding a new fact or a new 'coloration' to the Image; and 3/ it may cause no change because the recipient's Image is not structured in a way that it can relate to the message (even though it is in a language with which he is familiar). "A message must have some recognizable connection with a part of one's Image, beyond being in a familiar language, before it can be 'understood'" (Pratt, 1977, p. 210).

Among the more recent contributions congruent with Boulding's seminal insights, information expert Andrew Madden's effect-oriented and stimulus-response approach to information is worth mentioning. In his view information should be defined as "a stimulus originating in one system that affects the interpretation by another system¹⁸⁹ of either the second system's relationship to the first or of the relationship the two systems share with a given environment" (Madden, 2000, p. 348). In other words: information is "a stimulus which expands or amends the World View of the informed" (Madden, 2004, p. 9).

In the context of sketching the contours of 'information behaviour', information scientist Marcia Bates advances an inclusive definition of information that is broader than "the generally understood sense of information as being factual, statistical, and/or procedural" (Bates, 2010b) and comes close to the approaches by both Boulding and Pratt.

The term [information] is generally assumed to cover all instances where people interact with their environment in any such way that leaves some impression on them—that is, adds or changes their knowledge store. These impressions can include the emotional changes that result from reading a novel, or learning that one's friend is ill. These changes can also reflect complex interactions where information combines with pre-existing knowledge to make new understandings, or enables the individual to deduce or induce new thoughts and ideas." (Bates, 2010b)

3.4.2.3 Information in a social context

In the humanities, 'information' is dismissed as a specifically technological and heartless concept and a concern about information social and cultural embeddedness is raised. Library and information scientist Ian Cornelius' *information and interpretation* (Cornelius, 1996) is an instance of this hermeneutic take on information. For Cornelius information is socially constructed within a set of practices; a practice being a "coherent set of actions and beliefs which we conform to along with the other people in our practice (whatever it may be, profession or game), and it has its own internal logic and ethic" (Cornelius, 1996, p. 15). In such a view information is not an objective independent entity

¹⁸⁹ A system may be a mechanism, an organism, a community, or an organisation.

that pertains to the real world; it is rather a human artefact, constructed and reconstructed within a particular situation of social practices. In a number of recent publications (Gorman & Gorman, 2017; Mercier & Sperber, 2017; Sloman & Fernbach, 2017) the social perspective has been further developed to account for the many situations in which sound and objective facts do not change our minds and to understand phenomena such as confirmation bias and the persistence of beliefs and opinions both in a personal and practice context (Kolbert, 2017). Rather than a crucial factor in truth finding and solving logical problems, the principle role for reasoning and information processing might be that it does help us to justify our beliefs and actions to others, that it protects and strengthens the beliefs of a social and cooperative group.

3.4.2.4 *Multi-type perspectives*

The multi-type approaches to information are often, implicitly or explicitly, inspired by Popper's notion of two kinds of knowledge where subjective knowledge consists of our internal dispositions, and objective knowledge refers to the logical content of our theories published in books and stored in libraries. Popper relates the two kinds of knowledges to three worlds: 'World I' is the physical world, 'World II' the realm of our conscious experiences, and 'World III' the world of the logical contents of books, libraries, and computer memories¹⁹⁰. Popper's main thesis is that our conscious subjective knowledge (World II knowledge) depends very largely upon World III theories, on our theories about concepts such as body, time and existence¹⁹¹. Within this tradition of subdividing, communication specialist Brenda Dervin presents a three-fold approach to information¹⁹²: 'Information₁' is objective information and refers to external reality; 'Information₂' equals subjective information and represents the internal reality of humans (Dervin, 1977, p. 22); finally, 'Information₃' relates to the set of behavioural techniques that people have to make a reconciliation between internal and external world (see also Donohew & Tipton, 1973)¹⁹³.

¹⁹⁰ In his contribution to the Tanner lectures, Popper explicitly situates scores, performances and recordings in world III: "A symphony may be embodied or physically realized in many different ways. There is the composer's manuscript; there are the printed scores; there are the actual performances; and there are the recordings of these performances, in the physical shape of discs, or of tapes. But there are also the memory engrams in the brains of some musicians: these too are embodiments, and they are particularly important. One can, if one wishes, say that the world 3 objects themselves are abstract objects, and that their physical embodiments or realizations are concrete objects" (Popper, 1978).

¹⁹¹ Popper claims further that "animals, although capable of feelings, sensations, memory, and thus of consciousness, do not possess the full consciousness of self which is one of the results of human language and the development of the specifically human world 3" (Popper, 1978). This view on the interplay between theory and reflective practice will be revisited in Part III.

¹⁹² Popper is not explicitly mentioned in the article.

¹⁹³ Donohew & Tipton contend that "an individual's 'image of reality' is divided into three parts. First are the goals, beliefs, and knowledges which an individual has compiled as a result of his lifetime of experiences. [...] The second part of an individual's image or reality is the concept of self. This includes an evaluation of his ability to cope with various situations [...] The third part of the image of reality is an information-handling 'set' developed

3.4.2.5 Deconstructionist views

A final category of commentators on information presented in this section clearly counterbalances the enthusiasm and optimism with regard to information and questions its overpowering importance. In *The Modern Invention of Information* (Day, 2001), library and information scientist Ronald Day develops a critique on information by claiming that the value that has been attached to information is an attempt to arrive at a privileged, even totalitarian form of knowledge and discourse.

The world of information that we are given by foundational texts and traditions of information in the twentieth century is a deeply troubling and problematic one. It is troubling because of its seeming naturalness and common sensibility and because of the ease of its predications for an information age of the present and the future. It is problematic because its claims are far too simplistic and reductionistic of the complexities of sense, knowledge, and agency in the world and because a careful examination of its own claims and foundational models reveals vast and deep exclusions and contradictions. (Day, 2001, p. 117)

What we find here in Day's concerns is in fact a plea for the re-entrance of imagination as critical counterbalance to the dominating power of information.

3.4.3 *A comparative perspective: Data, Information, Knowledge and Wisdom*

T.S. Eliot (the Rock 1934)

O perpetual revolution of configured stars,
O perpetual recurrence of determined seasons,
O world of spring and autumn, birth and dying!
The endless cycle of idea and action,
Endless invention, endless experiment,
Brings knowledge of motion, but not of stillness;
Knowledge of speech, but not of silence;
Knowledge of words, and ignorance of The Word.
All our knowledge brings us nearer to our ignorance,
All our ignorance brings us nearer to death,
But nearness to death no nearer to God.
Where is the Life we have lost in living?
Where is the wisdom we have lost in knowledge?
Where is the knowledge we have lost in information?
The cycles of Heaven in twenty centuries
Brings us farther from God and nearer to the Dust.

out of past experiences. The 'set' probably controls the selection of information used by the individual to cope with the environment. Here we are talking about an individual's information-seeking and processing 'styles'" (Donohew & Tipton, 1973, pp. 246–247, cited in Case & Given, 2016, p.63)?

T.S. Eliot's poetic analysis of the state of information, knowledge and wisdom in the first half of the twentieth century can be seen as a prelude to a systemic and hierarchical perspective on various types of intelligence that surfaces near the end of that century. The data–information–knowledge–wisdom [DIKW] hierarchy is not so much rooted in philosophy or communication-theory but constitutes a practical and common-sense model that enlightens the relational status of the elements within information and knowledge-systems (see Fig. 3.2). The central relation, the one between information and knowledge, is already present in Boulding's framework (Boulding, 1955) where it is claimed that knowledge should not be considered to be the simple accumulation of information, but rather as a structure with its parts connected in various ways.

The DIKW-pyramid (Ackoff, 1989) is a further extension of this primary information-knowledge nucleus and the sequence is based on the assumption that the categories within it move from the least to the most integrated form; thereby data is the rawest component, and wisdom the most rarefied and exclusive one. Information scientist Chun Wei Choo (2006) adds a 'signal' to the sequence as the most basic element and proposes that the transformation from information to knowledge (wisdom is not included in his model) is the result of two complementary processes: "the 'structuring' of data and information that imposes or reveals order and pattern" and "the human 'acting' on data and information that attributes sense and salience" (Choo, 2006, p. 131). Below, the main elements of the structure are defined (see Fig. 3.2 for an overview).

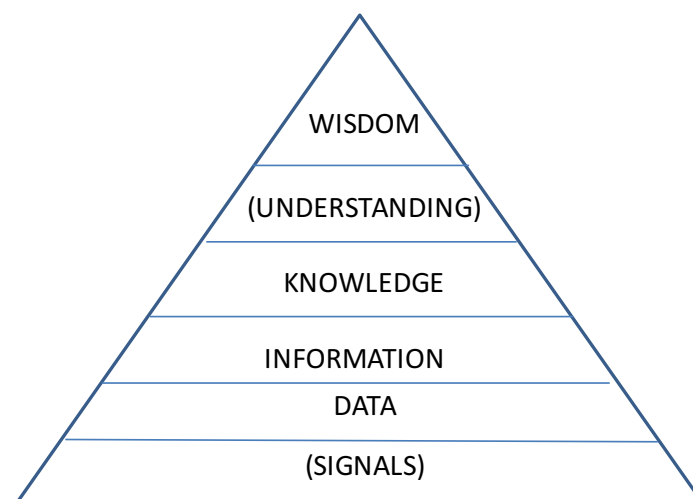


Figure 3.2. The (extended) DIKW-pyramid.

Boulding, amongst others, uses the term 'signal' to characterize the most basic element in the build-up to knowledge and wisdom and defines it as "a non-random event set in the middle of a succession of random events (noise)" (Boulding, 1955). He also points to the problem of distinguishing between

signals and random events. Choo defines signals as the “sights, sounds, and other sensory phenomena to which the human actor is exposed” (Choo, 2006, p. 132). Signals represent our elementary connection to the world.

From the vast amount of signals reaching a person, only a small number is selected or noticed. This noticing typically involves grouping or delimiting signals into packets of ‘data’ (marks on paper become words, pixels become images, and so forth). This first ordering process is conditioned by the material itself but also influenced by the observer’s in-born attention mechanisms, past learning and beliefs about what signals to expect. Data are symbols that represent properties of objects, events and their environments. They are products of observation that have no value until they are processed into a useable and functional form. ‘Metadata’ are usually not listed in DIKW-hierarchies and in a sense occupy uncharted territory in-between objective data and user-oriented information. Metadata emerged as a new element in the last two decades, and focus on the provision of semantic descriptions of a diverse kind to digital resources (Sicilia, 2006). Coupled with infrastructures for knowledge representation (such as ontologies¹⁹⁴), metadata form the basis of a Semantic Web.

Within the DIKW-context, ‘information’ is data that are processed to be useful. Meaning and significance are added to data by means of cognitive structuring and interrelating data so that information can provide answers to ‘who’, ‘what’, ‘where’, and ‘when’ questions. ‘Information as meaningful data’ is an approach put forward by information philosopher Luciano Floridi (2005). Floridi advances two varieties of information according to their semantic content: a red light that is flashing can be considered either as a “piece of factual information, representing the fact that the battery is flat” but also as “a piece of instructional information, conveying the need for a specific action, e.g., the re-charging or replacing of the flat battery” (Floridi, 2016) .

Next in the DIKW-model is the category of ‘knowledge’. Knowledge is generally considered as information that has been organized and understood by a human brain, forming justified, true beliefs about the world. Knowledge originates and is applied in the minds of knowers and also serves as a framework for allowing the evaluation and incorporation of new experiences and information (Davenport & Prusak, 1998, p. 5). The often quoted insight by economist Fritz Machlup (1902-1983) that “information is acquired by being told, whereas knowledge can be acquired by thinking” (quoted in Case & Given, 2016, p. 75) points to the messaging character attributed to information and the autonomous function of knowledge producing. Another eminent ‘knowledge-scholar’, Nico Stehr also points to the transfer-quality of information versus the embodied situatedness of knowledge:

¹⁹⁴ In computer science and information science, an ontology does not fully equal the philosophical meaning of the term. It refers to the a shared and formal representation of a domain or discourse, with a focus on the formal definition of the types, properties, and interrelationships of the entities that pertain to that particular field.

Knowledge, as we define it, constitutes a capacity for action. Knowledge is a model for reality. Knowledge enables an actor, in conjunction with control over the contingent circumstances of action, to set something in motion and to structure reality. Knowledge allows an actor to generate a product or some other outcome. Knowledge is thus knowledge about processes. [...] The function of information, in our view, is both more restricted and more general. Information is something actors have and get. Information is about a product. [...] In its compacted form, information can migrate more easily. [...] For information to be useful there is no need to master the conditions of its implementation, as is the case for knowledge. Information is more general. [...] Information travels and is transmitted with fewer context-sensitive restrictions. Information can be detached from meaning. [...] Information is not as situated as knowledge. (Stehr & Ufer, 2009, pp. 8–9)

DIKW-pioneer Russell L. Ackoff (1989) adds 'understanding' as a category that supersedes knowledge. When memorizing information, useful knowledge is amassed but it does not provide for, in and of itself, an integration that infers further knowledge. 'Understanding' involves the appreciation of why things are as they are. It is the process by which one can take knowledge and synthesize new knowledge from the previously held knowledge.

Finally, 'wisdom' as an ultimate category can be viewed as evaluated understanding; it is the process by which we discern, or judge, between right and wrong, good and bad. "As previously noted, information, knowledge and understanding all focus on efficiency. Wisdom adds value, which requires the mental function we call judgement" (Ackoff, 1989, p. 9). Akin to Kant's notion of genius, Ackoff asserts that wisdom has no logic which can be specified and programmed. An act of judgement is never independent of the actor. Ackoff refers specifically to the field of aesthetics as an example of these unique and personal non-efficiency evaluations.

Although theorists have serious doubts concerning the validity and profoundness of the DIKW-differentiation scale, its common-sense quality has nevertheless inspired policy-makers to apply it in a real-life context. In an influential 2005 UNESCO world-report, entitled *Towards Knowledge Societies*, the distinctions that we just mentioned are readily used and validate the impact of the framework.

A piece of information, "enhanced" though it may be (to eliminate noise or transmission errors, for example), does not necessarily make sense. As long as vast swathes of the global population lack equal opportunity in terms of access to education – in order to master the available information with critical judgement and thinking, and to analyse, sort and incorporate the items they consider most interesting in a knowledge base – information will never be anything but a mass of indistinct data. (UNESCO, 2005, p. 19)

3.4.4 *What about imagination?*

Information's journey in this fourth form of life is related to decisive changes in science, culture and society, but what about its fellow traveller, imagination? Notwithstanding the quote attributed to

Albert Einstein (1879-1955) saying that “imagination is more important than knowledge”, and that “knowledge is limited to all we now know and understand, while imagination embraces the entire world, and all there ever will be to know and understand”, the position of imagination in an age of overwhelming information is precarious. ‘Images’ undergo the consequences of reproduction and availability (Benjamin, 1935/2003), and akin to the fragmentation and specialization of knowledge and information, the authentic imagination possessed by a single genius seems to fall apart in a collage of influences and fragmentary contributions. Imagination is a complex field in the 20th and 21st centuries and it is daunting to extract any unifying thread in the diverse usages of ‘imagination’ that emerge in the history of the term. In the context of our overview we sketch three seminal evolutions which are related to the trajectory of information. The first element concerns the emancipation of the term ‘imagination’ from the realm of visual ‘imagery’; the two other evolutions connect to major trends in the history of the idea of imagination, identified by Kearney as ‘existential’ and ‘parodic’ imagination (Kearney, 1988)¹⁹⁵.

3.4.4.1 Imagination and imagery

In this fourth form of life, imagination seeks to break free from its ties with visual images and imagery. Philosopher Amy Kind (Kind, n.d.) distinguishes between the image-based and non-image theories of imagination and situates the former well before the 20th century (Descartes, Hobbes, Berkeley) and the latter in more contemporary considerations (Ryle, 1949; Scruton, 1982; Walton, 1990). In *the Language of Imagination* (White, 1990), Alan R. White (1922-1992), a philosopher with special interest in the philosophy of mind, regrets the assimilation of imagination and visualization in the history of the concept; he sees no fundamental difference between the imaginative capacities of a theoretical thinker and the ones of the painter. According to White, to “imagine something is to think of it as possibly being so” and “is linked to discovery, invention and originality because it is thought of the possible rather than the actual” (White, 1990, p. 186). It is not the same as merely forming an image, as in imagery.

The evolution of the differentiation between imagery and imagination is also present in the field of psychology. James dedicates chapter XVIII of the *Principles of Psychology* (James, 1890) to ‘imagination’; he unties imagination from visualization and distinguishes between visual and auditory imagination, and the imagination of movement. From a simple word-count, it can be deduced that

¹⁹⁵ In the *Poetics of Imagining* (Kearney, 1998a), Kearney extends the range of imagination-types into: phenomenological (Husserl), ontological (Heidegger), existential (Sartre), poetical (Bachelard), dialectical (Merleau-Ponty), hermeneutical (Ricoeur), Post-modern I – a labyrinth of mirrors - (Lacan, Althusser, Foucault) & Post-modern II – towards a post-modern hermeneutics (Vattimo, Kristeva, Lyotard). For the sake of overview, our discussion will be limited to the two main attractors, with a additional note on the work by Paul Ricoeur (1978; 1955/1977).

James prefers the word imagination over imagery (without making clear distinctions however). After James, the behaviourist school of psychology shows little interest in vague concepts such as imagination but in Neisser's *Cognitive Psychology* (Neisser, 1967/2014), a clear distinction between imagination and imagery is made: 'imagery' is considered to be a factor that can be studied and controlled (it is used 122 times in the book) whereas imagination has a more generic meaning (with only 5 hits in the book). In an anecdotal section on the effect of mind-expanding drugs, Neisser refers to a testimony by writer and novelist Aldous Huxley (1894-1963) who seemed to be disappointed on the effect of hallucinogenics and reports to have seen only very few images during the experiment. Neisser comment is technical: "If he [Huxley] lacked imagery, he did not lack imagination" (Neisser, 1967/2014, p. 155), referring to the flowery language used by Huxley to verbalize his experience. Neisser's use of vocabulary implies that imagination is term that pertains to the arts and poetics, and that imagery is a technical term that relates to develop mental images without the presence of an external stimulus.

In spite of the attempts to settle the semantic confusion, the *Dictionary of Psychology* (Colman, 2014) is still very nuanced, and unclear in differentiating between the two categories.

- 'imagination': 1. The act or process of imagery, especially of generating mental images of stimuli that are not being or have never been experienced in perception; more generally creative ability or resourcefulness. 2. In approaches to literary criticism: a creative joining of active and passive perceptual elements that imposes unity on poetic material;
- 'imagery': The act or process of forming mental images without stimulation of sense organs, or the mental images formed by memory and imagination, including not only visual images but also images from the other senses, such as hearing, taste, smell, and touch.

A consequence of this state of confusion, is that every volume on imagination and imagery, has to include a chapter on terminology. In *Musical Imaginations* (Hargreaves, Miell, & MacDonald, 2012), the editors declare: "musical imagery is the recreation of sounds in the mind when no audible sounds are present, and it differs from musical imagination in that the latter involves invention—whereas musical imagination involves the mental creation of new sounds, musical imagery involves the recreation of existing ones" (Hargreaves et al., 2012, p. 4) ; 'musical imaginations' in plural is dedicated to musical creativity and its relations with concepts such musical invention, improvisation, generation, composition, arranging, performance, and listening (Hargreaves et al., 2012, p. 2).

In chapter one of *Musical Imagery* (Schneider & Godøy, 2001), the authors explore the semantic field of 'imagery' in philosophy and psychology and conclude that musical imagery is "a composite or

‘impure’ phenomenon in the sense that comprises many things at the same time” and therefore ideally suited to function at the intersection of musicianship and several scientific disciplines.

3.4.4.2 Existential imagination

Starting in the mid-nineteenth century and lasting until the mid-twentieth century the concept of imagination comes under the influence of phenomenological (Husserl) and existentialist thought (Søren Kierkegaard, Friedrich Nietzsche, Martin Heidegger and Jean-Paul Sartre). The three decisive claims made by phenomenology are that imagining is a productive and intentional act of consciousness, not a mere reproduction of objects in the mind; that imagining cannot be reduced to mediating between body and mind but performs an original synthesis between the sensible and the intelligible; and finally that imagining is not an ornamental side effect but an instrument of innovation. (Kearney, 1998, p. 6). Existentialism builds upon these premises. It shares with romantic idealism the framework of a subjective humanism¹⁹⁶ and holds on to the idea of imagination as a productive power. However, it distances itself from the abstract affirmations and redemptions that transcendental idealism affords and promotes within a context of modern bourgeoisie culture. Existentialism’s focus is on the factual world of the daily struggle for existence rather than on the realisation of freedom, happiness and beauty in a superior and affirmative world of culture.¹⁹⁷

As an exponent of this line of thinking, Jean-Paul Sartre (1905-1980), dedicates two essays to the topic of imagination. The first, published in 1936 is a short introductory work, entitled *Imagination* (Sartre, 1936/2007), which critically overviews the work of previous philosophers and psychologists. The second study, *L’imaginaire* (Sartre, 1940/2004), follows four years later and is subtitled *Psychologie phénoménologique de l’imagination*^{198 199}. Crucial in Sartre’s approach is that he considers the image not to be a thing but rather to constitute an (intentional) act of consciousness²⁰⁰ which provides some kind of ‘intuition’ of the presence of an object without it actually being present (as in perception). Imagination also differs from perception and understanding in that it negates the real world in terms of temporality and spatiality, and presents its intentional object as ‘not being’²⁰¹. By this absolute independence from the objective constraints of the perceptual world, imagination discovers its freedom with regard to the organisation of our experiences and the creation of an existential self. This

¹⁹⁶ *L’Existentialisme est un Humanisme* (Sartre, 1946).

¹⁹⁷ This analysis is analogous with the one that is developed in Critical Theory (Kearney, 1988, pp. 196–201; Marcuse, 1937/2009).

¹⁹⁸ Also published in English as *The Psychology of the Imagination* (Sartre, 2001).

¹⁹⁹ The brief discussion hereafter is based on the consultation of the primary sources and on secondary literature (Abrams, 1953; Kearney, 1988a; Levy, 2014; Perna, 2001; Stokes, 2016).

²⁰⁰ Referring to Brentano’s phenomenological concept of intentionality.

²⁰¹ *L’être et le néant* (Sartre, 1943).

imagining of the world in ways different from its factual condition forms can be acted upon with a view to change. Sartre situates the imaginative and creative potential not in a separate and elevated realm, but in everyday activities and presents the case of reading a novel as an instance of creative activity.

When we are reading a poster or a phrase isolated from its context we simply produce a sign consciousness, a *lexis*. If we are reading a scholarly work, we produce a consciousness in which the intention adheres to the sign at every instant.[...] But if the book is a novel, everything changes: the sphere of objective signification becomes an unreal world. (Sartre 1940/2004, 64)

The reader intends an unreal world and does not merely restore or represent absent objects. When one reads a novel, there is a series of explicit statements describing the characters and events of the story which are provided by the author. But the story is not exhausted by these descriptions. Rather, the author will rely upon the reader to 'fill in' details left out of the explicit descriptions. The author's creative act is only an incomplete and abstract moment in the production of a work.

If the author existed alone he would be able to write as much as he liked; the work as object would never see the light of day and he would either have to put down his pen or despair. But the operation of writing implies that of reading as its dialectical correlative and these two connected acts necessitate two distinct agents. It is the joint effort of author and reader which brings upon the scene that concrete and imaginary object which is the work of the mind. There is no art except for and by others. Reading seems, in fact, to be the synthesis of perception and creation. (Sartre, 1948/1988, pp. 51–52)

Philosopher Paul Ricoeur (1913–2005) is not a representative of the existential school but explicitly critiques and extends Sartre's views on imagination in an article entitled *Sartre and Ryle on the Imagination* (Ricoeur, 1981). In the *Poetics of Imagining* (Kearney, 1998), Kearney labels Ricoeur's views on imagination as 'hermeneutical' but given the topical connection with Sartre, a brief excursus into Ricoeur's views seems to be in place here.²⁰²

According to Ricoeur, the history of Western thought – with the principal exceptions of Aristotle and Kant – is one of the priority of the original over the copy and Ricoeur's project is directed toward the development of productive imagination as opposed to one of reproductive imagination. Within this context, Ricoeur critiques Sartre's perspective on imagination, which is based on the absence and 'not being' of something or someone and is therefore unable to develop a genuine theory of fiction; the absent person or thing in Sartre's illustrations is still and always an analogue of an original. Ricoeur's idea of a radical, productive imagination, however, necessitates a *utopia*, a 'nowhere', a place that, unlike an image, is not determined by an original. The utopia is not only an escape from reality, but it

²⁰² The following paragraph is primarily based on an article by George Taylor (Taylor, 2006) who transcribed Ricoeur's Lectures on imagination, which were delivered at the University of Chicago in the fall of 1975.

has its own ontology and points to a new kind of reality, thereby expanding our sense of reality and reality's possibilities.²⁰³

The imagination has a prospective and explorative function in regard to the inherent possibilities of man. It is, *par excellence*, the instituting and the constituting of what is humanly possible. In imagining his possibilities, man acts as a prophet of his own existence. [...] By changing his imagination, man alters his existence. (Ricoeur, 1955/1977, p. 127)

Notwithstanding the strong claims about the *utopia*, Ricoeur understands that the 'nowhere' cannot be completely uninformed by what has gone before. He argues, against the romantic view on imagination, that his productive imagination is not something irrational, it must be categorial in order to be trans-categorial. To be effective, the productive imagination must transform existing categories; it cannot exist totally outside and separate from them. From this it follows that any transformative fiction must have elements of reproductive imagination, must draw from existing reality sufficiently so that its productive distance is bridgeable (Taylor, 2006, pp. 97–98).

The specific attention to imagination by French authors is not without societal significance. The slogan "*l'imagination au pouvoir*" that characterizes the protest-movement of May '68, explicitly appeals to the power of imagination to deconstruct traditional structures of power and influence and to create a new ontology.

3.4.4.3 Parodic imagination

What is called by Kearney (1998), the 'parodic imagination' further undermines the romantic idea of imagination by calling into question several fundamental tenets of the modern imagination. It is strongly linked to Postmodernism and to a 20th century context in which mechanical reproduction becomes the creator of images, leading to the degeneration of the idea of the modern subject as authentic and creative producer.

The modern subject then, at least in part, has been transformed from an active, creative subject, to a passive subject bombarded by prefabricated images. [...] Talk of authentic expression becomes precarious to the extent the image itself usurps that reality it was intended to represent. Yet since the postmodern imagination is acutely aware of this irony, its paradigm is best described as a labyrinth of mirrors. The image of the labyrinth is meant to convey a mimesis gone wild, a reflection of reflection, a pure reflexivity without origin. This hyperbolic self reflective tendency and intense self-awareness' leads to a wilful self parody. In this sense the postmodern imagination is a parodic imagination. (Scribner, 2001, p. 186)

²⁰³ Ricoeur envisages different domains in which imagination can work its magic. Within the domain of epistemology, the theoretical model provides a new description of reality. In poetics, the metaphor is presented as a means to unfold new dimensions of reality. It helps us go beyond the world of objects and opens a larger pre-objective dimension (Taylor, 2006, p. 97).

The parodic imagination refers back to the premodern paradigm where imagination was tied to the metaphor of a mirror which reflects the light of a metaphysical origin beyond itself (Abrams, 1953). The postmodern paradigm is typified by the metaphor of an interplay between multiple looking glasses which reflect each other interminably and dissolve into self-parody (Kearney, 1988, p. 253). This brings us back to mimesis model, but not full-circle since it is a return that implies a self-parody. The parodic imagination is not concerned with the imitation of pre-existing Forms but is an imitation of an imitation with no original beyond itself (Kearney, 1988a, p. 255).

Philosopher Michel Foucault (1926-1984) provides arguments for the postmodern debunking of the humanist imagination by declaring the 'death of man' implying the dissolution of the philosophy of creative imagination as promoted by modern idealism and existentialism. Literary critic Roland Barthes (1915-1980) considers images as no more than surface signs of an unconscious language and treats the imaginary as a mere myth. He concludes that we no longer know what truth is in a time in which myths of bourgeois humanism have been destroyed and to which the demythologizer cannot return. Deconstruction philosopher Jacques Derrida (1930-2004) explicitly revisits Plato's idea of mimesis in his essay *The Double Session* (Derrida, 1972/1981b). Derrida juxtaposes a short prose work by Stéphane Mallarmé, *Mimique*, to a fragment from Plato's *Philebus* thereby organising an encounter between two long-standing adversaries: philosophy and literature. The former is devoted to the pursuit of an original and authentic truth, the latter forced to use second-hand copies of truth, thereby representing the false, the fictitious and the counterfeit. Derrida's reading locates in *Mimique* the question of mimesis. As we saw earlier, in the traditional, ontological concept, mimesis has been conducive in establishing a pejorative attitude to poetry, literature or the arts because of its reference to a more original presence of reality or truth. In Mallarmé's *Mimique* however, the mime mimes nothing but the mimetic itself, and thus refers to no imitated truth or presence. Here, Derrida observes a play of mimesis which completely explodes the traditional notion of imitation. In *Mimique*, there's a mime which has no original, it is pure mimicry. Derrida comments:

There is no imitation. The mime imitates nothing. And to begin with he does not imitate. There is nothing prior to the writing of his gestures. Nothing is prescribed for him. No present has preceded or supervised the tracing of his writing. His movements form a figure that no speech anticipates or accompanies. They are not linked with logos in any order of consequence [...] We here enter a textual labyrinth panelled with mirrors. (Derrida, 1981b, p. 194)

From the denial of any essence that would distinguish the imaginary from the real, Derrida concludes that imagination becomes an empty and superfluous concept. The opposition between imagination and reality (information) dissolves into the textual play of inescapable indecisiveness. The world

becomes a never-beginning, never-ending inter-referring text. This implies that literature becomes an empty concept:

We can no longer speak of a decidable being of literature, one which might be distinguished from some notion of 'truth' which it is supposed to imitate (as copy) or create (as origin). Literature is both true and false. And following the deconstructive logic of undecidability this also means it is neither true or false. (Kearney, 1988, p. 290)

It seems then as if, at the end of this fourth life, both information in imagination can be characterized by the notion of abundance. In the world of science and scholarship there is an abundance of information looking for an endpoint or end-structure in which all that information can converge.

Thanks to science and technology, access to factual knowledge of all kinds is rising exponentially while dropping in unit cost. It is destined to become global and democratic. Soon it will be available everywhere on television and computer screens. What then? The answer is clear: synthesis. We are drowning in information, while starving for wisdom. The world henceforth will be run by synthesizers, people able to put together the right information at the right time, think critically about it, and make important choices wisely. (Wilson, 1998, p. 294)

In the realm of literature and the arts, the abundant proliferation of images is looking for an origin and its derivative: 'originality'. A glimpse at the future of information offers at least two interesting routes: more information, as in 'big data', where the sheer volume of data interact in ways that automatically lead to the emergence of knowledge, or as Weizsäcker proposes the (re-)involvement of imagination in order to see *das Ganze*. The latter option would confirm the futurist's vision of an 'age of imagination'.

3.4.5 Section summary

Within the context of this fourth life, information's connection with subjectivity and meaning is shattered by Shannon & Weaver's technical understanding of information as an objective quantity. The technological realisations that the mathematical approach to information allows, posits it right at the centre of post-war society. Suddenly, information is everywhere (technology, biology, psychology, music theory, etc.) indicating the overall flexibility and usability of the term. Still, by its linkage to crucial humanistic factors such as freedom, uncertainty, expectation, new definitional approaches are in order.

Activity-based definitions in particular reposition the impact of information by interposing personal knowledge (the image) between information and action; it is the central personal depository or agency that processes and assesses informational elements to which it is exposed either intentionally or unintentionally. This perspective automatically implies a differentiation between knowledge and information: information is 'out there', 'in the cloud', within reach of any individual knower who can

potentially assimilate the information into her/his image of the world or the self and develop it into knowledge. This flexible and information-prone image functions as the pivotal link between information and imagination. Imagination is not the mere reproduction of visual images but the faculty that creates fictional worlds and ontologies that are always and to a certain degree depending on the categories that humans develop in the course of their prehistory in relation to information from the ecological environment. The confrontation with global information on existential problems raises doubt with regard to the role of creating ideal worlds, and next to that, the proliferation of images in an information society leads to a labyrinth of mirrors that undermines the notion of authorship and creation *ex nihilo*.

3.5 Chapter summary and discussion

In this chapter, we aimed at exploring the semantic spectrum of information with a view to contextualize the panoply of intuitive and often *status quo* driven opinions with regard to the role of information in artistic practice; a second objective was to scan the genealogy of information and imagination for insights that can contribute to proposing a conceptual space for an informed performership in the 21st century. We did not opt for a standard dictionary-based approach but for a broad-spectrum history of words and ideas because of our interest in a wider-ranging, memetic²⁰⁴ context of the concept of information and its relation to the field of imagination. The linkage between information and imagination is one that unfortunately has quasi no precedents in studies on the history of ideas, probably because it is a specifically artistic concern. This explains and justifies the attention that we gave it here, in the context of Artistic Research.

In the context of premodern thought, our analysis indicates that Plato's seminal view on the relation of an original to a copy of it, does not go unchallenged. Alternative configurations between information and imagination are available which: 1/ bypass the standard epistemological route via the inclusion of inspiration-affiliated terms such as *enthousiasmos*; 2/ redirect the information process from an ontological level to a psychological, pedagogical and communicative plane; 3/ overturn the hierarchical order by prioritizing an imagined world over a factual one – and thus foreshadow the concept of creative imagination; 4/ adopt a pragmatic/rhetoric approach whereby imagination amplifies and fortifies the communication of knowledge; or 5/ reverse the sequence of direction of information (*s'informer*).

²⁰⁴ 'Memetics' is not to be confused with 'mimetics'. In the theory of memetics, the meme is a replicator of a unit of culture and "just as genes propagate themselves in the gene pool by leaping from body to body via sperms or eggs, so memes propagate themselves in the meme pool by leaping from brain to brain via a process which, in the broad sense, can be called imitation" (Dawkins, 1976/2006, p. 192).

The modern period (from 1600 onwards) is marked by a radical transformation. Following the subjective turn in rationalism and the break-down of phenomenological unity by empiricism, imagination's role can be metaphorically subsumed under the metaphor of a lamp rather than a mirror (Abrams, 1953). Humankind stands as its own source of light, enlightening a chaotic, fragmented and formless world which is in need of organisation and order. The imaginative and creative genius, is said to reach a noumenal realm by using the lamp as a creative, productive tool to come to an original, authentic expression of a second nature.

In the 19th century the balance between the two fields shifts again when imagination and information go their separate ways: information gets more and more linked to transpersonal objectivity whereas imagination plays the card of an intimate subjectivity.

From the twentieth century on, the dividing line between information and imagination wanes and loses its ontological meaning. Both information and imagination deal with a condition of abundant proliferation and while the former concept looks for an integrated and systemic destination and endpoint, the field of Imagination seems to operate in a labyrinth of mirrors and struggles to find an authorial origin.

We can infer a number of insights from the genealogy presented above as far as contextualizing current practices is concerned.

Firstly. The scholarly critiques on the information-imagination compatibility, as formulated in the opening chapter by Weizsäcker (1973), Benjamin (1955/2007), and Kivy (2002), can be traced to very selective and historically contingent understandings of the terms thereby discarding the alternative options and positions: Weizsäcker refers solely to the doctrine of Platonic idealism present in the first life; Benjamin's critique is based on an empiricist model of information that considers information as fact; and Kivy digs up the archaic meaning of information as 'giving form to' in order to dismiss the role of information in the context of music performance.

Secondly. With regard to the use of information in the discourse of musicians (Chapter 2) several memetic influences can be observed such as the role of cybernetica in sensorial feedback, or the influence of Kant's notion of *Nachahmung* in the appraisal of teachers as the main route for forging a connection with genius. Most interesting however is how the central role of the score as a primary source of information can be related to the paradigm-shift that information undergoes in its second form of life and to the development of Western Art Music as an autonomous Art practice.²⁰⁵ Within

²⁰⁵ "The separation of composition from performance and the survival of the products of composition as written texts independent of performances are the two defining features of art, as opposed to popular music. Popular music exists in real time, in performance; its mode of existence might be called a process. Art music exists in this way too, but it also exists as an object that may be independently surveyed, as a written text that is the result of

the epistemic contours of the second life, the focus of musical thought shifts from speculative ideas and the study of antiquity to particular cases of outstanding musicianship that are embodied in a musical work. Writing and enquiring about actual pieces instead of developing a discourse on composition or theories about the scientific or philosophical origins of music can therefore essentially be considered as a form of empiricism with the score as a fact-containing object. From this perspective, and to a certain extent, the score makes all other sources of information superfluous (Weber, 1994, pp. 492–493).

Thirdly. From this large-scale contextual investigation, also a number of non-mutually exclusive, archetypical distinctions within the category of imagination can be inferred; they each relate to a differential appraisal of and focus on certain privileged information sources:

- **Mimetic Performative Imagination:** mimetic imagination is at stake when the score is considered as an exact representation of the ideal world as it is created by the composer. The composer is here a creative agency akin to Plato's demiurge or the Christian God; the performer's imagination is limited to contemplating, re-creating, and acting within the perfectly ordered cosmos. "Conductors, singers, pianists, all virtuosos should know or recall that the first condition that must be fulfilled by anyone who aspires to the imposing title of interpreter, is that he be first of all a flawless executant. The secret of perfection lies above all in his consciousness of the law imposed upon him by the work he is performing" (Stravinsky, 1947, p. 122).
- **Parodic Performative Imagination:** parodic imagination appears in instances when the performer's imagination is informed by a model: the work of peers, master-performers, etc. To a certain extent Historically Informed Performance also pertains to this category since HIP models the imagination on historical performance practices.
- **Creative Performative Imagination:** creative imagination conforms to Danuser's concept of *Aktualizierender Modus* of interpretation. The score has the status of a basic script but the imaginative powers of the performer are the central source of information. This orientation relates to research projects such as *Experiment21* (Orpheus Institute) or the *Centre for Musical Performance as Creative Practice* (Cambridge University). "For performance does not exist in order to present musical works, but rather, musical works exist in order to give performers something to perform" (Small, 1998, p. 8).

composition; that is, it has its own peculiar mode of existence that at least since the fifteenth century has been called a 'work'" (Berger, 2000, p. 118). See also Lydia Goehr (1992).

- Pragmatic Performative Imagination: pragmatic imagination is involved in cases where the primary interest of the performer is in ‘convincing’ an audience by highlighting and rethorically rendering the musical text. In Carl Philipp Emmanuel Bach’s *Versuch über die wahre Art, das Clavier zu spielen* (1753), we find a passus that combines a mimetic and pragmatic imagination: “The keyboard player himself has to sense the same passions as the ones the author felt when composing a new piece. In certain cases, the keyboard player can dispose of many excellent ways to win the hearts of his audience by means of improvised fantasies” [CPE Bach *Versuch* I,3 §13]²⁰⁶.
- Interpretative/Hermeneutical Imagination (Sartre, Ricoeur): a type of imagination that is activated in relation to coded texts and attempts to restore what has been lost in the process of coding.

Next to contextualizing an existing situation, our interest was also in finding perspectives that allow for an actualization and specification with regard to the role of information in a performers’ practice of the 21st century. Four observations stand out here.

Firstly, the compatibility of information and imagination does not fare well in dual-world ontologies in which superiority of a separate, *noumenal* world of forms is asserted over an everyday, phenomenological and informed one. Plato’s worldview downgrades imagination to an important extent in favour of the ideal Forms (see Weizsäcker’s comment); in romantic idealism (and some of its forebears in antiquity), an inverse position is advanced, leading to a separation of science (information) and the arts (imagination) which is from a memetic point of view probably even more influential than the dualism in antiquity. Quasi-inevitably, these two-world settings are in need for alternative and ineffable routes by which artists are granted privileged access to the metaphysical realm either by a top-down process of inspiration and illumination (*enthousiasmos*), or via a bottom-up capacity such as genius, or by a combination of the two (see Kant: genius + *Geist*). The inclusion of privileged access is a quasi-systematic characteristic of dual world views and it relieves artists from the burden of accountability, which is the case in ‘regular’ epistemic processes such as induction or deduction.

Secondly, information seems to always involve a quality that relates to its earliest meanings as ‘the giving of form’ to something (‘first form of life’). In the OED, this definition is labelled with ‘rare’ but already in the introduction we noticed that Kivy uses this archaic meaning to disqualify the notion of

²⁰⁶ Er [der Clavieriste] muß dieselbe Leidenschaften bey sich empfinden, welche der Urheber des fremden Stückes bey dessen Verfertigung hatte. Besonders aber kan der Clavieriste vorzüglich auf allerley Art sich der Gemüther seiner Zuhörer durch Fantasien aus dem Kopfe bemeistern.

<http://www.koelnklavier.de/quellen/versuch/kap1-3.html> consulted November 2016.

an informed musicianship (see 1.1). As such, information as the 'giving of form', is perfectly compatible with having an image of what is to be formed. The problem arises when, in an ontological context, a direct relation between 'form' and materialisation is implied (as in the wax metaphor). In such one-on-one relation there seems to be no space for any intervening capacity (imagination) and the only thing that is left is a post-factum contemplation or copying of a perfect unity. This determinative quality of information can also be detected in the mathematical understanding of information (fourth form of life) where the 'bit' provides only an answer in terms of 'yes' and 'no' without a 'maybe' or a 'perhaps' or 'possibility'. When, however, the archaic meaning of information as 'giving form to' is discussed in a psychological a pedagogical context, it does seem to be conducive to a fruitful and even necessary cooperation with imagination. As the unitary dimension of information decreases, the role of imagination matures in the course of history from a mediating (Aristotle) to a constitutive (Kant) element.

Thirdly, in the twentieth century, activity-based models come to the fore in which the role of information is related to the notion of knowledge. Within such a framework, information's role is not constitutive but rather contributory and allows for freedom and personal development.

Fourthly, the humanist, phenomenological and existentialist traditions contribute to the information-imagination dialectic the notion of 'freedom' as a non-dualist element that counters the determinism of a totally informed world. It is a freedom to operate and to act within an actual world but also one that facilitates the creation of possible worlds.

Finally, if the plurality of terms for imagination mentioned in this chapter – *yetser*, *mimesis*, *phantasia*, *imaginatio*, *Einbildungskraft*, *fantasy*, *fancy*, *imagination* – all seem to refer, in their diverse ways, to the human power to convert absence into presence, actuality into possibility, what-is into something-other-than-it-is (Kearney, 1998b, p. 4), the semantic field that surrounds information points exactly to these starting points of imagination, namely 'actuality' and 'what-is'. It is only when this actuality claims full constitutional status that imagination is suffocated. As Bateson claims, information is not determining but rather 'a difference which makes a difference', information is not the same as subject-related knowledge and unlike knowledge it possesses the quality of being transferrable. Especially in psychological and pedagogical context, information has the potential to make a difference to our image(s) of the world, transform it and by that also potentially influences, more distally, the activities that act upon those images. "Information typically takes the form of discrete and small-sized items that have been removed from their original contexts and made available as 'morsels' ready to be rearticulated" (Blair, 2010).

With these considerations in mind we are at a point to have a first attempt at revisiting our initial question: what could be the semantic contours of information in an artistic setting? If we take Bateson's very inclusive, yet punctual definition of information as a point of departure and specify it

according to activity-based approaches (Bates, 2010b; Boulding, 1955,1961; Pratt, 1977, 1998) we can come to a provisional working definition and a ‘translation’ (Gadamer, 1960/2004, p. 552) that is still very broad in its spectrum and in need of further refinement in the course of our enquiry:

In an artistic context, information constitutes a difference that (potentially) makes a difference with regard to our personal and collective *Image* related to art production and reception, and the actions and imaginations that build upon that *Image*.

Definition 1: Information in an artistic context.

Chapter 4: Information in action – generic perspectives

In the previous chapter, basic terminological spadework led to a historical menu of perspectives and possibilities with regard to the concept of information and its relation to the field of imagination. We discerned several types of information (metaphysical, environmental, intersubjective, biological), and modes of imagination (passive, active, mimetic, pragmatic, parodic, hermeneutical, creative). Next to these terminological groundworks, a psycho-pedagogical and activity-based approach to information (as opposed to an ontological one) surfaced as a promising framework for further defining the contours of an informed musicianship.

A next step in our deliberation towards granting information a considered status in the field of music performance involves zooming in on these functional aspects and the mechanics of information as an activity: how do people (in general) think, search, select and use information? Information, as a historically contingent term, does not favour such a generic approach into universal mental dispositions and behaviour. Within the spectrum of universality- and objectivity-seeking disciplines, cognitive psychology and its offspring ('embodied', 'situated', and 'ecological' psychology) provide probably the most punctual insights and specialised categories to account for the processing of information. However, our interest here is not primarily directed at what happens step by step, once information enters the mind of the user, but is more general in its aims and concerned with the distal causes and necessities that facilitate(d) the development of such capacity. The reason for preferring such an angle is that it allows for transdisciplinary common ground, for a generic, open, biological and pragmatic view on things that can be specified and integrated with the cultural particularities that surfaced in the previous chapters.²⁰⁷ Hereafter, perspectives from evolutionary theory, developmental psychology, and Information Behaviour Research are presented with a view to come to such a bio-cultural dialectic.

4.1 Evolutionary perspectives

Evolutionary theory is an epistemic lens that is intrinsically concerned with the quest for common behavioural grounds and looks far back into the beginnings of human life on planet earth to see how early humans evolved into modern *Homo sapiens* with instinctive socio-cognitive abilities, including an information intelligence (Spink, 2010, p. 3). In *the Study of Information: interdisciplinary messages* (Miller, 1983), cognitive psychologist George A. Miller (1920-2012) coins the term 'informavore' to refer to an innate disposition with regard to information processing:

²⁰⁷ It is a methodology that in the introduction is referred to as 'bio-cultural'.

In *What is Life?* [...], Erwin Schrödinger [points] out that organisms survive by ingesting, not food, not calories, but negative entropy²⁰⁸. It is no accident, of course, that the mathematics of entropy are also the mathematics of information. The analogy is obvious: Just as the body survives by ingesting negative entropy, so the mind survives by ingesting information. In a very general sense, all higher organisms are informavores. (Miller, 1983, p. 111)

Miller's analogy posits that, since a higher organism (such as a human) has a natural tendency to degenerate into a more disordered state, it needs to compensate for that degenerative tendency by ingesting order via a process of information, or negative entropy. Miller does not extend his metaphorical hypothesis but the idea is prolonged by philosopher Daniel Dennett (1991) who situates informavoreness in the 'early days' of the evolution of consciousness and considers it as a tool that favours the 'producing of a future' over simply 'hoping for the best'. According to Dennett, for rudimentary nervous systems it suffices to organize behaviours such as for instance tracking, anticipating, approaching, withdrawing. These activities are appropriate to what is in the immediate future and do not involve objective messages that merely inform in a neutral way about a certain condition, just for the sake of it. Better brains, however, can extract more information and can do it faster; moreover, to avoid noxious contact and to increase the chances of finding nutritious bits, they use approximate laws of the world. One of the primary elements that assists such brains is an orienting response: an organism gives every sense organ an opportunity to contribute to the pool of available and relevant information by stopping what it is doing and by quickly scanning or updating the state of affairs. Once these orienting responses become a habit, regular vigilance turns into a state where regular exploration becomes a new behavioural strategy: a strategy of acquiring information for its own sake. To Dennett, this transition marks a fundamental shift in the economy of organisms: it is the origin of curiosity, or epistemic hunger. Instead of gathering information only on a pay-as-you-go, use-it immediately basis, these creatures transform into informavores: organisms hungry for further information about the world they inhabit (and about themselves). Dennett remarks that, since evolution never 'invents' completely new systems, there is no such thing as 'objective' information; there is always a negative or positive editorial 'spin' involved which refers to the affectual origins of information processing.²⁰⁹

More recently, several authors (Madden, 2004; Spink, 2010) have started to explore the evolutionary origins of human's relation to information. According to information scientist Amanda Spink, information behaviour is a combination of instinctual and biologically evolved behaviour, environment influences, and lifetime development. However, only a few studies are currently available that attempt

²⁰⁸ 'Entropy' is a term which has its origin in thermodynamics, more in particular in its second law where it is stated that there is a natural tendency of any isolated system to degenerate into a more disordered state. In more general terms 'entropy' is a measure of the disorder or randomness in a closed system.

²⁰⁹ Summarized from Dennett (1991, pp. 178–181).

to unravel the role of information in the adaption of organisms to their environments (Madden, 2004; Mithen, 1988; Spink, 2010). Madden's view on information as "a stimulus which expands or amends the World View of the informed" (Madden, 2004, p. 9) has already been related to Boulding's concept of the *Image* in Chapter 3 but Madden's argument is also strongly embedded in an evolutionary framework. In 'Evolution and Information' (Madden, 2004) the author relates the origins of information exchange to a new situation that arose when from the perspective of evolution it became opportune to intentionally communicate information between (potential) sex partners:

One of the consequences of the evolution of different sexes is that often, prospective mates had to evolve means of communication. With that development it became possible for animals to expand their World Views by means other than direct exploration of their environment. (Madden, 2004, p. 16)

Madden asserts here an evolutionary sequential appearance of two sources of information: 1/ direct interaction with the environment as in sensorial and ecological information; and 2/ communication of information among fellow-organisms as in intersubjective information sharing.

More closely related to our domain of interest, is work by anthropologist John E. Pfeiffer (1982; 1983) who claims that art may have played a significant role in the education and development of young members of the Upper Palaeolithic²¹⁰ groups. Music, song and dance helped children to imprint the crucial survival information contained in the myths into their memories; thereby helped by their heightened emotional states. Pfeiffer's idea – which is pragmatic and reminiscent of Cicero's views on imagination (see chapter 3) – is inspired by the fact that after two or more million years of 'sluggish' evolution in the *Homo* line, all of sudden art appeared and one of the most spectacular developments in the human story unfolded from 30,000 to 10,000 years ago. Why did people suddenly go deep into caves "to draw pictures on the walls, equipped with ground-up earth pigments, flint chisels, limestone lamps fuelled by animal fat and, presumably, scaffolding for decorating high walls and ceilings?" (Pfeiffer, 1983, p. 37). Pfeiffer claims that as supreme innovators, *Homo sapiens* was confronted with too much happening too fast, "too much new knowledge flowing in at an unprecedented and accelerating pace, [lead to] nothing less than a full-fledged information explosion [...] the times called for something beyond the traditional methods of passing information on from generation to generation [via observation, imitation, listening]" (Pfeiffer, 1983, p. 38). Since our ancestors were still illiterate, the only way of storing knowledge was to memorize it. Pfeiffer's thesis is that without a

²¹⁰ The Upper Palaeolithic is the third and last subdivision of the Palaeolithic or Old Stone Age. Very broadly, it dates to between 50,000 and 10,000 years ago and coincides with the appearance of behavioural modernity and before the advent of agriculture. *Homo sapiens* are believed to have emerged about 195,000 years ago in Africa. Although these humans were modern in anatomy, their lifestyle changed very little from their contemporaries, such as *Homo erectus* and the Neanderthals; the Upper Palaeolithic is characterized by the appearance of a variety of artefacts in the archaeological record.

technology of writing at one's disposal, information had to be dramatized and connected to emotion for memory's sake. Cave art was the preferred medium by which information-load was addressed until it would be (partly) overruled by the invention of writing²¹¹. Pfeiffer concludes that:

The explosions of information and population which began in the Upper Paleolithic are the same ones which continue to plague us today as we careen toward the 21st century. The Cro-Magnons pioneered in trying to build stable societies out of individuals with a small-band, hunter-gatherer mentality. (Pfeiffer, 1983, p. 45)

Archaeologist Steven Mithen takes up Pfeiffer's thesis in an article where he relates Upper Palaeolithic Art with information gathering (Mithen, 1988). Mithen looks in support of Pfeiffer's view to aspects of the imagery itself; for instance, in the way in which tracks, hoof prints, depict signs of vulnerability or strength. From this, Mithen concludes that Upper Palaeolithic art may be related to the cognitive development of the use of 'search' behaviour rather than the accurate and fixed depiction of reality (as Pfeiffer suggests): "art controls the development of search behaviour and selective attention by specifying which particular aspects of animal behaviour and form should be attended to if relevant information is to be gathered" (Mithen, 1988, p. 322). It is thus proposed that the role of the early art-forms is not to accurately represent reality (see *mimesis* in Plato) but rather to install a pragmatic and informational attitude how to gather that information to then utilise in decision making.

The foregoing examples indicate that investigations into the phylogenetic origins of informational behaviour are still in an early, tentative, hypothetical and exploratory phase but nevertheless show a remarkable intertwining between the fields of information and imagination. If we, in turn, take the scholarship related to the evolution of imagination as a starting-point, a similar relation can be observed.

The behavioural side of imagination is generally hard to come to grips with in a systematic way. Imagination is not observable, it is not a behaviour, it is an operation or action, hidden deep in the mind of the beholder and therefore not a preferred object of investigation for researchers who rather direct their attention to more tangible and testable concepts such as imagery and creativity. Evolutionary theory overcomes these inherent limitations by aiming at providing a functional explanation for imagination in terms of survival value. A number of functional explanations readily come to mind and have been also proposed in scholarly literature (Belsey, 2006, pp. 116–117): 1/ imagination permits humans to arrive at specific, risk-free, satisfactions for our appetites and by that also provides moments of relaxation; 2/ imagination allows us to present creatures and situations that

²¹¹ The fact that art embodies information before the entrance of writing is an interesting point in the context of artistic research and the dialectic between the artistic and written component.

could do harm and admits taking control over the threat; 3/ imagination enables the visualization of unknown places that might be worth the effort of migration; 4/ by imagining we can empathize with fellow-humans which leads to facilitating inter-human cooperation; 5/ imagination allows for improvisation in unforeseen situations and choosing between alternative solutions; 6/ inventing new social skills and technology may rely on imagination; 7/ imagination and narrative link events in a causal sequence and provide instructive- and role models in a society (courage, pair bonding); 8/ imaginative stories provide low-cost, low-risk surrogate experience; and 9/ they can be richly instructive sources of factual information (Dutton, 2009, p. 110). In general, the advantage of imagination seems to reside in its capacity to create (better) alternatives to the world we know.

Opposing these potentially, beneficial aspects, it has also been claimed that evolution would have guarded against a capacity that creates worlds in which the rules of nature and society are broken, as in fantasy. Imagination can lead to isolated solipsism which is inherently maladaptive (Mithen, 2001, p. 51). This initial observations and indications leave us with a cluster of conflicting elements that need some more explaining and contextualising.

A crucial element is to make a distinction between imagery and imagination: “imagery typically comprises a mental representation of a state of affairs in the outside, physical world. [...] Mental images typically have ‘truth relationships’ to the outside world” (Baron-Cohen, 2006, p. 103). Although imagery may be necessary for human imagination, it is not a sufficient condition. In this context, it has been suggested that basic imagery is to be subjected to a transformation before it can be categorized as a product of imagination (Leslie, 1987). The general (logical) framework is one in which a ‘primary’ and ‘truthful’ representation or image of the world is copied into a second-order or meta-representation which then can be manipulated and changed without jeopardizing the important truth relationships that the original representation needs to preserve for reasons of survival.²¹² Here the relation between information and imagery is very prominently present, strengthening the view that their dialectical but inherently linked appearance in human history (see the previous chapter) is but a cultural manifestation of choices and hierarchies within a predetermined biological framework.

As far as the next step, from imagery into imagination is concerned, Mithen discerns in ‘the evolution of imagination’ (Mithen, 2001), four types of human imagination of which the origins are situated at different times in our evolutionary history.

²¹² A recent publication in the field of neuro-psychology supports the assertion of an immediate (biological) link between sensorial information and imagery. Neuroscientist Daniela Dentico et al. (2014) investigated the role of bottom-up and top-down connections during visual perception and the formation of mental images. They thereby assessed the directionality of cortical signal flow during perception of movie clips versus mental replay of the movies and free visual imagery. Their analyses revealed an increased top-down signal flow during mental imagery as compared to visual perception. These results were the first direct demonstration of a reversal of the pre-dominant direction of cortical signal flow during mental imagery as compared to perception.

- Imagination in terms of thinking (perhaps unconsciously) about the consequences of different courses of action in a decision-making process is a very old type of imagination most likely shared by many types of animals. This is a primary form of imagining possible worlds; it concerns worlds that still have a strong correspondence to a real world, otherwise they would not be immediately useful in terms of survival value.
- Imagination as a capacity to think about the contents of other minds probably stretches back to the common ancestor of 5-6 million years ago, and is an essential means of maintaining the complex and large social groups of Early Humans. Humans have a 'theory of mind', an intuitive understanding of their own and other people's minds or mental states, including beliefs and thoughts (Colman, 2014).
- A next step in the evolution of imagination would be the development of imagination in the context of narration. Mithen attributes this capacity to Early Humans and their concerns with transmission of tool-making skills, the planning of big game hunting, and communication about new places and landscapes.²¹³ Gesture and mime may have played a critical role, here, in the absence of language: "If another individual could have simply told what he/she had seen or what was being planned, the Early Human mind may not have required such powers of imagination" (Mithen, 2001, p. 50).
- Imagination as in creating fantasy worlds where the rules of nature and society are broken is, according to Mithen, the most recent form of imagination to have evolved. Because of the danger of creating solipsistic and non-congruent individual worlds and world-images, modern humans, especially those after 50,000 years ago, learned how to overcome those evolutionary constraints by "exploiting material culture, by telling stories, and performing rituals as a means to offload and provide cognitive anchors for ideas that have no natural home within the evolved mind" (Mithen, 2001, p. 51).

It is this last step that leads to works of art and science and makes modern humans far more imaginative than all human ancestors and relatives. Key features of human imaginative behaviour include religious and ritualistic activities, production of paintings and sculpted objects, multi-component tools, and architecture. Moreover, the fact that modern humans create complex mythologies, involving supernatural beings, very early on in their existence (circa 30,000 years ago) demonstrates that they were able to conceive of entities that break the rules of nature, and that do not exist in the physical world but only in fantasy.

How was this evolutionary leap possible in a technical sense? Mithen provides an appealing answer in *The Prehistory of the Mind* (Mithen, 1996) where he asserts that modern humans were able to integrate bodies of knowledge and ways of thinking that had evolved in, and previously been restricted to, quite different and separate cognitive domains. Mithen identifies three such domains: 1/ intuitive psychology (social intelligence)²¹⁴ for managing the complex social world in which hominids lived; 2/

²¹³ Early Humans are to be situated in a period between 1.8 million and 300,000 years ago and were the first of our ancestors to disperse from Africa. Some of the landscapes they eventually occupied were quite different from the African savannah (Mithen, 2001, p. 40).

²¹⁴ The alternative terms between brackets are used in *The Singing Neanderthals* (Mithen, 2005, p. 264).

intuitive biology (natural history intelligence) for understanding animals and plants, the weather and the season, and aspects of the natural world essential for a hunter-gatherer lifestyle; and 3/ intuitive physics (technical intelligence) which enables the complex manipulation of artefacts and especially the production of tools. What *Homo sapiens* added to this multiple intelligences principle is one additional key feature: 'cognitive fluidity' or "the capacity to integrate ways of thinking and store knowledge from separate intelligences so as to create types of thoughts that could never have existed within a domain-specific mind" (Mithen, 2005, pp. 263–264).

Cognitive fluidity evolved as a consequence of language and the capacity for analogy and metaphor: "spoken and imaginary utterances acted as the conduits for ideas and information [own emphasis] to flow from one separate intelligence to another" (Mithen, 2005, pp. 264). In evolutionary terms, cognitive fluidity and the appearance of fantastic imagination means that the rules of nature encoded into the human mind were overridden by a form of mutation allowing new patterns of neural networks in the brains of modern humans. Parts of the brain dealing with specific and isolated knowledge became entwined and led to completely new types of thoughts, behaviours and objects as evidenced by carvings and traces of ritual behaviour. The problem of solipsism in human thinking was overcome by the creation of objects of art, paintings, rituals who arose in support of this mutation. In *the Art Instinct* (2009), philosopher Denis Dutton (1944-2010) seconds the value and the role of art in allowing intersubjective communication and to experience something of another's mind: "the work of art is another human mind incarnate: not in flesh and blood but in sounds, words or colours" (Dutton, 2009, p. 235). They represent not only the products of a new way of thinking, but are also their primary source. We can individually come up with all kinds of fantasies but describing it to fellow-humans or recalling it the next day is not evident, unless these newly forged images are offloaded from the mind in to the physical world.²¹⁵ Offloading these ideas and imaginations from the mind into the physical world by means of pictures or notes alleviate the burden on memory and these public images act as a cognitive anchor that could be recalled, manipulated, and shared. In this regard, the imaginative brains of modern humans may not, in itself, have greater powers of imagination than that of its immediate predecessors (Neanderthals); they simply exploit the world outside of the skull to augment its powers of creative thought (Mithen, 2001, p. 50).

Summarizing this co-evolutionary story of imagination and information behaviour we can come to the framework presented in Fig. 4.1 which also integrates elements from Chapter 3. Humans 1, 2 and 3, all possess individual images of the world and the self; these images are based on an informational

²¹⁵ Mithen contrasts these phantasies with gossiping: "[gossip] is always easy to remember and to pass on. This is because it engages with a part of our evolved psychology- the ideas in gossip are exactly the types of ideas our minds have evolved to deal with" (Mithen, 2001, p. 49).

input that connects them to the physical, biological and cultural world and rely on the passive (Voltaire) or primary (Coleridge) imagination for their ultimate construction. Humans 1,2 and 3 have direct links to each other by sharing certain pre-dispositions (psychology, biology, physics) that allow for the development of a *Theory of Mind*²¹⁶ and for assuming certain shared orientations in life. Some aspects however are idiosyncratic and individually acquired and can only be shared if the active or secondary imagination enters the phase of creation and adds its products (language, stories, theories, art, performance, behaviour) to a phenomenological and perceivable world.

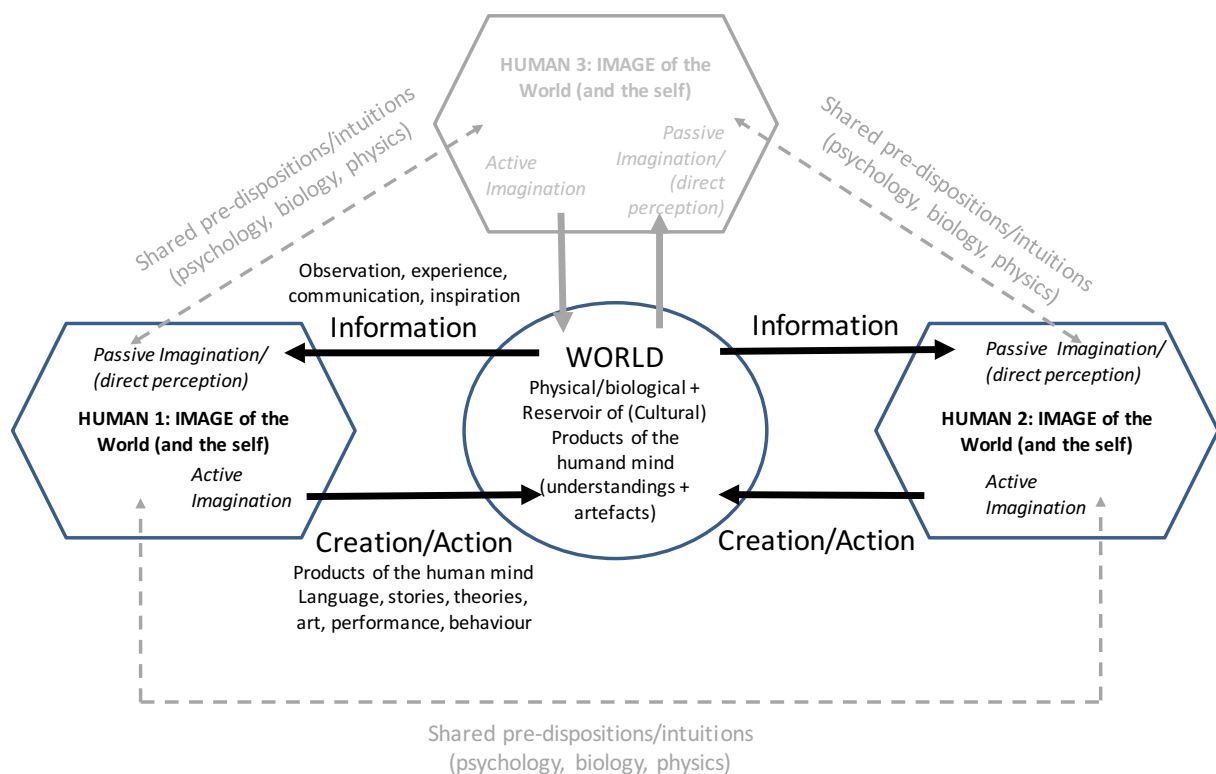


Figure 4.1. The alliance between information and imagination.

We find here an intrinsic alliance between information and imagination akin to the one we observed in the terminological genealogy of the first chapter.

4.2 Two developmental approaches

Developmental (ontogenetic) theories are at times linked to the evolutionary (phylogenetic) approaches by biologist Ernst Haeckel's phrase "ontogeny recapitulates phylogeny"; it is a largely discredited biological hypothesis which holds that the development an animal, from fertilization to gestation, goes through stages resembling successive phases in the ancestral evolution of the animal.

²¹⁶ For a tentative relation between *Theory of Mind* and music see Livingstone & Thompson (2009).

Our aim is not to forge such a link here but rather to focus on two seminal figures in the field of developmental theory and represent and assess their respective views on the information-imagination dialectic.

Freud already illuminated certain developmental aspects with regard to imagination and knowledge and the balance between them (see the previous chapter). He concluded that imagination comes to fruition in adult life when child play starts to receive inhibitory constraints via its link to an inescapable reality (the reality-principle). Psychologists Jean Piaget (1896-1980) and Lev Vygotsky (1886-1934) both offer more in-depth analyses of this developmental balance. Remarkable is that the outcome of their enquiries is to a large extent conflicting with regard to the aspect-ratio between information and imagination (Archambault & Venet, 2007).

According to Piaget the child inhabits from birth an illusory world and gives it meaning via the egocentric pleasure principle; imagination is a tool that overcomes the lack of knowledge that children have with regard to the world that surrounds them (especially between 2-7 years). Eventually, imagination loses its grip at the moment when the child leaves this illusory world for a realistic one and trades the egocentric view for more useful formal and logical thinking. As a temporary tool that does not contribute to an understanding of the real world, imagination is from a Freudian point of view a marginal element of ontogenetic development.

Vygotsky on the other hand situates the young child not in a fictional and egocentric world but in a real, intersubjective one that provides essential elements for the child's primary needs and one that has to be explored by the child in order to become an autonomous, free and creative human being. Vygotsky insists on the capacity of the human being to free itself from the real and to create via imagination something new. Piaget and Vygotsky both acknowledge the existence of rational thinking and imagination, but for Vygotsky a total fusion and integration between the two forms of thinking through an immersion in reality cannot be reached in lifetime. Imagination belongs to the crucial superior mental functions (such as memory, will, verbal thinking) and has the disconnection with reality as one of its crucial preconditions:

Imagination and creativity connected with free processing of elements of experience and with their free combination absolutely require as a precursor the internal freedom of thinking, action, and cognition that can be attained only by one who has already mastered the formation of concepts. Not without reason do imagination and creativity drop to zero with the disturbance of this function. (Vygotsky, 1998, p. 153)

Since imagination and creation are related to reality by recombining elements of experience, a logical consequence is that they become more interesting as the materials acquired by lived experience accumulate and that capacity for creation increases through lifetime.

For a better understanding of the striking opposition between Piaget and Vygotsky on the information-imagination we must go back into the theoretical underpinnings for their points of view.

According to Piaget (Piaget, 1945; 1951), cognitive development occurs through the interaction between the individual and the environment, based on the individual's perception or cognitive (thought-related) construction of the environment. The main emphasis in this interaction lies in the individual's interpretation and understanding of the environment based on his own knowledge and experiences. Piaget thinks that this cognitive development occurs in phases, and that these phases follow a fixed order for all human beings. Cognitive development occurs when the child gradually adapts to the environment (*adaptation*), either by interpreting the situation on the basis of personal knowledge and experiences (*assimilation*) or by absorbing new experiences and reorganizing (changing, adjusting) cognitive opinion (*accommodation*).

Within this framework, new learning occurs because accommodation makes it necessary to change the former categories of understanding – accommodation comes close here to the role of information that we discussed in the context of activity- and Image-based approaches to information. Piaget emphasizes however that assimilation and accommodation are two processes that complement each other and change their inter-intensity in relation to an *equilibrium* principle. Within this generally applicable description of a child's thought development imagination, imitation, play, and intelligence are related to each other (Piaget, 1945/1951, p. x): 1/ genuine intellectual development occurs in a context where assimilation is closely linked to accommodation (in an exchange); 2/ if assimilation gets primacy on accommodation symbolic play and creative imagination are stimulated; and 3/ reproductive imagination and representative imitation are connected to a situation where accommodation is granted primacy over assimilation, hence imitation is when the child practices an action pattern by adapting (or accommodating) him- or herself to an external model. Here the factor of *mimesis* (reproductive imagination) is revisited in the context of intellectual development and implicitly favoured over mere creative play (creative imagination) which practices an action pattern solely for the satisfaction that lies in the feelings of mastery based on previous experience. Piaget reconnects hereby with the creation myths of the first life where the demiurge creates a world according to a model [παραδείγμα] and to Kant's process of *Nachahmung* as a possibility for learning artistic rules. Although, to Piaget, both play and imitation are fundamental for the general, intellectual development – imitation can become play, and vice versa – play emphasizes the child's own world, while imitation forges a connection with reality. When this connection is strengthened in the course of ontogenetic development, creative imagination becomes simply superfluous, according to Piaget.

The framework that Vygotsky develops with regard to psychological development is socio-constructivist and does not posit universal stages of intrinsic, ontogenetic maturation. Vygotsky believes that learning should always precede growth via a *zone of proximal development*, which is the central concept in Vygotsky's thinking. According to Vygotsky, a child is able to learn skills or aspects of a skill that go beyond the child's actual developmental or maturational level through the assistance of a more capable person. Individual development is about social interaction which allows the child to acquire instruments that have been developed by former generations. The development of imagination, as a superior mental function, depends on these social interactions in order to grow from a subjective understanding into an objective one (Archambault & Venet, 2007, p. 13). Like Piaget, Vygotsky also uses the concepts of creative and reproductive imagination but values them inversely: "one type of activity we could call reproductive, and is very closely linked to memory; essentially it consists of a person's reproducing or repeating previously developed and mastered behavioural patterns or resurrecting traces of earlier impressions" (Vygotsky, 1930/2004, p. 7); another type is the one of creative or combinatorial behaviour/imagination and it includes "activity that results not in the reproduction of previously experienced impressions or actions but in the creation of new images or actions" (Vygotsky, 1930/2004, p. 9). In order to account for the combinatorial aspect, Vygotsky proposes three consecutive phases: 1/ perception and accumulation of experience; 2/ dissociation (as the breaking up of a complex whole into individual parts); and 3/ a process of change/distortion/transformation based on the dynamic nature of our internal neural stimulation and the images that correspond to them.

The traces of external impressions are not laid down inalterably in our brain like objects in the bottom of a basket. These traces are actually processes, they move, change, live, and die, and this dynamism guarantees that they will change under the influence of imagination. (Vygotsky, 1930/2004, p. 26)

Vygotsky further elevates imagination from its link to untruthfulness by stating that:

In everyday life, fantasy or imagination refer to what is not actually true, what does not correspond to reality, and what, thus, could not have any serious practical significance. But in actuality, imagination, as the basis of all creative activity, is an important component of absolutely all aspects of cultural life, enabling artistic, scientific, and technical creation alike. In this sense, absolutely everything around us that was created by the hand of man, the entire world of human culture, as distinct from the world of nature, all this is the product of human imagination and of creation based on this imagination. (Vygotsky, 1930/2004, p. 9)

Here Vygotsky points to the value of imagination in the real world whereas Piaget opposes the field of imagination to that of reality. Vygotsky makes the relation between the two domains more concrete by proposing four essential associations:

- “The first type of association between imagination and reality stems from the fact that everything the imagination creates is always based on elements taken from reality, from a person’s previous experience”. Vygotsky counters the view of a *creatio ex nihilo* and invokes scientific analysis to argue that “the most fantastic creations are nothing other than a new combination of elements that have ultimately been extracted from reality and have simply undergone the transformational or distorting action of our imagination” (Vygotsky, 1930/2004, p. 13).
- A second link concerns the association between the final product of imagination and a complex real phenomenon. This product, the combination of elements based on experience of reality, sometimes corresponds to real phenomena such as a desert or the French Revolution [Vygotsky’s examples]. In those cases, “[imagination] becomes the means by which a person’s experience is broadened, because (s)he can imagine what he has not seen, can conceptualize something from another person’s narration and description of what he himself has never directly experienced. He is not limited to the narrow circle and narrow boundaries of his own experience but can venture far beyond these boundaries, assimilating, with the help of his imagination someone else’s historical or social experience” (Vygotsky, 1930/2004, p. 17).
- Imagination creates illusory situations that elicit non-illusory, real emotions. Vygotsky presents music as the ultimate example: “Frequently, a simple combination of external impressions, such as a musical composition, induce a whole complex world of experiences and feelings in a person listening to the music. This expansion and deepening of feelings, their creative restructuring constitutes the psychological basis for the art of music” (Vygotsky, 1930/2004, p. 17).
- The essence of a fourth type of association between imagination and reality is that “a construct of fantasy may represent something substantially new, never encountered before in human experience and without correspondence to any object that actually exists in reality; however, once it has been externally embodied, that is, has been given material form, this crystallized imagination that has become an object begins to actually exist in the real world, to affect other things. In this way imagination becomes reality” (Vygotsky, 1930/2004, p. 17).

From this brief discussion of two seminal sources, it can be inferred that the relation between imagination and information coming from the real world, are differentially looked upon by these two developmental psychologists. Piaget posits a relation where knowledge and information about reality gradually take over the child’s world of imagination, while Vygotsky sketches parallel increasing courses of development where imagination is enriched by a surplus of informational experience. It is an ontogenetic dialectic that resonates with the historical journey of information and imagination as we presented it in Chapter 3 and conforms either antagonistically or sympathetically with the phylogenetic development that we sketched previously in this chapter.

Mathematician Marcus Du Sautoy summarizes this essential complementarity between factual information and imaginative speculation by paraphrasing Wittgenstein²¹⁷: “Whereof we cannot know, there our imaginations can play”(Du Sautoy, 2016, pp. 513–514).

In the next chapter-section we aim at focussing, again from a generic perspective, on the actual role of information in the daily life of Homo sapiens in our times.

4.3 Dealing with information in everyday life

4.3.1 *The paradox of information*

Although, in our times, information is omnipresent and -available in its modern guise as communicator of factual and disembodied knowledge, journalist and author Elizabeth Kolbert wonders in a recent review article why some of our beliefs and opinions seem to be immune to the impact of factual information (Kolbert, 2017). In *Novum Organum*, Francis Bacon already points to this phenomenon by observing that “once a man’s understanding has settled on something (either because it is an accepted belief or because it pleases him), it draws everything else also to support and agree with it” [F. Bacon, *Novum Organum*, bk.I, XLVI] (Bacon, 1620/2000, p. 43). Social psychologists in the second half of the 20th century refer to this phenomenon either as *belief perseverance* or “the tendency to cling to one’s initial belief even after receiving new information that contradicts or disconfirms the basis of that belief” (Baumeister & Vohs, 2007, p. 109)²¹⁸; *confirmation bias* or “processing information by looking for, or interpreting, information that is consistent with one’s existing beliefs” (Baumeister & Vohs, 2007, p. 162); or *my-side bias* where people are able to generate and remember more reasons supporting their side of a controversial issue than the opposing side (Baumeister & Vohs, 2007, p. 163). General explanations for human’s susceptibility to hold on to existing beliefs and opinions include the protection and individual claims to intelligence; above all, however, ignoring factual information is one of the human ways to process information efficiently and cost-friendly.

Humans are bombarded with information in the social world and cannot possibly take the time to carefully process each piece of information to form an unbiased conclusion. Human decision making and information processing is often biased because people are limited to interpreting information from their own viewpoint. People need to process information quickly to protect themselves from harm. It is adaptive to rely on instinctive, automatic reflexes that keep humans out of harm’s way. (Baumeister & Vohs, 2007, p. 162)

²¹⁷ Wittgenstein concluded his *Tractatus Logico-Philosophicus* with the famous line: “Whereof one cannot speak, thereof one must be silent”.

²¹⁸ For the seminal experiments with regard to perseverance of belief see Ross, Lepper & Hubbard (1975) and Anderson, Lepper & Ross (1980).

In three recent publications, the perseverance of first impressions and tendency to select information that corroborates existing beliefs and opinions are revisited and subjected to further scrutiny.

In *The Enigma of Reason*, cognitive scientists Hugo Mercier and Dan Sperber focus on the evolution of reason and argue that reasoning did not develop in order to solve abstract, logical problems or to help draw conclusions from unfamiliar data, but rather to resolve the problems arising from the life in collaborative groups; habits of mind that seem implausible from an analytical point of view may prove to be very useful when considered from the perspective of social and collaborative interaction. A primary observation in this context is that although humans are quite adept at spotting the weaknesses in other people's arguments, they are almost invariably blind about their own incongruences. Presented with someone else's argument, we are quite adept at spotting the weaknesses. Almost invariably, the positions we are blind about are our own. This lop-sidedness, according to Mercier and Sperber, reflects the task that reason evolved to perform, which on the one hand is to prevent us from being misinformed by the other members of our group and potentially risk one's life based on that information, and on the other hand, to devise and evaluate arguments intended to protect social standing and life security.

In *The Knowledge Illusion: Why We Never Think Alone* (Sloman & Fernbach, 2017), cognitive scientists Steven Sloman and Philip Fernbach also point to sociability as the key to human functioning. From experiments where graduate students are asked to rate their understanding of everyday devices (including toilets, zippers, and cylinder locks), the authors induce that people believe that they know way more than they actually do. According to the authors, humans have a general tendency to maintain an unrealistic confidence in their own knowing due to their trust and belief in other people's expertise.

There has always been what cognitive scientists like to call a division of cognitive labour. From the beginning of civilization, people have developed distinctive expertise within their group, clan, or society. They have become the local expert on agriculture, medicine, manufacturing, navigating, music, storytelling, cooking, hunting, fighting, or one of many other specialties. One individual may have some expertise in more than one skill, perhaps several, but never all, and never in every aspect of anything. No chef can cook all dishes. Though some are mighty impressive, no musician can play every instrument or every type of music. No one has ever been able to do everything. (Sloman & Fernbach, 2017, p. 14)

Therefore, according to the authors, it is not surprising that we can hardly tell where our own understanding ends and others begins; there seems to be no sharp boundary between one person's ideas in knowledge and those of other members of the group. According to the authors again, this element of human functioning has been crucial and empowering to innovation, progress and

invention; it allows humans to build on the work of fellow-humans. However, this dependence on other minds gets dangerous when applied to the political domain where citizens are inclined to define their positions without being able to foresee the differential impacts of implementing a range of political ideas. Since people ratchet down the intensity of their views once they are confronted with their quasi-cluelessness with regard to the implications of certain decisions, Sloman and Fernbach see in this a remedy to the illusion of explanatory depth and a tool to change people attitudes. In all of this, the authors do not make a plea for more information, rather instead of putting all the weight of a decision on the individual and educating him/her to make wise decisions, efforts should go a type of decision-making that is supported by a community of knowledge and evaluated through personal and pragmatic assessment.

We're not championing faith in whatever a community believes or whatever a credentialed expert says. Along with faith must come a healthy dose of skepticism and a keen eye for charlatans and those who are confidently wrong. (Sloman & Fernbach, 2017, p. 260)

Finally, in *Denying to the Grave: Why We Ignore the Facts That Will Save Us* (Gorman & Gorman, 2017), Jack Gorman, a psychiatrist, and his daughter, Sara, a public-health specialist, present a theory of health science denial or why we ignore proven scientific evidence and put ourselves at risk for instance by holding on to the conviction that vaccines are hazardous. The Gormans argue that ways of self-destructive fact denial must at some point have been adaptive. They thereby point to the physiological component of confirmation bias and cite research which suggests that people experience genuine pleasure — a rush of dopamine — when processing information that supports their beliefs (Gorman & Gorman, 2017, pp. 134–136). Providing people with accurate information (“just giving the facts”) is according to the authors not an effective method to disarm destructive beliefs, people simply discount it. Throughout the book the authors argue that there are complex psychological, social, and neurobiological underpinnings of resistance to scientific evidence and that many of these tendencies are completely adaptive, healthy, and essentially human. The challenge that remains is to figure out how to address the tendencies that lead to false scientific belief without completely repressing them. The Gormans propose a multipronged approach that guides people toward the evidence without dismissing the importance of their human emotions.

These three recent reference-texts point to a deeply ingrained paradox in the human relation to information: although our society invests a great deal in the production of factual knowledge, the information that can be deduced from it is not always reaching its target domain. In these examples, imagination is not the challenging counter-factor or resisting factor to information, but rather the habits and beliefs that people rely on in everyday life (their *Images* as we saw in Chapter 3). The

building blocks that support the defence against new information are the power of first impressions, the drive to convince others of the blind confidence in the specific expertise of fellow-humans, and the joy one finds in finding evidential confirmation. These empirical findings are on a par with the observations that came from the discourse analysis in Chapter 2: the integration of information in existing practices is not so much a matter rational and boring accountancy but rather an energy-demanding challenge, a courageous act of rebellion against a very powerful, ingrained, and natural disposition to hold on to the *status quo*, especially if it concerns extra-disciplinary and counter-intuitive information.

4.3.2 ‘Information Behaviour Research’

A more detailed analysis of information searching and handling is provided by Information Behaviour Research [IBR] which arose as a sub-discipline in the mid- and late 1990s from a cluster of theoretical activity within library and information science: librarians wanted to understand library users better, government agencies were interested to understand how information flow could contribute to innovation, and social scientists generally were interested in the social uses of information (Bates, 2010a). The label ‘information behaviour’²¹⁹ is in fact a *non sequitur*, information does not behave, but it is nevertheless the most commonly used term today and replaces older terms such as ‘user studies’ and ‘information seeking & gathering’. Ted Wilson, one of the founding fathers of the discipline, delineates the contours of information behaviour as follows:

Information Behaviour is the totality of human behaviour in relation to sources and channels of information, including both active and passive information seeking, and information use. Thus, it includes face-to-face communication with others, as well as the passive reception of information as in, for example, watching TV advertisements, without any intention to act on the information given. (Wilson, 2000, p. 49)

Wilson’s definition is intended to cover a broad range of activities: it entails intentional and purposeful (‘active’) behaviours as well as unintentional or serendipitous (‘passive’) ones such as glimpsing or encountering information (Case & Given, 2016), and explicitly and implicitly, the main subfields in ‘information behaviour’ as a discipline are represented: information needs, information seeking and information use.

The vocabulary varies from one author to another but the general picture is one wherein these three subareas are supposed to be operational in a ‘universe of knowledge’ (Wilson, 1981) where a dynamic interaction among three components occurs: the information user; the information (or knowledge)

²¹⁹ Since the study of information behaviour has strong roots in American scholarship, the term is most frequently in its U.S. spelling ‘behavior’. Since our main text maintains a British-English spelling, the spelling, also within citations, will be adjusted accordingly.

resource; and the intermediary mechanism (also called information system) which is situated between the first two components (see Fig. 4.2).

The *user* initiates the system because of some problems, goals or intentions that do not find a satisfying answer within the own reference group or 'user's life world' (Wilson, 1981) and of which it is believed that its management or realization might be furthered by information obtained from an (external) information resource. In sociology, the spheres that envelop the information user would be called a 'practice' or a 'reservoir of personal repertoires', where 'repertoire' refers to the set of strategies and their analogic potential that any one individual possesses, and 'reservoir' to the total of sets and its potential to the community (Bernstein, 2000, p. 158).

The *information resource* is made up of structures of texts which are capable of changing the recipient (Belkin & Robertson, 1976; Belkin, 1984). In this context, a text is meant as "a collection of signs purposefully structured by a sender with the intention of changing the image-structure of a recipient" (Belkin & Robertson, 1976, p. 201).²²⁰ The intermediary *information system* negotiates between the user's desires, requirements, knowledge and the knowledge resource's contents, representation and organization, so that, if texts appropriate to the user's situation are in the information resource, they (or aspects of them) are brought to the user's attention (Belkin, 1984).

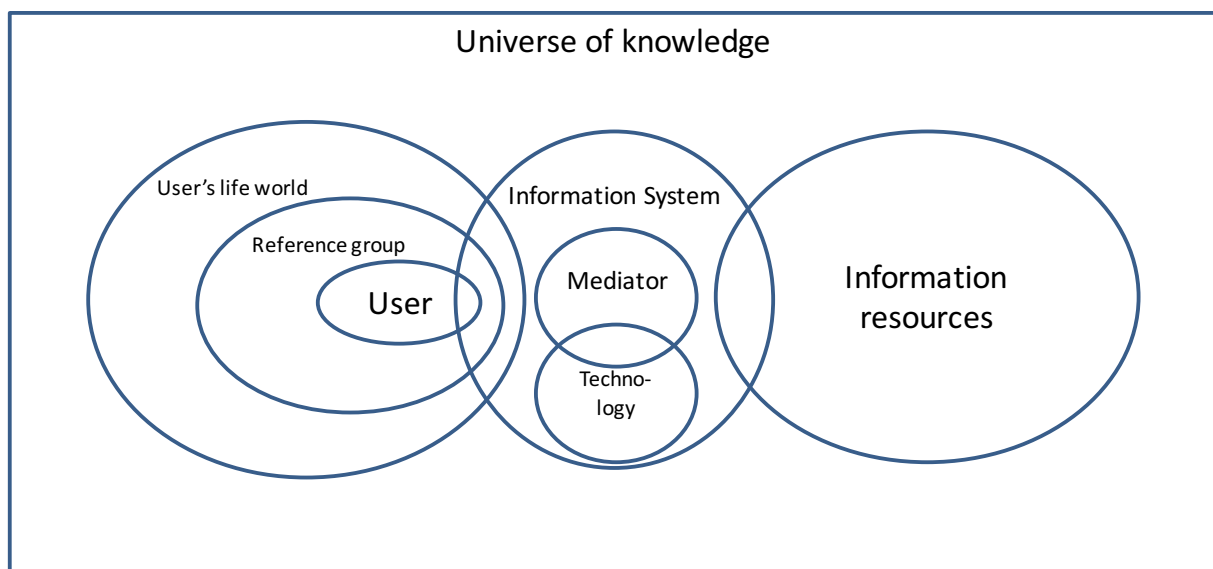


Figure 4.2. The domains involved information seeking (after Wilson, 1981).

²²⁰ This particular formulation dates from the late 1970s, when part of the field was still called 'information science'. The notion of 'text' coupled with 'intentionality' is meant to exclude biological information and perceptual information. Belkin (Belkin & Robertson, 1976) in fact uses the term a 'knowledge resource' which contains information. Subsequent models will prefer the term 'information resource' and define 'information' as to cover "all instances where people interact with their environment in any such way that leaves some impression on them—that is, adds or changes their knowledge store" (Bates, 2010b).

The overall challenge of information behaviour studies is to understand the cognitive models or images that the main components of the system have of one another and of themselves. Within that context, a ‘person-centred’ and qualitative approach rather than a ‘system-centred’, ‘resource-centred’ and quantitative approach has taken over since the 1980s. Researchers became aware of the fact that to address the user’s problem and to promote communication between the system and the user, an image or model of the user is needed as well as an image or model of the texts represented in the system. In information behaviour studies, a description of this information user generally incorporates a complex interplay between three dimensions of activity: a physical (actual actions taken within a particular situation); an affective (feelings experienced); and a cognitive dimension (thoughts concerning both process and content) (Kuhlthau, 1991, p. 352).

From this very short introduction, it can be summarized that IBR generally involve three actors (user, system, resource), three dimensions (situational, affective, cognitive) and three (predominantly unidirectional) processual stages (information need, information seeking, information using). We will have a closer look at these three stages and their characteristics to enlighten our vision on how information actually works.

4.3.2.1 Information needs

Aristotle opens his *Metaphysics* with a seminal statement: “all men by nature desire to know [πάντες ἄνθρωποι τοῦ εἰδέναι ὀρέγονται φύσει]”²²¹ (Aristotle, 2006, p. 3) and bases this assertion on the fact that humans take pleasure in their senses (which could qualify as sensorial information). It is remarkable how the remainder of Aristotle’s first paragraph in the *Metaphysics* anticipates Bateson’s definition of information (information as a difference that makes a difference) and blends it with Wilson’s perspective on information behaviour²²². Aristotle claims:

For not only with a view to action, but even when we are not going to do anything, we prefer seeing (one might say) to everything else. The reason is that this, most of all the senses, makes us know and brings to light many differences [διαφοράς] between things. [Arist. *Metaphysica*, Book I] (Aristotle, 2006)

Aristotle’s observation and those of others (see 4.1.) which indicate a certain fundamental and biological ingrained need for information have been a longstanding issue of debate among

²²¹ The text in Greek is provided by <http://www.perseus.tufts.edu/hopper/text?doc=Perseus%3Atext%3A1999.01.0051%3Abook%3D1%3Asection%3D980a>.

²²² There is no explicit link in both authors to Aristotle, and (to my knowledge) not in the literature that deals with information-issues.

philosophers, psychologists, educationalists and therapists (Case & Given, 2016, pp. 78–79). It is for instance common knowledge that sensory deprivation can have detrimental effects on human's well-being; on the other hand, therapies, such as Restricted Environmental Stimulation Therapy (REST), show that being cut off from sensorial information (for a while) has a relaxing and benign effect.

In an attempt to come to grips with the concept of information needs, Wilson (1981) differentiates between three interrelated categories of primary needs: 1/ physiological needs, such as the need for food, water, shelter etc.; 2/ affective needs such as the need for attainment or for domination; and 3/ cognitive needs, such as the need to plan or to learn a skill. Viewing information from this perspective, Wilson does not grant information the status of primary need (such as the need for shelter or the need for sustenance) but rather a secondary order need which follows from the desire to satisfy primary needs (Wilson, 2000, p. 51).

In a similar way, library scientist Petros Kostagiolas et al. (2016) draw a line between 'information motives' and 'information needs': the occupational, socio-cultural, politico-economic and physical environment create certain motivations (primary needs) that engender information needs (secondary needs). From a less theoretical but more practical perspective (experience of healthcare practitioners), health scientist Wies Weijts et al. (1993) differentiate within the cluster of information needs between 1/ needs for new information; 2/ needs to elucidate the information held; and 3/ needs to confirm information held. Wilson (2000) comments with regard to the formulation of 'information held', that it is not the information that needs elucidation but rather the values and beliefs present in the subjects that are at stake; this is congruent with Boulding's use of the *Image* and with the distinction between information and knowledge that we articulated before.

One of the theoretical models that aims at encapsulating the various taxonomical efforts into a processual framework is communication and information scholar Brenda Dervin's 'sense-making' metaphor by which she describes how humans perceive information needs as 'cognitive gaps' (Dervin, 1992). Dervin pictures humans as moving through space and time, and as long as individuals are able to make sense of their experiences, movement ahead is possible. However, from time to time, forward movement is blocked by the encounter of a 'cognitive gap', a situation in which the ability to make sense has run out. An information need has arisen in order to bridge this gap, people seek information to construe a new sense and use this information to help them continue on in their journey. Dervin differentiates between five situations in which these gaps and information needs occur:

The decision stop, where the human sees two or more roads ahead; the barrier stop, where the human sees one road ahead but something or someone stands on the road blocking the way; the spin-out stop, where the human sees self as having no road; the wash-out stop, where

the human sees self as on a road that suddenly disappears; the problematic stop, where the human sees self as being dragged down a road not of his/her own choosing. (Dervin, 1992)

Educator and library scientist Carol Kuhlthau links cognitive gaps to affective states by observing that in a situation where a cognitive gap arises, a state of uncertainty may be created. Kuhlthau formulates her ‘uncertainty principle’ as follows:

Uncertainty is a cognitive state that commonly causes affective symptoms of anxiety and lack of confidence. Uncertainty and anxiety can be expected in the early stages of the information search process. The affective symptoms of uncertainty, confusion, and frustration are associated with vague, unclear thoughts about a topic or question. As knowledge states shift to more clearly focused thought, a parallel shift, occurs in feelings of increased confidence. Uncertainty due to a lack of understanding, a gap in meaning, or a limited construction initiates the process of information seeking. (Kuhlthau, 2004, p. 92)

Without any clear reference to it, Kuhlthau is here on the same page as pragmatist philosopher John Dewey in his book *the Quest for Certainty* which opens with: “Man who lives in a world of hazards is compelled to seek for security” (Dewey, 1929, p. 3), and examines how people deal with uncertainty by changing the world through action (practice) and by changing the self in emotion and idea (theory). The search for security is also present in psychologist Abraham Maslow’s well-known ‘hierarchy of needs’²²³. In ‘the need to know and the fear of knowing’ (Maslow, 1963), Maslow advances the thesis that we do have an instinctive need to know (and hence a need for information), but that it must be integrated with a fear of knowing, with anxiety, with needs for safety and security: “we can seek knowledge in order to reduce anxiety and we can also avoid knowing in order to reduce anxiety” (Maslow, 1963, p. 122); sometimes we would rather not know that we are at high risk for a disease or natural disaster. Within this context, information is perceived rather as a causal factor of anxiety and dysfunction than as a solution to it. The idea that information can cause anxiety and dysfunction is discussed in psycho-dynamic theories and refers to the insight that “we protect ourselves and our ideal image of ourselves by repression and similar defences, which are essentially techniques by which we avoid becoming conscious of unpleasant or dangerous truths” (Maslow, 1963, p. 118).²²⁴

4.3.2.2 Information seeking

The experiencing of an information need does not always lead to purposive *information seeking*.²²⁵ There is not only the aspect of information anxiety (Maslow, 1963, p. 122); people may also rely on

²²³ ‘basic needs’ (physiological + safety); ‘psychological needs’ (belonging/love + esteem); ‘self-fulfillment needs’ (self-actualization).

²²⁴ We already discussed the reluctance to integrate information that is potentially incompatible with existing opinions and beliefs in section 4.3.1.

²²⁵ Next to active or purposive behaviours, unintentional or serendipitous behaviours such as glimpsing or encountering information are also part of the field of information behaviour (Case & Given, 2016).

their own memory or intuition to meet the information need; they may start a trial-and-error procedure; they can take decisions with incomplete information or on the basis of beliefs and prejudices (see 4.3.1.); or they may also suppress their information needs or avoid a problem situation so that no information seeking is necessary (Choo, Detlor, & Turnbull, 2000, p. 8). An active and purposive phase of information seeking is only one of many options. Even if an information need seems amenable to be prolonged in an active and purposive stage of information seeking, still several factors other than the existence of a need may intervene in the process. Wilson (1981) mentions personal, interpersonal and environmental barriers including elements such as the importance of satisfying the need, the penalty incurred by acting in the absence of full information, the availability of information sources and the costs of using them.

Purposive information seeking then, once activated, is directed towards solving a problem, making a decision, or increasing understanding and in a very general sense, the information seeker identifies possible sources of information, differentiates and chooses between them, makes contact with them, and interacts with the sources to obtain the desired information. Wilson (1981), summarizes with this definition:

Information Seeking Behaviour is the purposive seeking for information as a consequence of a need to satisfy some goal. In the course of seeking, the individual may interact with manual information systems (such as a newspaper or a library), or with computer-based systems (such as the World Wide Web). (Wilson, 2000, p. 49)

Let us briefly introduce some of the essential concepts and vocabulary that appear in four information seeking models developed by four influential information scholars.

Most known is probably Bates' 'berrypicking'-metaphor (Bates, 1989) which challenges the previous generally assumed idea of matching a single query via a database to a single output set. Bates claims that information seekers may begin with just one feature of a broader topic and encounter with each new piece of information new ideas and directions to follow and, consequently, a new conception of the query. At each stage the search terms used in order to get a better match for a single query are not merely modified, rather the query itself (as well as the search terms used) is continually shifting. This type of research is labelled by Bates as 'evolving search'. This type of research implies that a single query is not linked to a single set of information but by bits of information at each stage of the search.

A bit-at-a-time retrieval of this sort is here called berrypicking. This term is used by analogy to picking huckleberries or blueberries in the forest. The berries are scattered on the bushes; they do not come in bunches. One must pick them one at a time." (Bates, 1989)

A second model, 'Information foraging theory' (Pirolli, 2007), can be considered as a spin-off concept, generated by the informavore-metaphor. The theory first emerged in ecological studies to explain the way organisms optimize the amount of energy they can take in through foraging of food resources. In the case of a predator for example: how much effort is invested in stalking and chasing a specific prey and how much energy can be gained from eating it? Optimal foraging then is about getting the highest amount of benefit whilst expending the lowest amount of energy through the structuring of environments and the selection of appropriate strategies. In today's information galaxy, source selection is of vital importance taking into account the limits on human attention and processing capacity. The information foraging model predicts that deciding between sources is a trade off between amount of effort required to use a source against the anticipated usefulness of the information gained from that source. 'Perceived source quality', 'relevance' and 'reliability' are the key words here. Next to these rules of economy these decisions are also modulated by personal interest and motivation and by situational elements such as the complexity of the problem or challenge. The key concepts to emerge from this analogy are:

- Information: The item of information that is sought or found and the value it has in fulfilling the information need;
- Information patches: The temporal and spatial environments in which information is clustered;
- Information scents: The determination of information value based on proximal navigation cues and metadata;
- Information diet: The decision making to decide whether or not to select and pursue an information item.

In a third model information behaviour researcher David Ellis (1989) provides a frequently used, systematic vocabulary by describing six characteristics that are implied in the information seeking (Ellis, 1989, p. 238):

1. Starting: activities characteristic of the initial search for information.
2. Chaining: following chains of citations or other forms of referential connection between material.
3. Browsing: semi-directed searching in an area of potential interest.
4. Differentiating: using differences between sources as a filter on the nature and quality of the material examined.
5. Monitoring: maintaining awareness of developments in a field through the monitoring of particular sources.
6. Extracting: systematically working through a particular source to identify material of interest.

Building on the principle of uncertainty (as discussed under 'information needs'), Kuhlthau (2004) finally examines the affective dimensions of information seeking and postulates that information search is composed of six stages that are characterized by different emotional responses: 1/ during

initiation, thoughts and discussions centre on contemplating the problem and relating it to prior experience and knowledge. Feelings of uncertainty and apprehension are common in this stage; 2/ during *selection*, the user typically confers with others and makes a preliminary search of information available in order to identify the general area or topic to be investigated and the approach to be pursued. Feelings of uncertainty evolve into an optimism and a readiness to search; unless of course selection is delayed or postponed; 3/ during *exploration*, the user expands personal understanding of the general area. Becoming oriented and sufficiently informed about the topic gradually leads to a personal focus. Feelings of confusion and doubt may increase since the information encountered rarely fits perfectly with previously-held constructs and inconsistency and incompatibility between sources may be encountered; 4/ *Formulation* is the turning point of the process in which the user establishes a focus or theme on the problem that can guide searching (akin to the forming of a hypothesis). Feelings of uncertainty diminish as confidence and as sense of clarity increases; 5/ *Collection* is the stage where the focus is further defined, extended and supported by making detailed notes on relevant issues and interacting with libraries and other information systems. Confidence increases and interest in the project deepens; and 6/ In the final stage of *presentation*, the user completes the search and makes a personalized synthesis of the topic. There is a sense of relief, accompanied by satisfaction if the search is thought to have gone well, or disappointment otherwise (Kuhlthau, 2004, pp. 165–166).

Again, Kuhlthau's ideal course of events is not the only scenario possible. In the process of information seeking, one can get stuck in one of the phases and an information overload can increase feelings of uncertainty and anxiety. Information scientist Constance A. Mellon (2015) describes the phenomenon of information phobia and anxiety and reports how university students feel scared, overpowered, lost, and confused in their confrontation with libraries. There's little known about the failure-rate of information seeking and its relation to this kind of heightened anxiety. In his most recent survey Case reckons that there are probably a great many of failures: "it is easy to imagine calling a halt to an information search when one is faced with an overwhelming number of information sources and an uncertainty about their relative quality" (Case & Given, 2016, p. 119).

4.3.2.3 Information use

The final stage to be considered in IBR is *information use*.

Information use occurs when the recipient processes information by engaging mental schemas and emotional responses within a larger social and cultural context. The outcome of information use is a change in the individual's state of knowledge (increase awareness, understand a situation), or capacity to act (solve a problem, make a decision, negotiate a position). (Choo et al., 2000, p. 14)

This approach is very close to the activity-based formulation that we proposed at the end of Chapter 1. In the definition above, the 'image(s)' that people entertain about the self and the world are described in cognitive (mental schemas), emotional and cultural terms and are the first targets of information; observable actions come in second order. Social researcher Robert Rich (1975) examines the relation between social science related information and policy-making, and makes a similar distinction between 'conceptual' and 'instrumental' uses of information. A conceptual use generally occurs from three to six months after the information is initially received, and changes the way that users know and think; an instrumental use occurs within three months after delivery and the impact of information can be clearly documented in memo's, legislation and the like.

Rich's distinction is paralleled by library scholar and information scientist Robert S. Taylor (1986) who categorizes the purposes of information into two types: tangible and intangible functions. Tangible functions include direct triggers for action and responses to questions, while the intangible include informing, instructing, clarifying, and socializing. Exposure to information can result in at least two kinds of results: 1/ changes in the knowledge and the image of the recipient (conceptual or intangible); and 2/ application of the information to some task or decision (instrumental or tangible).

In an earlier article Taylor (1982) uses different terms and thereby paraphrases and activates the DIKW-hierarchy model (see 3.4.3). Taylor advocates a process by which data are organized into information; through the processes of selection, analysis, and judgment, data-based information becomes something that can educate, inform, and contribute to personal, professional, and cultural growth (here the element of *Bildung* enters IBR). This first form of knowledge is called informing knowledge (intangible function), which can add to or change one's picture of the world and therefore affect a person's decisions and actions. It is contextual and nutritional, but is not immediately useful or productive knowledge. The second form of knowledge is action- or decision-oriented, and knowledge of this type is called productive knowledge (tangible function). Thus, not all knowledge becomes productive in the practical sense; in fact, most knowledge remains part of the educating, informing, and enjoying context from which we extract portions to help us in making data productive. The process of moving from informing to productive knowledge which results in action, according to Taylor, is a judgmental process, where options are presented and advantages and disadvantages weighed. This last step (the judgmental) is usually done by the final user, the one who says: "If I do X, then Y". This decision process is a personal one and utilization of formal knowledge will depend not only on its validity, quality, or ease of access, but also on the degree of "fit" between the knowledge provided and the information environment within which the user operates and where he must make decisions. It is this "fit" that determines the value of that knowledge (see Fig. 4.3 for an overview).

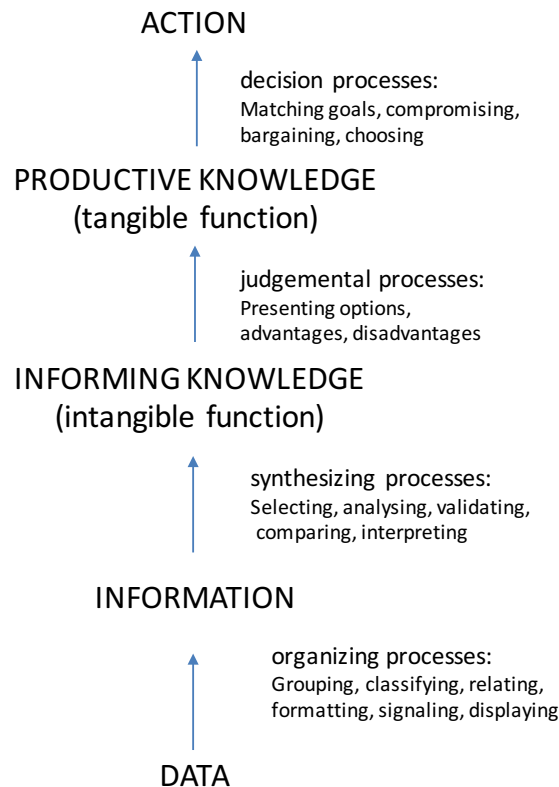


Figure 4.3. The tangible and intangible function of information (after Taylor, 1982).

Finally, in a third article, Taylor (1991, p. 230) comes to refining the kinds of impact that information may have on existing knowledge structures by defining eight, not mutually exclusive categories. Taylor's data are gathered from professional groups such as legislators, engineers and physicians but can be extended to a more generic context:

1. Enlightenment. Information is used to develop a context or to make sense of a situation. Enlightenment is not used here in the sense of divine illumination but relates to questions such as: "Are there similar situations? What are they?"
2. Problem Understanding. Information is used in a more specific way than enlightenment-it is used to develop a better comprehension of a particular problem.
3. Instrumental. Information is used so that the individual knows what to do and how to do something. Instructions are a common form of instrumental information. Under some conditions, instrumental information use requires information use in other classes.
4. Factual. Information is used to determine the facts of a phenomenon or event, to describe reality. Factual information use is likely to depend on the actual and perceived quality (accuracy, reliability) of the information that is available.

5. Confirmational. Information is used to verify another piece of information. Confirmational information use often involves the seeking of a second opinion. If the new opinion does not confirm existing information, then the user may try to reinterpret the information or choose between sources to trust.
6. Projective. Information is used to predict what is likely to happen in the future. Projective information use is typically concerned with forecasts, estimates, and probabilities.
7. Motivational. Information is used to initiate or sustain personal involvement.
8. Personal or Political. Information is used to develop relationships and enhance status.

This view strongly counters Kivy's assertion with regard to Historically Informed Performance and the way that information should be distinguishably present in the sounding result (see chapter 1). The one on one relation between information and outcome is not an essential function of information in the framework of IBR, it is only a possibility.

4.3.2.4 Information behaviour in the arts

Artists have not enjoyed much attention in IBR-studies. Librarian Susie Cobbledick (1996) argues that a probable explanation lies in "the persistent appeal of certain preconceptions concerning artists - that they are intuitive, self-contained individuals who create via inspiration" (Cobbledick, 1996, p. 344). People like that, it is presumed by IB-researchers, have information needs that are entirely fulfilled through 'divine intervention'. By consequence, the studies that are available are very limited in their scope and methodological *enverchure* and are mainly situated in the realm of the visual arts. Cobbledick (1996) presents in-depth interviews with four artists - a sculptor, painter, fiber-artist, and a metalsmith - and drawing on "years of personal observation" (Cobbledick, 1996, p. 348), she pre-structures her interviews by means of five needs for information. Remarkable and rather specific for field of interest here, is the inclusion of 'inspiration' in the list of needs that guides her investigation:

- An inspiration need relates to ideas, moods, emotions, general or suggestive visual information – "anything that serves as a motivator or catalyst in the creation of art".
- A need for specific visual information concerns the sources of the visual elements that appear in finished work.
- A need for technical information about the characteristics and properties of the various techniques and media used to create art.
- A need for staying updated with the current trends in the visual arts as it is found in journals, magazines, exhibitions.
- A need for business information about shows, commissions, and sales is used for finding work and exhibiting and selling work.

From interviewing four artists – a very small sample indeed – no definite conclusions are drawn. Each of the participants seems to consult libraries and journals, but most information is gained through contacts with other artists and sometimes also through experimentation. Cobbledick concludes that “artists need to have access to the universe of knowledge, not merely to some of its parts, and libraries that would meet their information needs must become access points to that universe” (Cobbledick, 1996, p. 365). Librarian William Hemmig builds on some aspects of Cobbledick’s work in a literature review (Hemmig, 2008) and an empirical study (Hemmig, 2009). From the literature review, he concludes that “nearly all of the literature focuses on art students, academic art faculty, or librarians, and so any claim that practicing artists fit the model²²⁶ is largely unsupported by research” (Hemmig, 2008, p. 343). Nevertheless, in general terms, Hemmig is supportive of Cobbledick’s model and adds more specific elements.

- Artists frequently need information on subjects unrelated to art and that’s why the traditional art library does not serve artists well. In fact, it is the public library that has the resources to best serve artists.
- Creative information needs and behaviours are extremely idiosyncratic and individualistic and there is a strong preference for serendipitous browsing.
- When mediation is desired, social mediation is preferred over use of catalogues and indexes (especially when materials and techniques for marketing and career guidance are concerned).
- Priorities are given to specific sources by different communities, the most pronounced example being the use of art periodicals: students use them heavily to learn of current trends in the art world, while established artists use them far less often.
- There are differences not only between the information behaviours of artists and art historians, but also between those of practicing visual artists, art students, and academically-affiliated art teachers.

Hemmig’s conclusion is that next to the solitude of much artistic activity, artists do form communities for types of support, stimulation and learning and that a model of the ‘shared repertoire’ is probably the best fitting information model for practicing artists. In a subsequent article, Hemmig reports on a quantitative study which he administered to a sample of a community of practicing visual artists in order to determine the community’s use of various information sources in the service of creative and sales activities. In the study, he surveyed 44 practicing artists, most with no academic affiliation. Hereafter a summary of the most noticeable results:

- The top six sources of inspiration are: forms occurring in nature; personal life experience; works of art seen in person (includes architecture); man-made objects other than works of art;

²²⁶ Referring to Cobbledick’s model.

images and/or text in art magazines, periodicals, newspapers; images and/or text in art books (includes exhibition catalogues).

- Important (2nd place) in the category 'specific visual elements of information' are images generated directly from the own imagination.
- Experimentation and exchange with artist colleagues are mentioned as the main sources of information with regard to materials and technique.

Hemmig concludes that artists' needs are idiosyncratic, that they like browsing, and that social contacts are important, especially for technical and marketing information.

Regarding the information behaviour of professional musicians there's currently no specific study available.²²⁷ A recent study on the information behaviour of practising musicians (Kostagiolas et al., 2016) has been published recently but since amateur musicians in a community band are the specific target group in the study, the results are not really fitted to the concerns of professional musicians. One finding, however, seems to be transferable to a professional context. In calling out the barriers for information seeking, Kostagiolas et al. (2016) observe that some of most frequent barriers encountered²²⁸ are related to the music information seeking process which requires specialized knowledge and a new set of skills, the 'music information literacy' skills (Kostagiolas et al., 2016, p. 10). These skills include according to Kostagiolas et al.: 1/ the formulation of questions through key concepts and terms; 2/ identification, location and retrieval of information; and 3/ development and implementation of searches in the appropriate information resources.

Within the same context, the American Library Association's (ALA) Presidential Committee on Information Literacy defines the 'information literate person' in its final report in 1989:

Ultimately, information literate people are those who have learned how to learn. They know how to learn because they know how knowledge is organized, how to find information, and how to use information in such a way that others can learn from them. They are people prepared for lifelong learning, because they can always find the information needed for any task or decision at hand. (Association of College and Research Libraries, 1989)

4.3.2.5 (Re-)modelling information behaviour

The elements that are represented above are part of a 'standard-view' in IBR. However, if we envisage IBR to be part of a larger project that aims at granting information a considered status in music performance, at least three problems/objections/remarks/adaptations require our attention.

²²⁷ Case confirmed this state of affairs in a personal communication (7/01/2016).

²²⁸ For instance: the lack of familiarity with ways of efficiently searching information, the large volume of uncontrolled information in the internet, the unavailability of reliable information resources, the difficulty of evaluating information prior to its use.

Firstly. While most research output in the field focusses on the information user as a point of departure ('the user initiates the system'), another element in Wilson's definition, 'passive reception', is in danger of being overlooked.²²⁹ Probably, due to its origins in library science, there is little to be found on the power and impact of the tacit structure and *Image* of the information resources themselves, and on the decisive influence they have on individual and collective choices.²³⁰ Wilson mentions 'passive reception' as an instance where information is not acted upon, but that formulation does not account for the hidden and intentional information communication that reaches recipients, and often subconsciously influences their images, attitudes and decisions.

If we distance ourselves for a moment from the user-centred view of information behaviour studies and borrow from the sociology of knowledge, we find a particularly interesting perspective in sociologist Basil Bernstein's 'pedagogical device' (Bernstein, 2000). This device concerns the ensemble of rules or procedures via which knowledge is converted into classroom talk, curricula and online communication. Three fields are thereby connected: 1/ a field of production (where knowledge is produced); 2/ a field of reproduction (schooling institutions); and 3/ a field of recontextualisation which mediates between the two former fields and consists in appropriating discourses from the field of production, and transforming them into a pedagogic discourse. The position of the field of recontextualisation is quasi-similar to the one of information systems, it mediates between a field of knowledge and a knowledge-seeker, be it here in a pedagogical context. The difference between the information behaviour model and the pedagogic device is the inverse direction in which they operate: information behaviour takes the seeker/user as a point of departure, whereas the pedagogic device starts from the field of knowledge production and shows how rules²³¹ modify knowledge before it reaches the field of the user. We would therefore advocate an explicit, bi-directional connection of the areas such as it is for instance found in everyday information architecture²³² where two main approaches can be distinguished: top-down, which focuses initially on the information content (see

²²⁹ At least in the publications that were consulted in the context of this dissertation.

²³⁰ Earlier publications from the mid-70s till the mid-80s are probably an exception (Belkin & Robertson, 1976; Belkin, 1984).

²³¹ These rules are hierarchically related; the recontextualising rules are derived from the distributive rules, and the evaluative rules are derived from the recontextualising rules. The function of the distributive rules is to regulate the relationships between different groups by distributing different forms of knowledge, and thus constituting different orientations to meaning. Recontextualising rules move a discourse from its original site of production to another site, where it is altered as it is related to other discourses. The decontextualized discourse no longer resembles the original because it has been pedagogised or converted into pedagogic discourse. Evaluative rules are concerned with recognising what counts as valid acquisition of instructional (curricular content) and regulative (social conduct, character and manner) texts (Bernstein, 2000, chapter 2)

²³² Designing, organizing, labelling and creating sitemaps, content inventories and navigation systems for websites to help people find and manage information more successfully.

pedagogic device), and bottom-up, which takes user needs as the starting point (see information behaviour) (Feather & Sturges, 2003, p. 252).

Secondly, this bi-directional perspective on the flow of information has important consequences for the understanding of information systems where, traditionally, top-down operations are poorly represented. Situated between the information resources and the information seeker, Wilson (1981) distinguishes within the field of information systems between a 'mediator', generally a human being (an information broker), and a 'technology', a combination of techniques and tools that assist in the search for information²³³ but he does not, at least not explicitly, include the scope of immaterial top-down filters such as curricula, disciplines, curricula and knowledge categories. Headrick (2000, pp. 4–5) gives a useful overview of categories of information systems which he calls 'technologies of knowledge' since they supplement the mental functions of thought, memory, and speech in the course of organizing and managing information. Five categories are distinguished:

- Systems used to gather information (search and research methods).
- Systems for naming, classifying, and organizing pieces of information to make them comparable and accessible in an efficient manner (e.g. libraries, curricula, biological taxonomies).
- Systems used to transform information from one form into another and to display it in a new way (lists -> statistical tables -> graphs -> three-dimensional objects).
- Systems designed for storing and retrieving information (dictionaries, and encyclopaedias, museums, archives, libraries, and botanical gardens).
- Systems for communicating information (postal service, messengers, the telegraph, the telephone, or electronic mail, newspapers, radio, television).

The critique on an overly rigid perspective on information systems is important if we want to understand the information behaviour of musicians and challenge and meaningfully counter the one-sided assertions that IBR-authors such as Cobbledick make about the belief that artists rely predominantly on 'divine inspiration' as an information system.

A final problem with the generic model represented in Fig. 4.2 is that Wilson (1981) explicitly remarks that information the 'universe of knowledge' might be drawn upon directly by the information seeker through information exchange via people in the user's reference group or life world (peers or experts) who are then considered as the embodiments of information (Wilson, 1981). Directly 'drawing upon a universe of knowledge' becomes problematic since in a follow-up publication, Wilson quite strongly avoids the term 'knowledge' because "knowledge is knowable only to the knower; it cannot be

²³³ Wilson's model dates from a pre-WorldWideWeb era but the terms can be extended in contemporary settings.

transmitted – only information about the knowledge I have can be recorded and accessed by another person, and that information can only ever be an incomplete surrogate for the knowledge” (Wilson, 2000, p. 50).

Information systems as a concept are a thorny issue in the field and there is no agreed definition in the literature (Feather & Sturges, 2003, p. 306). They are powerful gatekeepers that negotiate between an ever expanding information galaxy (McLuhan, 1962) and the inherent limits of human information processing. For the sake of overview and to make the basic design of information behaviour useful to our purposes we propose to subsume under the label ‘information systems’: formal and informal systems, technological and human mediators and also immaterial filters such as curricula, practices, research methods and taxonomies.

Taking into account these remarks and additional perspectives, we might then agree on the heuristic tool as represented in Fig 4.4. It represents a bi-directional flow of information which is mediated by information systems that include human, technological and immaterial filters. By implementing the notion ‘informavore’, an inherent need for information (either primary or secondary) is acknowledged while the term ‘information galaxy’, which refers to McLuhan’s Gutenberg Galaxy, implies that we are dealing here with information that has its roots in texts (intentional forms of information) and not so much in ecological information.

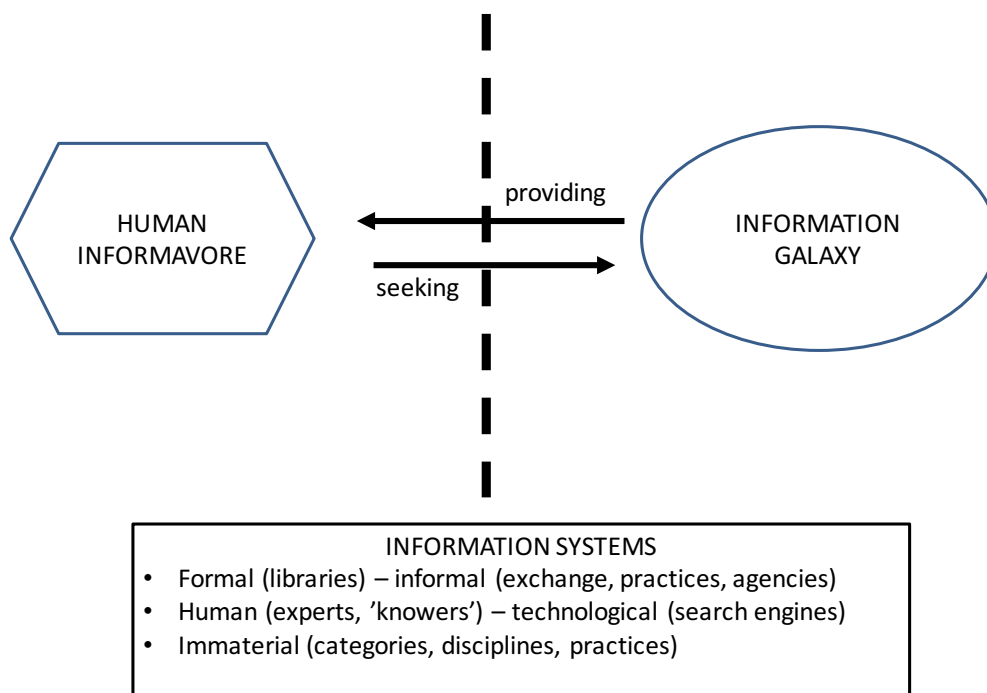


Figure 4.4. A heuristic framework of information seeking.

4.4 Chapter summary

Above, we consulted three fields of investigation that provide a generic, dispositional perspective on information in action and its relation to imagination.

From an evolutionary perspective, a partnership between information and imagination was explicitly present in analyses of cave art where imagination is suggested to be a tool for offloading information, directing attention to important features of the environment, and as a means to provide information regarding the individual and imaginative minds of fellow-humans. A sequential, evolutionary continuum between information and reality that connects imagery and creative imagination could be theorized with a crucial and pivotal role for cognitive fluidity which allows humans to communicate information between otherwise separated and domain-specific fields of expertise.

From a developmental point of view, two seminal perspectives were reviewed. Both Piaget and Vygotsky consider imagining and informing oneself about a phenomenological reality as complementary strategies to cope with the world. However, they disagree regarding the development of their respective aspect-ratio during life-time. Piaget favours information to imagination which he situates early in life when an adequate amount of information is yet to be acquired whereas Vygotsky considers information to constitute the early building blocks for a rich imagination later in life. Our aim was not to arbitrate between the views of Vygotsky and Piaget but rather to indicate that the information-imagination alliance is not only a historical field of negotiation (see Chapter 3) but is also a factor in ontogenetic considerations.

Finally, within the domain of Information Behaviour Research, we identified the main tenets and structures of information behaviour which generally involve three actors (user, system, resource), three dimensions (situational, affective, cognitive) and three (predominantly unidirectional) processual stages (information need, information seeking, information using). We acquired some additional conceptual vocabulary by reviewing some of the literature that pertains to each of the three stages. 'Information needs' are the most challenging aspect to theorize about and to validate empirically. Some of the insights and distinctions point to a generic informative impulse: 1/ from the view of evolutionary biology, our hunger for information (humans as 'informavores') can be seen as originating from an orienting response to environmental cues which then evolved into a behavioural habit and disposition; 2/ information needs seem to serve bigger purposes (survival, affection); and 3/ a specific need surfaces in situations of uncertainty which lead to experiencing an emotionally supported cognitive gap. While acknowledging different types of informal information gathering and behaviours such as information avoidance, the term 'information seeking' is preserved for instances of purposive or intentional behaviour that follow a specific information need. The phase of information seeking is typically subdivided in several actions (browsing, chaining, monitoring,

collecting, selecting) that are supposed to bridge the cognitive gap and relieve the feeling of uncertainty. Considerations of 'information use' are congruent with the conclusions that we drew from the terminological investigation in chapter three. Information can effectuate and immediate and observable result thereby referring to the archaic notion of information as 'giving form to', but information can also cause an effect to the image one has about the self and the world. Several parallel languages are used to make that point: informing versus productive knowledge, intangible versus tangible function. Within the domain of information use we could also assert that not every engagement into an information process leads to a successful outcome; several barriers were discussed of which the main one is the difficult relation between new information and ingrained beliefs that are either individually acquired or intersubjectively present in cultural practices or dispersed fields of expertise. As in Chapter 2, we could conclude that, in some cases at least, informing oneself extra-disciplinary and beyond the conformational horizon of settled beliefs is rather an act of innovative and courageous rebellion than one of conforming to the *status quo*.

It was also noticed that the information behaviour of artists is poorly represented in the pool of publications related to IBR. Moreover, the limited quantity of studies available are usually very narrow in their methodological scope and tentative in their conclusions. Three insights however caught our attention:

- IBR-studies struggle with categorizing the information needs of artists and this has consequences on the development of adequate information systems.
- IBR-studies that are situated in the artistic field typically incorporate 'inspiration' as part of the artist's information needs.
- Most studies indicate that informal, collegial exchange, experimentation and the own imagination serve as the main sources of information (see the role of the teacher in music education as discussed in the previous chapters).

In general, the various elements that we gathered from a generic, dispositional and behavioural perspective are supportive of the activity- and psychology- based view that we developed in the previous chapter and offers counter-arguments to the dismissal of information in an artistic context as it was first asserted in Chapter 1. Dealing with information is an inborn capacity that allows organisms to survive and in the case of *Homo sapiens* to imagine new situations and environments to be shared with fellow-humans via cultural artefacts. However, dealing with information is not self-evident: constructing adequate information systems that resonate with a user's practical concerns are a major challenge in our times and next to this more practical element also a new dialectical domain opened itself in this chapter, the one between information and habit or tradition. IBR-studies indicate an extensive list of functions attributed to information: information can be enlightening, it can be of

assistance in problem understanding, it can confirm beliefs and opinions or define new interests. Based on the findings in Chapter 2 (HIP & SIPP) and the considerations in 4.3.1. we should also add 'innovative' and 'explosive' to the list of functions of information.

Chapter 5: The contours of an informed performership

PART I of this dissertation is dedicated to creating a conceptual space for an informed performership. In the first chapter, we opened with substantial doubts and scepticism – expressed mainly by art scholars and philosophers – regarding the role of information in an artistic and imagination-oriented environment. In the three ensuing chapters, the focus was on collecting components and perspectives with the potential to cast a more differentiated and constructive light on the alleged opposition between information and imagination.

By sample-surveying texts from three distinctive performers' orientations (Chapter 2), we found that information is used by musicians in semantically flexible ways. Intra-disciplinary sources of information such as scores, teachers, iconic examples, as well sensorial information turned out to be valued informational elements in mainstream performance [MSP]. In the more specialised contexts of Historically Informed Performance [HIP] and Scientifically Informed Performers' Practice [SIPP], we observed that intentional contact with knowledge originating from extra-disciplinary fields of expertise holds the potential of innovating and transforming habits, performance traditions, and learning styles. We could also differentiate between HIP and SIPP in terms of information source and target domain, information processing mode and seminal status.

From the spadework into the history of words and ideas that focused in a discipline-specific way on the interaction between information and imagination (Chapter 3), an activity-based, psychological understanding of information came to the fore as an alternative to the seminal Form-image hierarchy as posited by Plato and as referred to in dualistic analyses (see Chapter 1). A genealogical analysis indicated that the ontological dualism between the field of information and the one of imagination is more of an intrinsic alliance than an opposing dualism. Moreover, by processualising information and interposing Boulding's *Image*²³⁴ between information and imagination, an integrated framework was created where a variety of information sources, processes, and modes of imagination can be linked to. Finally, an exploration into the more generic traits of information in a behavioural context (chapter 4) pointed to: 1/ an inherent human resistance to new information; 2/ a central role for cognitive fluidity in un-locking task-specific information processes; 3/ a trade-off between information and imagination in ontogenetic development; and finally, 4/ more refined descriptors of information behaviour in terms of information need, information seeking, information use, and information systems.

The elements ensuing from this multi-perspective investigation have been presented in an informational way – information *on* information, without too much interpretative processing or critical

²³⁴ 'Image' is capitalized and italicized here because of the explicit reference to Boulding's use of the term (see Chapter 3).

comments; the main objective was to scan the field of information and imagination from a performer's point of view and to build a discipline-specific information-base that allows for defining the conceptual space that can be attributed to the notion of an informed performer in this final chapter of PART I.

5.1 Creating a conceptual space for an informed performership

An information-*aficionado* might now conclude from the considerations in the previous chapters that information is not a counter-field but rather an inherent, constitutive element of musicianship: musicians use information in different contexts (feedback, score) and as a means to challenge the status quo in their practice; throughout history, the dialectic between information and imagination has been a central concern to conceptualizing artistic practice; this complementarity and alliance can also be traced to biological dispositions and generic behaviour.

If we take the musician's *Image* as a central element in her/his perspective on musicking, genetic information (DNA) would account for the relatively hard-wired natural layer of that *Image*, it transmits basic skills (dexterity), intuitions, reflexes, developmental changes, and certain modes of self-organization that humans phylogenetically acquired through interaction with pre-historical environments via a process of Darwinian selection. It is a part of the *Image* that can be linked to 'nature' or the notion of 'innate talent'.

Another layer would then be the cultural layer, one that develops in interaction with the actual environment one lives in. Within this cultural layer, a distinction might be made between various sources of information such as: 1/ information directly acquired and bodily sensed by personal contact/experience/experiment with the natural and sign-mediated environment (scores, practising at the instrument, performing concert hall, auditory impressions); 2/ information shared and transmitted by peers, teachers, and colleagues; and finally, 3/ extra-disciplinary fields of enquiry.

From this perspective, the concept of an 'informed performer' seems to be no more than a mere pleonasm: it is impossible to be 'uninformed'?

This question brings us back to Kivy who indirectly refers to this terminological redundancy in his criticism on Historically Informed Performance as presented in Chapter 1 (Kivy, 2002). Kivy's critique is that, based on the archaic meaning of 'to inform' as 'to imbue with' (see also Chapter 3), the notion of an informed performance needs to be rejected since, according to him, a situation can arise in which information does not survive the process of judgement and taste, and does not imbue the performance as such. Kivy's criticism can be elegantly addressed by replacing 'Historically Informed Performance' by 'Historically Informed Performers' and by referring to the activity-based concept of information as we developed it in Chapter 3. Kivy, however, seems to be unconvinced by such a subjective turn:

No performer would reject the proposal that one might get good ideas about how to perform a work by finding out how it was performed in the composer's lifetime or what the composer's performing intentions were. Certainly the so-called mainstream performer would not reject it. (Kivy, 2002, p. 141)

An element that certainly counters Kivy's reluctance to explicitly link information to performership is the enquiry in Chapter 2, the Performer's Voice, which indicated distinctive attitudes with regard to the integration of extra-disciplinary information between MSP on the one hand and HIP and SIPP on the other: whereas MSP relies mainly on intra-practical information sources, such as a score, a teacher and own experience, thereby seldom referring to extra-disciplinary fields, it is only in HIP and SIPP that the channels to extra-disciplinary information are actively explored. Also in our behavioural analysis of information this situation was encountered: concepts such as confirmation and myside bias capture the intrinsic reluctance of humans to engage with potentially challenging and explosive information. If we then look at conceptual spaces such as the 'reflective practitioner' (Schön, 1983), the 'intuitive practitioner' (Atkinson & Claxton, 2000), or the 'creative artist', we see that although these concepts potentially suffer from a pleonastic inclination akin to the one implicit in 'the informed performer', they have nevertheless proven to be valuable instruments in creating awareness and opening new avenues of thought and development. In the same vein 'historically informed' has added and highlighted a substantial quality to 'traditional' performership: 'historically informed performers' show a specific interest in historical information as a guide to their performances.

How could this work in the case of the 'informed performer' who does not limit her-/himself to historical sources?

Quasi-unintentionally, Kivy points to a crack in the wall when asserting that, once the step is taken to make performers and not performances the intentional object of information, it seems rather obvious that one would not limit oneself to historical information but would be eager to expand the informational field from history also into other domains.

If the only reason for the performer's having historical knowledge is that it is a possible source of performance ideas, this does not in any way make historical knowledge a *favoured* source. It is just one of many possible sources of performance ideas, all of which are evaluated on the basis of the performer's musical judgement, taste, and creative intuitions. (Kivy, 2002, p. 141)

From the considerations in the previous chapters we learned that, in general terms, the information behaviour of musicians is primarily directed at intra-disciplinary sources of information such as the score, a teacher, iconic examples and proximally related fields such as music theory and history. Moreover, the activity of high level music making requires the development of reliable *Images*, habits and automatisms which then become part of a musician's identity and resist the confrontation with

potentially perturbing information. From this, it can be inferred that being informed in ways that surpass disciplinary borders is not a trivial characteristic of musicianship as suggested by Kivy.

Here, a meaningful differentiation imposes itself between ‘mere’ performership, ‘historically (or otherwise) informed’ performership and a performer’s orientation whereby the intentional interest in extra-disciplinary knowledge-domains is not limited to proximally related fields such as history or philosophy. To that end, we propose to extend ‘Informed Performership’ into the notion of a ‘Generally Informed Performership’ [GIP] or a ‘Generally Informed Musicianship’ [GIM].

However, GIP is not solely characterized by its explicit and extended orientation towards a vast range of extra-disciplinary information; the investigations that we performed in the previous chapters lead to the implication of several adjoining attitudes, characteristics and attributes that come with the conceptual space now attributed to a ‘Generally Informed Performership’:

1. GIP is grounded in an orienting impulse (Dennett, 1991) which is intentional and requires active, prospective, and systematic information seeking (see Chapter 4).
2. GIP is not dogmatic. GIP includes ‘standard’ performership with all its valuable strategies of cognitive-gap-bridging, problem-solving and imaginative artistry such as intuition, tradition, habits, experimentation, and reflection (see Chapter 2).
3. Performers’ minds constitute the primary target-domains of GIP. Actual performances are a secondary and only potential impact-domain (see Chapter 3).
4. GIP allows for a variety of information impacts: it holds the opportunity of dismantling existing knowledge perspectives and reconfiguring one’s *Image* but it can also serve as a tool in closing cognitive gaps and enlightening existing expertise (see Chapter 3).
5. GIP is exploratory, innovating, and not restricted to mere problem-solving; here information becomes the intentional object of imagination and can be linked to various modes of imagination: mimetic, parodic, creative, pragmatic (see Chapter 2).
6. GIP involves new ways of learning and development which are not focused on a model (situational learning), or on direct contact with the environment (personal experience, ecological learning), but rather on written texts that act as informational currency between fields of expertise (see Chapter 2).
7. GIP favours (whenever possible) contact with pure, non-pre-filtered or non-pre-processed primary sources, leaving space for personal interpretation, actualization and imagination (see Chapter 2).
8. The *modus operandi* of GIP is close to Bacon’s concept of the bee: “[GIP] takes material from the flowers of the garden and the field; but it has the ability to convert and digest them” [Bacon.Nov.Org.book 1, XCV] (Bacon, 1620/2000, p. 79).

Considering these attributes, we can now propose the following summarizing working-definition of GIP:

A Generally Informed Performership [GIP] is a mental space within the broader category of musicianship where a score-based performer (habitually) orients her/himself in an active, prospective, and systematic manner to information originating from extra-disciplinary fields as a complement to intra-disciplinary paths of artistic training, learning, and development, and allows this information to potentially make a difference to her/his *Image* of music-making and to the actions and imaginations that build upon that *Image*.

Definition 2: Generally Informed Performership [GIP].

5.2 Performing a Generally Informed Performership

Creating a conceptual space is one thing, implementing it is a different matter. In the introduction to PART I, we formulated a secondary research question which implicated the operational aspects of an informational strategy: how does an information galaxy behave when a musician is interrogating it? And what does it offer in terms of added value? In order to address these questions, we performed throughout the investigative process in PART I, in very general and structural terms, the concept of a Generally Informed Performership – *avant la lettre* – and situated it in a systematic, bio-cultural framework that negotiated between generic dispositions, and historically and culturally contingent practices. In view of the further development of the concept of GIP, we can now assess some of the opportunities and weaknesses that arise if a 21st century score-based musician seeks access to a discipline-transgressing galaxy of information.

On the opportunity-side, it can be inferred that basic information literacy skills and an inquisitive attitude do indeed allow fast and unprecedented access to an abundant amount of information coming from primary and secondary sources, intra- and extra-disciplinary. The digital forms in which most sources are available, the search-engines and the software that allow for purposefully scanning these texts contribute to a great extent to this situation of quasi-thresholdless access. Moreover, by bypassing the traditional information filters of disciplinary literature and by applying a practice-based outlook on things, perspectives and connections surface which allow for new and original configurations (see for instance the dialectic between information and imagination).

On the weakness-side, we must acknowledge that a systematic information search which aims at balancing and integrating overview, focus and detail is an effort-consuming and daunting enterprise that in 'normal' circumstances exceeds the attentional potential of individual action by a professional performer. There is not only the punctual research to be done, the exploration of boundary objects

such as information and imagination pre-supposes a general overview in relation to specific perspectives, awareness of the various parallel languages and keywords, and envisaging/imagining new links between the elements of information. Such an overview is not readily available and takes time to acquire via online explorations, conference participations and dedicated study-sessions.

Contra Lyotard (see 3.4.1.), it can be argued that ‘perfect information’ is an utopian dream and that experience, *Bildung*, and disciplinarity remain indispensable partners in this type of work: 1/ without focused and discipline-specific information-production, the notion of extra-disciplinarity is pointless; 2/ without discipline-specific questions and information-eagerness, the opportunity of a productive dialectic between various realms of imperfect information vanishes; and 3/ without *Bildung*-elements such as proficiency in foreign languages or basic epistemic awareness of the domain concerned, the information seeking process is limited *qua* depth, boundless *qua* volume and contingent *qua* selection. In our view, information literacy involves not only mere access to sources but also an epistemic compass, a general frame of reference²³⁵, basic language skills and an orientation with regard to where information is situated.

From a more generic perspective, psychologist Mihaly Csikszentmihalyi attests to the creative potential of crossing the boundaries of disciplinary domains but at the same time points to the scarcity of human attention as an important bottleneck. Csikszentmihalyi discerns two strategies in addressing this limitation: specialization (Csikszentmihalyi, 1996, p. 9) and selection. As far as the latter strategy is concerned, he observes that:

We remember and recognize only a few of the works of art produced, we read only a few of the new books written, we buy only a few of the new appliances busily being invented. Usually it is the various fields that act as filters to help us select among the flood of new information those memes worth paying attention to. A field is made up of experts in a given domain whose job involves passing judgment on performance in that domain. Members of the field choose to be included in the canon. (Csikszentmihalyi, 1996, p. 42)

Considering the inherent limits of attention and the ensuing strategies, Csikszentmihalyi further identifies several ways in which domains can help or hinder creativity via a cross-disciplinary information strategy. Three major dimensions are thereby relevant: the centrality of knowledge within a culture, the accessibility of knowledge to interested parties, and the clarity in which knowledge is structured. Csikszentmihalyi refers to the differential structure in the sciences and humanities to make

²³⁵ Only recently (Dec. 11th 2016) a Guardian journalist demonstrated the weaknesses of merely information access. When she googled “did the holocaust happen?”, she received top answers that deny its occurrence. <https://www.theguardian.com/commentisfree/2016/dec/11/google-frames-shapes-and-distorts-how-we-see-world>

his point with regard to the conditions of structure that need to be in place in order to facilitate cross-disciplinary fertilization.²³⁶

Mathematical genius peaks in the twenties, physics in the thirties, but great philosophical works are usually achieved later in life. The most likely explanation for these differences lies in the different ways these domains are structured. The symbolic system of mathematics is organized relatively tightly; the internal logic is strict; the system maximizes clarity and lack of redundancy. Therefore, it is easy for a young person to assimilate the rules quickly and jump to the cutting edge of the domain in a few years. [...] By contrast, it takes decades for social scientists or philosophers to master their domains, and if they produce a new idea, it takes the field many years to assess whether it is an improvement worth adding to the knowledge base. (Csikszentmihalyi, 1996, p. 38)

From these general considerations combined with personal observations, it can be inferred that, for a project such as GIP, creating a conceptual space is only a starting-point that is in need of a professional and supportive context in which the limits of human attention are respected and where it can effectuate its true accumulative potential. Such a context requires crucial elements such as:

1. A further assessment of new, 21st century opportunities within the larger framework of a knowledge-centred Information Age, where GIP can position its role as an innovative concept.
2. An educational project that fosters an informational attitude and information literacy in terms of epistemic horizon, information eagerness, awareness of boundary objects and disciplinary territories.
3. A research-space dedicated to GIP and to the integration of individual actions.
4. An understanding that allows for fruitful negotiation between practice and theory, between *Bildung* and information (akin to the space of convergence that we created between the field of imagination and information in this chapter).
5. A pragmatic musical ontology that is not structured in terms of metaphysical interventions and ineffable processes of genius but allows epistemic interaction with extra-disciplinary fields.
6. An information system grounded in artistic practice but oriented towards extra-disciplinary fields allowing for the storage, retrieval, and linkage of information.
7. Examples of GIP wherein musicians demonstrate how information works in their own practice.

It is believed that these conditions can be met in our time and that a renewed interest and explorative inquisitiveness should force itself on the agenda of musicians.

²³⁶ See also sociologists Basil Bernstein and Karl Maton for their notions of horizontal and hierarchical knowledge and knower structures (Bernstein, 1999; Maton, 2010).

In the next chapters, the requirements listed above will be examined sequentially and an attempt will be made at configuring an environment in which GIP or an actualised version of a *Gesamt-musiker* (Harnoncourt, 1982/2004) could thrive. In PART II the contextual elements 1 to 3 (mentioned above) will be addressed; PART III engages with the practical aspects 4 to 6; finally, in PART IV, examples of GIP will be presented.

PART II: Three facilitating contexts for a ‘Generally Informed Performership’

In PART I, we explored the conceptual space of an informed musicianship by examining both the historical and dispositional relations between the semantic fields surrounding information and imagination. We arrived at blending the two fields into the notion of an ‘informed performership’. In such a mode of performership, information has only a potential and indirect influence on artistic actions: information first impacts on the *Image* that musicians hold with regard to certain aspects of musical activity, and can then be brought into action to imagine possible worlds in an artistic sense, as well as to formulate solutions to cognitive gaps in a more craft-like, technical context. To counter the pleonastic inclination of an informed performership – performers are already intrinsically informed – a distinction between the sources of information was proposed as the factor that tells informed performership apart from ‘mere’ performership, and ‘historically informed’ performership. We concluded that an active interest in extra-disciplinary information (information that does not originate in musical practice and is not limited to history) should constitute that distinctive feature since such type of information is a weakly represented element in mainstream performership. To semantically integrate and stress that characteristic, ‘Informed Performership’ was extended into the working-concept of a ‘Generally Informed Performership [GIP]’.

In PART II, it is claimed that by a combination of circumstances at the dawn of the 21st century musicianship finds itself in a position that is conducive to effectuate the potential of such a generally informed and inclusive musicianship. The bottlenecks that seem to persistently hamper such a(n) (r)evolution are the object of investigation in PART III; in this part, three levels of circumstances are explored that seem to be supportive of an informative turn.

A first circumstance is to be situated at a historical and societal *macro*-level and relates to the idea that we are currently experiencing the wide-ranging impact of an Information Age. Since the term covers a broad spectrum of meanings, the discussion in Chapter 6 includes the specification of a heuristic device that allows a constructive and functional view on the Post-War informational developments and on the opportunities that these hold for music practitioners.

A second contextual element relates to the operational *meso*-level where certain general ideas, memes and tendencies (*in casu* ‘Information Age’ & ‘Knowledge Society’) are institutionally operationalized and vitalized. The establishment of the *European Higher Education Area* [EHEA] is an

action that initiated on the European continent a profound shift in terms of the epistemic and institutional context in which musicianship defines itself. It will be argued that the effectuation of an EHEA and the processes that enabled it, ushers in new possibilities for musicians and allows for a re-arrangement of three main historical currents that have developed quasi-parallel in the course of music's history: music as theory, music as ethical instrument, and music as art.

Finally, the context of facilitation is narrowed down to a specialized *micro*-level that came to the fore in the slipstream of the aforementioned societal tendencies and their institutionalisations, namely the framework of Artistic Research [AR]. Although it is claimed by some that this kind of inquisitive artistic behaviour has always been a part of musician's doings and sayings, the concept only touched firm ground at the beginning of this century. The inherent challenges that haunt the attempts to define Artistic Research lead our discussion into an alternative and functional approach based on the articulation of three research-languages and into the description of three archetypical modes of Artistic Research, with special attention to the informed mode.

Chapter 6: Macro-level – living in an Information Age

Although tradition, autonomy, genius, claims to divine inspiration, and inborn, individual talent are generally considered by the stakeholders of musical practice to be the natural, most powerful, and intrinsic engines that drive the history of musical practice, we already know from the analysis in the previous chapters that this perspective is historical contingent. It is a narrative built upon a particular (protectionist) perspective on man, world and society and this already indicates that in a more general sense, musicianship is by no means immune to macro-societal waves and the material and epistemic effects that these tendencies engender. Analyses in support of such an embedded relationship are readily available at a theoretical and analytical level in the sociology of art and music (Adorno, 1949/2006; Benjamin, 1936/2003; Bourdieu, 1993a; Weber, 1921/1958), and also palpable in musical practice itself each time musicians use scores (writing, external memory), modern instruments (industrial revolution), or digital technologies (informational turn).

The (seemingly) strong intrinsic connection between artistic practice and sociological thinking is not always valued accordingly. Sociologist Pierre Bourdieu makes the following provocative analysis with regard to the difficult relation between artistic practice and sociological investigation²³⁷:

Sociology and art do not make good bedfellows. That's the fault of art and artists, who are allergic to everything that offends the idea they have of themselves: the universe of art is a universe of belief, belief in gifts, in the uniqueness of the uncreated creator, and the intrusion of the sociologist, who seeks to understand, explain, account for what he finds, is a source of scandal. It means disenchantment, reductionism, in a word, vulgarity or (it amounts to the same thing) sacrilege: the sociologist is someone who, just as Voltaire expelled kings from history, wants to expel artists from the history of art. But it's also the fault of the sociologists, who have done their best to confirm received ideas about sociology, and especially the sociology of art and literature. (Bourdieu, 1984/1993a, p. 139)

Challenging Bourdieu's rather fatalist analysis and bringing the relationship between musicianship and society to our age, social theory offers more than a few 'turns' worthy of further reflection and exploration.²³⁸ Given our interest in the relation between artistic practice and information, the focus here is (evidently) on the changes that allowed for a productive explosion and global availability of information since the second half of the twentieth century. Today, the signs of this new age are clearly noticeable: the fact that we dispose of powerful search engines – ranging from *google* to the more specialised queries via the *Web of Science* – that digitally extend our informational hunting fields in an

²³⁷ I am indebted to Prof. dr. Henk Roose who brought this particular passage to my attention in the context docARTES-module 'crossing borders' in 2015.

²³⁸ In *the Control Revolution* (Beniger, 1986, pp. 4–5) the author identifies a multitude (more than 80) of societal transformations identified between 1950 and 1984 among which some of the most renowned are: post-industrial society, post-modern society, postliberal age.

unprecedented manner (even into areas that we were not initially interested in); the way in which questions can now be launched into cyberspace and thus potentially be addressed and discussed by a very large portion of humanity; the manner in which bookshops and libraries have transgressed their spatial and material boundaries; the spectacular increase in producing and publishing of specialised information accessible via an incalculable galaxy of media such as books, journals and podcasts. All these elements attest and indicate a novel way of living and interacting.

The term that somehow summarizes the aforementioned phenomena and which has been foregrounded as an influential societal marker of our era is the notion of an 'Information Age'. As defined by the OED the 'information age' is "the era in which the retrieval, management, and transmission of information, esp. by using computer technology, is a principal (commercial) activity"; a term closely linked and causally involved is the one of an 'information revolution' which indicates "the increase in the availability of information and the changes in the ways it is stored and disseminated that have resulted from the use of computers [...]".

This definitional approach hardly scratches the surface of a multifaceted concept which has been extensively discussed in sociological theory since World War II and seems to have found its ultimate destination nowadays as an umbrella-term, holding various meanings depending on the specific context in which it is used.²³⁹ It thereby overlaps with other concepts such as 'post-industrial society' (Bell, 1973), 'knowledge society' (Böhme & Stehr, 1986), 'network society' (Castells, 2010) and also implies a variety of derivative terms such as 'information overload', 'information anxiety', 'information architecture', and 'informed consent'. The information-buzz is clearly not a single thing but rather "a constellation of developments arising from the growing use of communication technologies in the acquisition, storage, and processing of information, and the role of information in supporting the creation and exchange of knowledge" (Mansell, 2009).

Next to the jubilant mood that the Information Age often incites, it is also important to indicate that the story of information is not all roses. *Information overload* is one well-known element of concern but besides that, there is also a concern related to *scientification*. The highly-valued 'objective' quality of information makes everyday life prey to powerful theoretical constructs which dictate, or at least influence, vital political, social-cultural and environmental decisions. Information has developed into a commodity that comes with a serious cost as it is considered to be the new oracle that is to be trusted in settling profound problems and challenges, thereby potentially disregarding personal nuances, freedom, values, particularities and possibilities.

²³⁹ In *Theories of the information society* (Webster, 2006), five definitions are proposed that are tied to technological, economic, occupational, spatial, cultural fields of human activity. In *a Dictionary of Sociology* (Scott & Marshall, 2009) an additional sixth 'analytically separate definitional criterium' is mentioned under the heading 'theory'; it refers to the process of *scientification* that will be discussed in 6.3.2.

Over- and re-viewing all the constituting factors of an Information Age is a task far beyond the scope of this investigation. Yet, to lend support to our overall claim that musicianship finds itself in a particular historical context in which epistemic inclusiveness seems to be a logical opportunity (a *Kairos*²⁴⁰-moment), a functional treatment of the main tenets is mandatory.

Hereafter, a historical context for our contemporary Information Age is sketched with a view to highlight the unique historical situation that presents itself to humankind; the historical outline is followed by a more detailed perspective on the ‘constellation of developments’ as suggested by Mansell (2009); a critical assessment of musicianship in the age of information concludes this chapter.

6.1 The Information Age: a unique historical opportunity?

Although the computer-based Information Age is often described as it were something completely new, our current dealings with information are closely linked to patterns of thinking and practices that go back for centuries. Examples of such deeply engrained informational dispositions are: 1/ a drive for knowledge, deep understanding, and certainty (Aristotle, 1924; Dewey, 1929); 2/ an eagerness to share and communicate knowledge and experience; 3/ the developing of tools (speech, writing) and technologies to convey recorded knowledge over distance and through time (media such as the clay tablet, papyrus and paper); 4/ the coping with information overload via a process of storing, sorting, selecting, classifying, transforming, and summarizing (Blair, 2010); and 5/ the yearning for a universal language, long before computer language gives concrete expression to it (Mattelart, 2003, pp. 2–3).

In Chapter 4 (4.1), we cited Pfeiffer’s work wherein the author situates the ‘formal’ onset of the information age in pre-literate cave-art societies and in the human need to create a means by which knowledge can be offloaded to an external and attention- and emotion-sensitive memory (Pfeiffer, 1982; Pfeiffer, 1983). Hobart & Schiffman (2000) seem to disagree with Pfeiffer’s analysis and in turn discern three distinctive information ages while considering literacy as the essential condition for igniting informational activities. The three ages they observe coincide with fundamental shifts in terms of human information and communication: *the classical age of literacy, the modern age of numeracy, and the contemporary age of computers*²⁴¹.

According to the authors, the *classical information age* is marked by the rise of literacy and the transition from an oral, narrative, and commemorating tradition to a written one: “a fundamental difference exists between the oral process of abstraction and literate ones, namely that the oral

²⁴⁰ Kairos [Καιρός] is in Greek mythology the personification of opportunity, the right moment to do something.

²⁴¹ The first two ages correspond roughly with the two first forms of life that were presented in Chapter 1 with an extension into the third life; the last age can be linked to the fourth life (including a part of the third life). The history that Hobart & Schiffman present is not an etymological one however, they trace the evolution of the modern notion of information as communicable knowledge retrospectively.

process is participatory and unreflective”²⁴² (Hobart & Schiffman, 2000, pp. 27–28). They further argue that in this first information age and with the rise of external, written memory- and communication-technology, a classifying mind-set settles in which works under the assumption that all knowledge can be brought into a properly devised system of general and specific categories.

Following this first age, the invention of printing in the fifteenth century represents a fundamental shift into a second, *modern information age*, which is crucial in paving the way for the cultural explosion of the Enlightenment.²⁴³ It is the sheer availability of books and information generated by the print revolution which challenges traditional forms of classification and clears the way for new, more abstract, analytical and mathematical means of managing information. It is here that new institutions, techniques and formats begin to emerge with a view to furthering knowledge and enhancing the storage and communication of information. Characteristic innovations are: 1/ the publication of the first encyclopaedia²⁴⁴; 2/ the birth of the scientific academy and scholarly societies; 3/ a sphere of mutual learning via an exchange network of journals, books and pamphlets; and 4/ the creation of mathematically accurate geographical maps. The ‘Victorian information society’ in the 19th century adds to the modern information age an operational and technical level by the invention and innovation of critical new technologies such as the telegraph, telephone, postal service, mechanised printing, the publishing industry, and publicly funded ‘memory institutions’ such as libraries, museums and art galleries (Black, Muddiman & Plant, 2007, p. 11). The general context is one of establishing a ‘public sphere’ based on the accumulation of knowledge via science rather than on growing toward personal wisdom which was the ultimate target of the previous age.

Finally, in our *contemporary information age*, communication technologies move onto higher technological and popular planes, with the development of film, radio and television. Paradoxically enough, the increase of information and communication seems to go hand in hand with an estrangement from the ‘real’ world. Although much of the developments in the 20th century are rooted

²⁴² Unreflective is used in the sense “that it does not foster a critical distance between knower and known” (Hobart & Schiffman, 2000, p. 28).

²⁴³ See also *The Gutenberg Galaxy, the making of typographic man* (McLuhan, 1962).

²⁴⁴ “*Par le moyen de l'ordre encyclopédique, de l'universalité des connoissances [sic] & de la fréquence des renvois, les rapports augmentent, les liaisons se portent en tout sens, la force de la démonstration s'accroît, la nomenclature se complète, les connoissances se rapprochent & se fortifient; on apperçoit ou la continuité, ou les vides de notre système, ses côtés faibles, ses endroits forts, & d'un coup - d'œil quels sont les objets auxquels il importe de travailler pour sa propre gloire, & pour la plus grande utilité du genre humain. Si notre Dictionnaire est bon, combien il produira d'ouvrages meilleurs?*” (Diderot & d'Alembert, 1751).

“Thanks to encyclopaedic ordering, the universality of knowledge, and the frequency of references, the connections grow, the links go out in all directions, the demonstrative power is increased, the word list is complemented, fields of knowledge are drawn closer together and strengthened; we perceive either the continuity or the gaps in our system, its weak sides, its strong points, and at a glance on which objects it is important to work for one's own glory, or for the greater utility to humankind. If our dictionary is good, how many still better works it will produce” (Diderot & d'Alembert, 1755/2002).

in numeracy and quantification (as in the modern age), the mathematical imagination reaches increasingly abstract universes and stimulates an analytical vision that further alienates itself from the material world it is supposed to represent. In this third information age, analysis and mathematics become a quasi-autonomous practice, manipulating symbols according to fixed, logical rules. This purified technique of analysis is implemented in the electronic circuits of the digital computer, leading to the contemporary ICT-idiom. Hobart & Schiffman (2000) argue that these technologies “have fostered a new form of knowing based on the idea of emergence, which describes how certain complex, natural systems continually adapt themselves to their environment. Unlike the analytical vision, this new form of knowing is expansive rather than reductive and open-ended rather than closed (Hobart & Schiffman, 2000, p. 6).

Without aiming at arbitrating between Pfeiffer’s and Hobart & Schiffman’s apparent disagreement regarding the onset of the information age (in a wider sense) and the evolution of information, we may infer that potentially an infinite regression to the earliest forms of communication is conceivable with regard to the origins of an informational attitude and that the evolution of information is rather a matter of degree and increasing facilitation than one of genuine quantum-leaps. Within such an evolving and trans-historical framework, it is useful to discern at least three general trends that seem to have culminated in our *contemporary information age*: reflection, abstraction and displacement.

A first development constitutes a continuous and cyclical process of *reflection* that is directed at examining and manipulating the information that becomes available when it is freed from experience. Reflection here means “the natural propensity of the mind to rework and reshape the products of its own creation, to see its own abstractions from a critical perspective as the objects of further study, analysis, and organization” (Hobart & Schiffman, 2000, p. 266).

A sequence of ever-growing *abstraction* is a second element: the classifying impulse of the *classical age* remains very much rooted in the senses, which provide direct access to reality; the analytical impulse of the *modern age* is already a step further removed from that reality by the translation of the phenomena into a new language of mathematical symbols; in our *contemporary age*, the analytical impulse is yet farther removed from reality which is now rendered digitally as a non-semantic coded sequence of zeros and ones. Then again, the abstract, disembodied and non-situated quality of information constitutes also the attractiveness of information as a universal *trait d’union* between distinctive fields.

Thirdly and finally, new ways of making sense of the world *displace* or *surpass* old ones. While the old idioms continue to develop, “the process of displacement shifts attention from one set of concerns and phenomena to another, as each information age coalesces around its own distinctive set of questions, absorbing and recasting what it can from its predecessors, pushing aside as irrelevant what lies beyond its own cultural ken” (Hobart & Schiffman, 2000, p. 7).

Considering these inherent inclinations, we may conclude that the uniqueness of our contemporary information age, which will hereafter be denoted as Information Age (capitalized), is not so much related to a sudden interest in information but rather to a technological and sociological context in which the mechanics of information blossom and by that, allow for new communicative and epistemic configurations.

6.2 The Information Age: a constellation of developments

Looking beyond a macro-historical logic – as it is claimed by Hobart and Schiffman (2000) – the Information Age, is in its concrete mechanics linked to an intricate web of technological innovations and seminal theoretical insights that engender important economic and social transformations in the second half of the twentieth century. Sociologist Armand Mattelart (2003) – who uses the terms ‘Information Society’ and ‘Information Age’ interchangeably – summarizes the elements of the web as follows:

The notion of the information society took formal shape in the wake of the invention of artificial intelligence machines during the Second World War. It became a standard reference in academic, political and economic circles from the 1960s. The manufacture of a world of images related to the ‘information age’ continued apace throughout the following decade. The true geopolitical meaning of the neologisms created at the time to designate the new society would not come to light until the eve of the third millennium, with the proclamation of what is usually called the ‘information revolution’ and the arrival of the Internet as the new public-access network. (Mattelart, 2003, p. 2)

A more extensive, chronological selection of key contributions to the Information Age is listed in Appendix 10. The list contains: 1/ an overview of the technological inventions (grey background with black characters); 2/ seminal publications with their key contribution(s), the disciplinary field from which they emerged and the vocabulary that is being promoted with regard to describing a new societal situation; and 3/ elements of a more criticizing nature (grey background with white characters). An initial look at the sequential list of events confirms that the information-virus took root in a physics-mathematics-engineering environment and gradually extended its scope by affecting and receiving empowerment from a vast array of academic disciplines in the course of the 20th century with applications in e.g. biology, psychology, music theory, economics, sociology, public policy. The terms that figure in the titles and descriptions of the key contributions are wide-ranging and next to a clear focus on knowledge and information, we find powerful notions such as control, feedback, learning, communication, memory, expectation, meaning, objectivity, personal (knowledge and computers), industry, creativity, decision-making, ideology, action and society.

A more systematically ordered approach to the Information Age theme is provided by sociologist Frank Webster in *Theories of the Information Society* (Webster, 2006). Webster presents five definitions that

are tied to various fields of human activity: a technological, economic, occupational, spatial, cultural definition (Webster, 2006).²⁴⁵

- At the basis of the technological approach is the futurist-inspired view that the technological innovations since the 1970s (such as computers and communication networks) have engendered profound changes in society comparable to the agricultural and industrial innovations that preceded what is called ‘the third wave’ (see Toffler, 1980).
- The economic view on the information society measures the state of informatization in a society by the size of its information labour force and part it is taken up in relation to *Gross National Product* (see Machlup, 1962).
- Daniel Bell’s theory of post-industrialism has been seminal in acknowledging that occupations have undergone an important shift in terms of focus and outcome. The focus of information workers in post-industrial societies is not on producing a manually factored object but rather on the production, analysis, and communication of knowledge resulting in a changed condition or world view (see Bell, 1973).
- The spatial approach to informatization holds that the networks along which information flows are responsible for creating a network society and real-time communication around the globe (see Castells, 1996).
- The cultural view finally holds that “contemporary culture is manifestly more heavily information-laden than its predecessors. We exist in a media-saturated environment which means that life is quintessentially about symbolisation, about exchanging and receiving – or trying to exchange and resisting reception – messages about ourselves and others” (see Webster, 2006, p. 20).

Webster considers all these perspective as contributing to the concept of the ‘Information Society’. However, taking into account the variations in vocabulary used in other sources and for the sake of overview and pragmatic ordering, we propose to integrate the chronological fragments and their domains of impact into a systematic heuristic device as presented in Fig. 6.1.²⁴⁶

The term ‘Information Age’ – and not ‘Information Society’ – is used here as the central attractor²⁴⁷ and umbrella term in a web of parallel languages²⁴⁸ that are characteristic for this particular field of

²⁴⁵ In *A Dictionary of Sociology* (Scott & Marshall, 2009) an additional sixth ‘analytically separate definitional criterium’ is mentioned under the heading ‘theory’; it refers to the process of scientification that will be discussed under the heading of a ‘knowledge society’.

²⁴⁶ Although the conceptual terminology as it is used in Fig. 6.1 is firmly grounded in the scholarly discourse that circumvents the information *topos*, it is pragmatic in its aim and is not claiming any universal or scholarly consensus.

²⁴⁷ The term ‘attractor’ here is borrowed from dynamic systems and chaos theory but used in a generic and non-technical way. The technical definition of an attractor is “an equilibrium state (or collection of states) to which a system evolves over time. When the system gets close enough to an attractor, it will remain close even if slightly perturbed. A system may have multiple attractors, each with its own region of attraction” (Clapham & Nicholson, 2014). Within our context it simply refers to the emergence of one or more super-concepts within a field of initial undisciplined and non-linear activity or inquiry.

²⁴⁸ Basil Bernstein claims that the humanities and the social sciences are characterized by horizontal knowledge structures that consist of “a series of specialised languages with specialised modes of interrogation and criteria for the construction and circulation of texts” (Bernstein, 1999, p. 162) and that “it is possible that the

scholarship. It is a term that allows for macro-historical considerations, epitomizes the importance of information in our age but also allows for the logics of pre-industrial, industrial and information societies to live side by side (Karvalics, 2009, p. 25). Contributing to the Information Age are four areas of development linked to four disciplinary fields: 1/ 'Inventions' – information technology; 2/ 'Communication & Control' – information theory; 3/ 'Access and Distribution' – information science; and 4/ 'Economy and Society' – information society studies²⁴⁹. Finally, the concept of 'knowledge society' is preserved for a higher order situation in which information as commodity is related to a user who is able to act upon that information and where more specifically scientific knowledge is a privileged factor penetrating all spheres of society (Böhme & Stehr, 1986, p. 8). We will elaborate counter-clockwise on these domains of the Information Age.

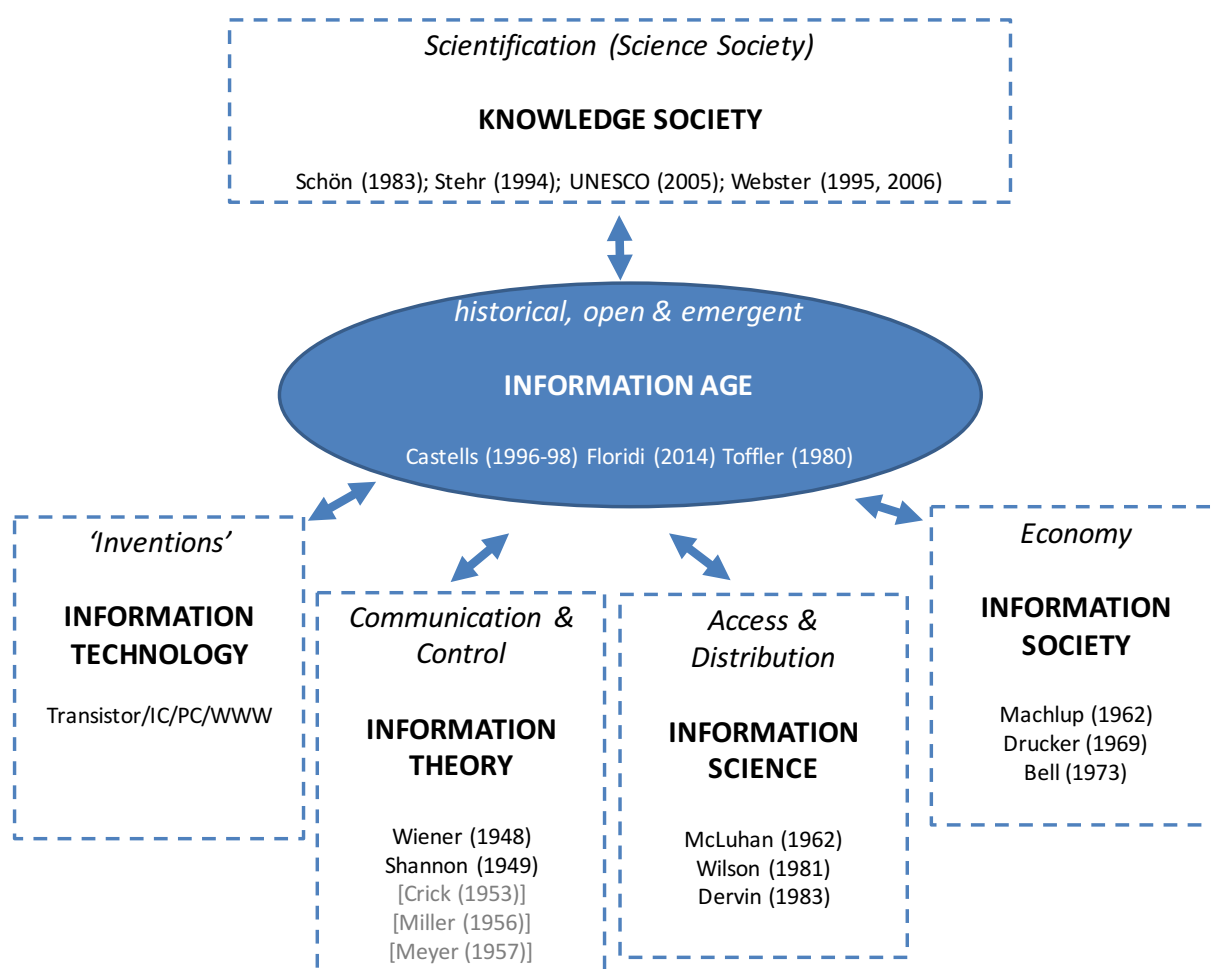


Figure 6.1. The domains that characterize the Information Age.

languages of horizontal knowledge structures, especially those of the social sciences, have an inbuilt redundancy" (Bernstein, 1999, p. 166).

²⁴⁹ I am indebted here to information scientists James Dearnly's & John Feather's useful and disciplinary-based distinction between information theory, information science and information society (Dearnley & Feather, 2001).

6.2.1 'inventions'

When asked which moment from the past he would like to visit if the means of transport could be magically provided, computer-icon Bill Gates comes up with the following answer:

My first stop on this time-travel expedition would be the Bell Labs in December 1947 to witness the invention of the transistor. It was a key transitional event in the advent of the Information Age. [...] Without the invention of the transistor, I'm quite sure that the PC would not exist as we know it today. (Gates, 1996)

In *Crystal Fire, the invention of the transistor and the birth of the information age* (Riordan & Hoddeson, 1998) and in 'The invention of the transistor' (Riordan, Hoddeson, & Herring, 1999), the creation of the transistor is recounted. Seconding Gates, the authors grant the invention of the transistor the title of most important invention of the past century and consider it as a prime example of how basic, scientific research can lead to useful commercial products. The transistor emerges in 1947 from a Bell Telephone Laboratories program of basic research on solid state physics and starts to replace the use vacuum tubes in the 1950s; it eventually spawns the integrated circuit and microprocessor which are at the heart of a semiconductor industry today. Considered as the 'nerve cells' of the Information Age, transistors conform to the logic of the switch, to be or not to be, and yes- and no answers. It is a logic already in place in the nineteenth century when mathematician George Boole states that "in virtue of the principle, that a proposition is either true or false, every elective symbol employed in the expression of hypotheticals admits only of the values 0 and 1, which are the quantitative forms of an elective symbol" (Boole, 1847, p. 82). By the invention of the transistor and its proliferative potential, this simple and reductive logic is allowed to infiltrate into very complex phenomena. The transistor acts then as an external nerve system where the human neural system of excitation and inhibition is replaced by binary codes leading to an enormous (potential) extension of human computation, memorization and communication capacities²⁵⁰. The promise of the transistor is fully implemented with the realisation of the integrated circuit [IC] in 1958 which really sets in motion the digital age as we live it today (Reid, 2001). An IC, or microchip, is a set of electronic circuits on one small piece of semiconductor material (silicon) which replaces the more voluminous discrete circuits made from independent electronic components. Over the past half century, the size, speed, and capacity of chips has increased enormously allowing a computer chip of 2016 to have a million times the capacity and a thousand times the speed of the initial computer chips of the early 1970s.

²⁵⁰See also: "We have extended our central nervous system itself in a global embrace, abolishing both space and time as far as our planet is concerned. Rapidly, we approach the final phase of the extensions of man-- the technological simulation of consciousness, when the creative process of knowing will be collectively and corporately extended to the whole of human society, much as we have already extended our senses and our nerves by the various media" (McLuhan, 1964/1994, p. 3-4).

A next step in the technological information revolution is the development of Personal Computers in the late 1970s. Computer pioneer Alan Turing imagines in a 1936 paper a machine that undertakes a limited range of calculations (Turing, 1937), but is unable to construct such a machine at the time. Under the pressure of war, the idea of computation is revived and is materialized. Throughout the 1950s and into the 1960s, the first (physically huge) computers are still reserved for laboratory scientists (often in military-related research institutes), but thanks to the invention of the transistor and the integrated circuit, computers become smaller, quicker and, cheaper, eventually leading to the microcomputer or Personal Computer. These wonders of technology make their way into our homes at the end of the 20th century and become indispensable extensions of the human mind. Next to the increase of computing capacity via microcomputers, the development of communication systems which allow these machines to interact is probably still of greater importance. *HyperText*, as a system that can switch between documents, is transformed into the ability to switch between different computers and enables the step toward global connectedness. In a 1990 proposal WWW-pioneers Tim Berners-Lee and Robert Cailliau elaborate on the concept of *HyperText* and by that pave the way for the ultimate operationalisation of the WorldWideWeb in 1992:

HyperText is a way to link and access information of various kinds as a web of nodes in which the user can browse at will. Potentially, HyperText provides a single user-interface to many large classes of stored information such as reports, notes, data-bases, computer documentation and on-line systems help. We propose the implementation of a simple scheme to incorporate several different servers of machine-stored information already available at CERN, including an analysis of the requirements for information access needs by experiments... A program which provides access to the hypertext world we call a browser.²⁵¹

With the advent of the *WorldWideWeb* the human condition with regard to the availability and accessibility of information changes spectacularly and is still on a course of expansion and increasing applicability. In 1997 two doctoral students at Stanford-university, Larry Page and Sergey Brin, add to the massive volume of information a powerful search engine and name it *Google*. Their idea is that cyberspace possesses a form of self-knowledge situated in the links from one page to another, and that a search engine is needed to exploit this knowledge. In 1998 'to Google' enters everyday language, first as an intransitive verb and since 2000 also as a more goal-oriented transitive activity (to search information about something or someone)²⁵². Search engines profoundly changes the ways in which we draw information from our global (both actual and historical) environment and are continuously increasing their semantic accurateness and practical field of application.

²⁵¹ <https://www.w3.org/Proposal.html>.

²⁵² OED.

6.2.2 Communication & control

Mathematician Claude Shannon's Mathematical Model of Communication (Shannon, 1948) already figured in the historical overview with regard to the dialectical relation between information and imagination in Chapter 3; the theory asserts that information is a measure of quantity, not meaning, and very strongly complies with the binary logic of the transistor. It is exactly this theoretical degree of abstraction and de-subjectification that allows engineers in the second half of the 20th century to imagine new techniques for manipulating data quasi-independently of human input. Shannon's contemporary mathematician Norbert Wiener (1894-1964) claims more generally and in relation to *cybernetics* (feedback-control) that "if the seventeenth and early eighteenth centuries are the age of clocks, and the later eighteenth and nineteenth centuries constitute the age of steam engines, the present time is the age of communication and control" (Wiener, 1948/1985, p. 39). Indeed, it seems that information theory and cybernetics record a paradigm-shift from one model or set of explanations for phenomena, to another:

"Energy – the notion central to Newtonian mechanics was now replaced by information. The ideas of information theory, such as coding, storage, noise, and so on, provided a better explanation for a whole host of events, from the behaviour of electronic circuits to the behaviour of a replicating cell. One reason for this is that the old Newtonian mechanics had dealt with closed, conservative systems, while the information-theory model could deal with open systems, that is, systems coupled to the outside world both for the reception of impressions and for the performance of actions, and where energy is simply not the central issue. (McCorduck, 1979, pp. 42–43)

It is this idea of an objective openness and interconnectedness based on a simple binary logic which in synergy with the technological evolutions opens the doors for a new epistemic situation in the twentieth century.

6.2.3 Access and distribution

The consequences of an information flood (Gleick, 2011) were already palpable well before our time. In the mid-18th century, for instance, Denis Diderot (1713-1784) announces an information explosion in the *L'Encyclopédie ou Dictionnaire raisonné des Sciences, des Arts et des Métiers* (1751-1752):

As long as the centuries continue to unfold, the number of books will grow continually, and one can predict that a time will come when it will be almost as difficult to learn anything from books as from the direct study of the whole universe. It will be almost as convenient to search for some bit of truth concealed in nature as it will be to find it hidden away in an immense multitude of bound volumes.²⁵³ (Diderot & d'Alembert, 1755/2002)

²⁵³ The original text in French is available via

<http://artflsrv02.uchicago.edu/cgi-bin/philologic/getobject.pl?c.4:1252.encyclopedie0513>: "Tandis que les siècles s'écoulent, la masse des ouvrages s'accroît sans cesse, & l'on prévoit un moment où il serait presque aussi

With the coincidence of technological and theoretical progress in the mid-twentieth century Diderot's prediction is generously surpassed and a transition from a *Gutenberg Galaxy* to a *Global Village* is effectuated (McLuhan, 1962). Within this context of global connectedness, the issue of *information overload* grows into an eminent factor which the integrated field of *Library and Information Sciences* [LIS] addresses by enquiring the encounters between a human brain – with all its inherent limits with regard to attention and memory – and a multitude of information:

[...] in an information-rich world, the wealth of information means a dearth of something else: a scarcity of whatever it is that information consumes. What information consumes is rather obvious: it consumes the attention of its recipients. Hence a wealth of information creates a poverty of attention and a need to allocate that attention efficiently among the overabundance of information sources that might consume it. (Simon, 1971, pp. 40–41)

Information overload is an essential concern today to information managers and architects. Addressing the phenomenon generally involves three interrelated fields: 1/ trying to structure information from the supply-side; 2/ attempting to understand the concerns and interests of the information-user; and 3/ constructing architectures and systems to negotiate between the former two domains, between information opportunity and overload (Wilson, 1981)²⁵⁴.

Next to this challenge of overload, the explosion of information access facilities also prompts other profound consequences. When communication theorist Marshall McLuhan advances the notion of a *Global Village* as a sequel to a print-oriented *Gutenberg Galaxy*, he states that: “the new electronic interdependence recreates the world in the image of a global village” (McLuhan, 1962, p. 31). It is remarkable how in McLuhan's phrase ‘electronic interdependence’ takes over the role of Plato's *Demiurge* in creating the world (see 3.1.2.1), and how the image of a global village becomes the eternal Idea on which creation is based. Moreover, McLuhan attaches to the concept of globalization also the idea of inescapable participation:

In the electric age, when our central nervous system is technologically extended to involve us in the whole of mankind and to incorporate the whole of mankind in us, we necessarily participate, in depth, in the consequences of our every action. It is no longer possible to adopt the aloof and dissociated role of the literate Westerner. (McLuhan, 1964/1994, p. 4)

In *La Condition Postmoderne: rapport sur le savoir* (1979/1984), Lyotard implicitly follows up on this topic and observes that by making knowledge accessible to the layman via information technologies,

difficile de s'instruire dans une bibliothèque, que dans l'univers, & presque aussi court de chercher une vérité subsistante dans la nature, qu'égarée dans une multitude immense de volumes; il faudrait alors se livrer, par nécessité, à un travail qu'on aurait négligé d'entreprendre, parce qu'on n'en aurait pas senti le besoin” (Diderot & d'Alembert, 1751-1772).

²⁵⁴ See Chapter 1.

grand narratives of centralized structures and groups are being destabilized. In the postmodern era, people will learn in different and less structured ways leading to a new way of knowing and learning in the postmodern era²⁵⁵:

We may thus expect a thorough exteriorisation of knowledge with respect to the “knower,” at whatever point he or she may occupy in the knowledge process. The old principle that the acquisition of knowledge is indissociable from the training (*Bildung*) of minds, or even of individuals, is becoming obsolete and will become ever more so. (Lyotard, 1979/1984, p. 4)

According to Lyotard, knowledge will no longer be transmitted *en bloc* but will be served *à la carte* to adults for the purpose of improving their skills and chances of promotion, but also to help them acquire information and languages that allow them to widen their occupational horizons and to articulate their technical and ethical experience (Lyotard, 1979/1984, p. 49). Therefore, competencies related to information retrieval will displace traditional conceptions of knowledge; “data banks are the Encyclopedia of tomorrow” (Lyotard, 1979/1984, p. 51), says Lyotard in 1979. This state of universal access to information will undermine the truth claims of traditional elites (also in artistic practices) and lead to a state of liberation.

Basil Bernstein makes a similar observation almost a quarter of a century later and integrates the perspective on information and power in his pedagogical device and more in particular in an analysis regarding the transition from *collection codes* of educational knowledge transmission towards more *integrated codes* (Bernstein, 2003). In education, *collection codes* are characterised by well-insulated subject hierarchies (disciplines) within educational knowledge that reinforce the hierarchical nature of the authority relationships. In the case of the *integrated code*, the contentual elements of a curriculum stand in an open and less classificatory relation to each other: “where we have integration, the various contents are subordinate to some idea which reduces their isolation from each”. This in turn leads, according to Bernstein, to “a disturbance of existing authority structures” (Bernstein, 2003, p. 92) and a potential liberation.

In other studies however, it becomes increasingly apparent that the information revolution is not unswervingly leading to freedom, equal access and distribution, but that the information society is rather “a matter of differential (and unequal) access to, and control over, information resources” which results in an “indissociable relation between information/knowledge and power” (Robins & Webster, 1999, p. 89).

Information storage is central to the role of ‘authoritative resources’ in the structuring of social systems spanning larger ranges of space and time than tribal cultures. Surveillance — control

²⁵⁵ This postmodern approach to information is also present in philosopher Gianni Vattimo’s notion of the transparent society (Vattimo, 1991, 1989/1992).

of information and the superintendence of the activities of some groups by others — is in turn the key to the expansion of such resources. (Giddens, 1985/1992, p. 2)

It can be inferred then that an information flood is not only a matter of opportunity with regard to a fertilization or reorganization of our epistemic grounds, it is also a reason for concern and reflection. Floods have the intrinsic capacity to destroy and demolish, and in some cases, they do so in selective ways by which strongly build constructions get stronger to the detriment of the weaker parts (see Knowledge Society in 6.2.5).

6.2.4 Economy

With the term 'Information Society' the path is followed of the economic consequences that an information explosion engenders and more in particular the way in which the economic value of information replaces the older manufacturing and industrial paradigms.

[...] the Information Society is seen to be as different form Industrialism as the Industrial Society was from its predecessor, the Agricultural Society. In the industrial era people made their livings by the sweat of their brow and dexterity of their hands, working in factories to manufacture products. In contrast, in the Information Society livelihoods are increasingly made by the appliance and manipulation of information, be it in software design, branding or financial services, and the output is not so much a tangible thing as a change in image, relationship or perception.²⁵⁶ (Webster, 2004, p. 1)

Economist Fritz Machlup (1902-1983) publishes *The Production and Distribution of Knowledge in the United States* in 1962 and is one of the first authors²⁵⁷ to be concerned with the Information Society as an economic factor. Machlup analyses the relationship between the increasingly dynamic and interdependent processes of communication, computing, and knowledge production and how these can be developed and optimized in the service of the U.S. economy. The concept of an 'Information Society' is not explicitly used in his text because Machlup opposes against a semantic differentiation between knowledge and information. Instead, a generic working definition is proposed where 'knowledge' (or information) designates "anything that is known by somebody", and where 'production of knowledge' is concerned with "any activity by which someone learns of something he has not known before even if others have" (Machlup, 1962, p. 7-8). Within this intentionally broad range of knowledge²⁵⁸ Machlup distinguishes between five types of knowledge (Machlup, 1962, p. 21-

²⁵⁶ This last sentence strongly reminds us of the activity-based approach developed in chapter one: information is not a thing, but a change/difference in *Image*.

²⁵⁷ The collocation 'information society' as it is now used first emerges in Japanese social science(s) in the early 1960's. The Japanese version of the expression (*joho shakai, johoka shakai*) is first used informally and then appears in a number of publications (a.o. by futurist Yoneyi Masuda).

²⁵⁸ According to historian Benoît Godin (2010) Machlup's inclusive view on knowledge is strongly influenced by the contemporary perspectives of philosopher Gilbert Ryle and polymath Michael Polanyi on 'knowing how', personal and tacit knowledge (Polanyi, 1958; Ryle, 1949).

22): practical knowledge, intellectual knowledge²⁵⁹, small-talk and pastime knowledge, spiritual knowledge and incidental, unwarranted knowledge.

Defining knowledge as composed of all these kinds of sub-knowledges is only the first aspect of Machlup's approach. In a second instance, knowledge is looked at in terms of production and distribution, or how it is used and communicated. Again, Machlup is very inclusive and down to earth qua production modalities and also on a par with the view on information as activity that we discussed earlier in Part I:

Where the result of the knowledge-producing activity is upon the actor's own mind, that activity will typically be watching, listening, reading, experimenting, inferring, intuiting, discovering, inventing, or (often also in connection with received messages) interpreting, computing, processing, translating, analysing, judging, evaluating—to give an illustrative, not an exhaustive, list. Where the result is upon someone else's mind, the activity by which it is produced will typically be talking, writing, typing, printing, motioning, gesturing, pointing, signalling, but also drawing, painting, sculpturing, singing, playing, or performing in any other visible or audible way. (Machlup, 1962, p. 30)

According to the degree to which the messages delivered by a person differ from the messages he has previously received, Machlup distinguishes several types knowledge-producers (Machlup, 1962, pp. 32–33)²⁶⁰ which are indicative for the levels of processing that information can undergo.

- A *transporter* will deliver exactly what he has received, without changing it in the least.
- A *transformer* changes the form of the message received, but is not supposed to change its contents.
- A *processor* changes both form and contents of what he has received, but only by routine procedures which subject different pieces of knowledge received to certain operations, such as combinations, computations, or other kinds of rearrangements, leading to definite results.
- An *interpreter* changes form and contents of the messages received, but has to use imagination to create in the new form effects equivalent to those he feels were intended by the original message; for example, the translator of a subtle speech or sensitive poetry in a foreign language.
- An *analyser* uses so much of his own judgment and intuition in addition to accepted procedures, that the message which he communicates bears little or no resemblance to the messages received.
- An *original creator*, although drawing on a rich store of information received in messages of all sorts, adds so much of his own inventive genius and creative imagination, that only

²⁵⁹ This category satisfies intellectual curiosity, a part of liberal education, humanistic and scientific learning and general culture; acquired, as a rule, in active concentration with an appreciation of the existence of open problems and cultural values. 'Music', 'Poetry and Drama', 'Fine Arts' are listed alongside 'Science' in this category (Machlup, 1962, p. 214).

²⁶⁰ These distinctions are in fact based upon a differential relation between information and imagination and the modes of imagination as discussed in Chapter 1.

relatively weak and indirect connections can be found between what he has received from others and what he communicates.

Machlup envisages four domains in which knowledge – as defined above - is produced: education, research and development, communication and information services, and with these wide-ranging categories of the knowledge industry as a heuristic basis, Machlup comes with some interesting national statistics with regard to that particular type of industry: 1/ the aggregate knowledge production (in 1962) makes up 29% of the adjusted Gross National Product (GNP); 2/ the rate of growth is projected at 2.5 times the average growth rate of other components of the total GNP, and knowledge production would soon reach 50% of the GNP; an 3/ the total civilian labour force engaged in knowledge-producing activities will be equal to 31.6% in 1969, and if full-time students of working age are added, the total labour force will be equal to 42.8% of the population.

Machlup's ground-breaking work leads to publications by a series of ensuing publications. In 1969, management consultant Peter Drucker, in his best-selling book *The Age of Discontinuity*, writes a section on 'The Knowledge Society', based upon Machlup's data and projections. Drucker predicts rightfully that, by the late 1970s, the knowledge sector will account for one half of the GNP. He also introduces the notion of knowledge worker: "Whilst the *Grosstadt* was founded on the industrial worker, the megalopolis is founded on, and organized around, the knowledge worker, with information as its foremost output as well as its foremost need" (Drucker, 1969, p. 32). Sociologist Daniel Bell is credited for effectively coining the term 'Information Society' which he uses interchangeably with the notion of a 'Post-Industrial Society'. Bell is interested in the effects of computer-based knowledge production in post-World War II industrial economies. In *The Coming of Post-Industrial Society* (Bell, 1973), he argues that the growing centrality of information and knowledge produces a new society, one that develops beyond the 18th-century model based on industrial fabrication. The intangible and immaterial processes of 'information' and 'knowledge' in the production of services constitutes the central processes of the evolving Information Age. Moreover, Bell argues that through knowledge technologies the main constitutive axis of an information society is based on theoretical knowledge, where the new dynamics of innovation are increasingly derived from a new relationship between science and technology.

6.2.5 Knowledge Society

With Bell's remark on the domination of theory in a Post-industrial society we enter the domain of a 'knowledge society'. An attempt to differentiate between knowledge and information societies is explicitly present in an influential 2005 UNESCO-document entitled *Towards Knowledge Societies*.

There it is stated that “the idea of the information society is based on technological breakthroughs”, whereas, “the concept of knowledge societies encompasses much broader social, ethical and political dimensions [...] Various forms of knowledge and culture always enter into the building of any society, including those strongly influenced by scientific progress and modern technology. It would be inadmissible to envisage the information and communication revolution leading – through a narrow, fatalistic technological determinism – to a single possible form of society” (UNESCO, 2005, p. 17). Further in the document we find an even sharper delineation and hierarchy of terms:

Knowledge societies are not limited to the information society. The rise of a global information society spawned by the new technology revolution must not overshadow the fact that it is valuable only as a means to achieve genuine knowledge societies. The growth of networks alone will not be able to lay the groundwork for the knowledge society. While information is a knowledge-generating tool, it is not knowledge itself. Emerging from the desire to exchange knowledge by making its transmission more efficient, information remains a fixed stabilized form of knowledge. (UNESCO, 2005, p. 19)

It is clear from this text that Machlup’s initial, unitary approach with regard to information and knowledge is overruled here. Information is now considered to be a means to an end, it is a knowledge-generating tool that lives primarily by its capacity to exchange and transmit. But information is not an innocent and neutral commodity for exchange and transmission, it holds a strong controlling and authoritative power that needs restraining and subjecting to human judgement and interpretation:

Instead of controlling it, many people will realize that it is controlling them. An excess of information is not necessarily the source of additional knowledge. [...] In knowledge societies, everyone must be able to move easily through the flow of information submerging us, and to develop cognitive and critical thinking skills to distinguish between “useful” and “useless” information. Useful knowledge is not simply knowledge that can be immediately turned into profit in a knowledge economy – “humanist” and “scientific” knowledge each obey different information-use strategies. (UNESCO, 2005, p. 19)

Notwithstanding this plea for a broad knowledge-spectrum that counterbalances the power and abundance of (objective) information, a knowledge society is in the scholarly literature for the greater part identified with a society in which theoretical knowledge occupies a pre-eminent place:

The theme which unites what are rather disparate thinkers is that, in this information society (though the term ‘knowledge society’ may be preferred, for the obvious reason that it evokes much more than agglomerated bits of information), affairs are organised and arranged in such ways that theory is prioritised. (Webster, 2006, p. 28)

Sociologist and historian Daniel R. Headrick (2000) situates the seeds for a state of affairs in which theory takes priority in settling practical problems in the eighteenth century and links it to a spirit of progress that motivated educated people to apply knowledge and reason to politics and business: “more knowledge would lead to the betterment of humankind” (Headrick, 2000, p. 12). There is a rich

vocabulary available describing the situation generated by the dominance of theory. Political scientist Robert E. Lane (Lane, 1966, p. 650) defines the term 'knowledgeable society' as a society where its members: 1/ inquire into the basis of their beliefs about man, nature, and society; 2/ are guided (perhaps unconsciously) by objective standards of veridical truth, and, at the upper levels of education, follow scientific rules of evidence and inference in inquiry; 3/ devote considerable resources to this inquiry and thus have a large store of knowledge; 4/ collect, organize, and interpret their knowledge in a constant effort to extract further meaning from it for the purposes at hand; and 5/ employ this knowledge to illuminate (and perhaps modify) their values and goals as well as to advance them (Stehr & Ericson, 1992, p. 4).

Learning theorist Donald Schön (1930-1997) famously challenges the model of 'technical rationality' and evidence-based practice as the dominant epistemology of practice in *The Reflective Practitioner* (Schön, 1983):

According to the model of Technical Rationality – the view of professional knowledge which has most powerfully shaped both our thinking about the professions and the institutional relations of research, education, and practice – professional activity consists in instrumental problem solving made rigorous by the application of scientific theory and technique. (Schön, 1983, p. 21)

Philosopher Gernot Böhme and cultural scientist Nico Stehr employ the term 'scientification' to refer to the same phenomenon:

Science and technology are going to penetrate and change the realm of jurisdiction, education, and administration, as they already have done with realms of production and transport.[...] This process has also been called a 'colonization of the life-world'. In fact, scientification not only means that certain aspects of our life are made a subject of research, but also a gradual transformation of the life-world and the realm of social action which makes scientific concepts and technological procedures applicable. [...] Scientification of architecture means that this occupation, traditionally considered to be something between art and craftsmanship, is being transformed by the introduction of science and technology. (Böhme & Stehr, 1986b, p. 125-126)

In a follow-up publications, Stehr prefers the term 'scientization' to refer to a knowledge society based on the penetration of all its spheres of life by scientific knowledge and the displacement of other forms of knowledge by scientific knowledge (Stehr & Ericson, 1992, p. 6).

Finally, the notion of 'applied science' also fits within the contours of a knowledge society. It is the image whereby scientists gather knowledge and create theories, and engineers apply that knowledge in order to design artefacts. Although the applied-science-view is often practically useful or even indispensable, it does not lead to new knowledge about the world (Vermaas, 2011, p. 55).

Given these differential interpretations of the concept of a knowledge society it is reasonable to use in this domain the term 'knowledge society' for a societal situation that allows a variety of knowledges (tacit, personal, reflective, intuition), and use the term 'science society' in cases where it explicitly refers to a process of 'scientification'.

6.2.6 *The Information Age: emergent, historical and open*

The notion of an Information Age is presented in Fig. 6.1 as an umbrella term that brings the aforementioned domain-aspects together and characterizes an era in which the retrieval, management, and transmission of information, especially by using computer technology, is a principal activity. The term seems to be at least vacant for the job:

We grope for words to describe the full power and reach of this extraordinary change. Some speak of a looming Space Age, Information Age, Electronic Era, or Global Village. [...] I myself have written extensively about the arrival of a "super-industrial society." Yet none of these terms, including my own, is adequate. (Toffler, 1980, p. 10)

Sociologist Manuel Castell's trilogy gave an important impetus to the generic use of the concept of an Information Age (Castells, 1996, 1997, 1998) but his choice of wording with regard to the title for his masterpiece is only briefly and pragmatically justified in a footnote:

Titles are communicating devices. They should be user-friendly, clear enough for the reader to guess what is the real topic of the book, and worded in a fashion that does not depart excessively from the semantic frame of reference. Thus, in a world built around information technologies, information society, informatization, information superhighway [...], and the like, a title such as *The Information Age* points straightforwardly to the questions to be raised, without prejudging the answers. (Castells, 1996/2010, p.21, note 31)

With this terminological license in mind and within the aforementioned conceptual configuration the term 'Information Age' (*Informationszeitalter, l'ère de l'information*) allows reference to a historical period (1944-) where information seems to represent a crucial but not all-encompassing category within in the global arena. We thus conceive the Information Age as being emergent, historical, and open.

The emergent quality of the Information Age is supported by outlining the five domains that are involved in the evolvment of the concept. The Information Age builds on a bottom-up coincidence of technological, theoretical, communicative, economical, and epistemic developments and is not a top-down societal ideology that pre-determines future implications. As such, the Information Age is connected and susceptible to a variety of minor influences and orientations which have the potential to cause a global butterfly-effect (see the influence of the developments such as the transistor and google).

Treating the Information Age as a historical super-concept then offers the opportunity to relate it to other macro-historical ages and revolutions and to understand the uniqueness of the new situation and its opportunities. We already identified three historical information ages in the introduction (Hobart & Schiffman, 2000) but other historical orderings have also been proposed, each from a very specific viewpoint:

- Following Machlup, futurist Alvin Toffler formulates a popular perspective in ‘the third wave’ (Toffler, 1980) by proposing three decisive turns in the history of human society and linking them to three revolutions : an agricultural, industrial and information wave.
- Philosopher Luciano Floridi calls the construction of the *infosphere* a fourth revolution (Floridi, 2010, p. 9). The first, Copernican revolution, removed humans from the centre of the universe; the second, Darwinian revolution links us to the rest of the animal kingdom; the third, Freudian revolution, links our Cartesian minds to subconscious drives; the final revolution, inspired by Turing, harbours a process of dislocation and reassessment of our fundamental nature and role in the universe. It implies the realisation of the intrinsically informational nature of human identity and humble awareness that the products of our own making share and surpass our own capacity for information processing (Floridi, 2010, p. 102). Turing displaced us from our privileged and unique position in the realm of logical reasoning, information processing, and smart behaviour (Floridi, 2010, p. 93).
- From a sociological point of view Anthony Giddens points to the link between an Information Age and an increased reflexive awareness²⁶¹ which is added to the achievements of modernity: “social reflexivity refers to the fact that we have constantly to think about, or reflect upon, the circumstances in which we live our lives. When societies were more geared to custom and tradition, people could follow established ways of doing things in a more unreflective fashion. For us, many aspects of life that for earlier generations were simply taken for granted become matters of open decision-making” (Giddens & Sutton, 2009, p. 100).

Notwithstanding the historical significance of the information revolution, within the model that is proposed here, the central notion of an Information Age is considered to be an intrinsically open concept, not in a philosophical (Wittgensteinian) sense, but in the way it invites for participation while at the same time acknowledging and accepting a reality of alternatives to the dominant paradigm of an information and knowledge society, both inter- and intra-societal, both historical and actual. Informatization is of major and direct significance for advanced, Western societies with an emphasis on economic growth and innovation (Webster, 2004b, pp. 1–2) but these civilizations are only part of a historical situation denoted here as an Information Age. Historian László Karvalics (2009) concludes that “one of the characteristics of the Information Age is that pre-industrial, industrial and information

²⁶¹ Sociologist Ulrich Beck (1944-2015), also rejects postmodernism. Rather than living in a world 'beyond the modern', we are moving into a phase of what he calls ‘the second modernity’. The second modernity refers to the fact that modern institutions are becoming global, while everyday life is breaking free from the hold of tradition and custom (Giddens & Sutton, 2009, p. 100).

societies live side by side” (Karvalics, 2009, p. 25). Floridi sees a simultaneous occurrence of three types of societies: pre-historical (without written records), historical (with written records) and hyperhistorical (ICT as an essential drive) societies:

From this perspective, human societies currently stretch across three ages, as ways of living. [...] at the beginning of the second millennium there were still some societies that may be living prehistorically, without recorded documents. [...] The greatest majority of people today still live historically, in societies that rely on ICTs to record, transmit, and use data of all kinds. [...] Then, there are some people around the world who are already living hyperhistorically, in societies and environments where ICTs and their data-processing capabilities are not just important but essential conditions for the maintenance and any further development of societal welfare, personal well-being, and overall flourishing. (Floridi, 2014, pp. 3–4)

Next to inter-societal differentiation, the Information Age also allows for intra-societal differentiation. Within Western capitalist and economy-driven societies there is certainly room and even a need for dissidence, reflection and counterbalancing. Often the arts and humanities have been prompted to take up that critical and dialectal role and to challenge the all-invasive role of objective and reality-oriented information. Within that context, the relation of an Information Age vis-à-vis the currents and traditions in musical practice is all but self-evident. Notwithstanding the (potential) opportunities information seems to offer to artistry in terms of imagination (see Chapter 1), problem-solving (Dervin, 1992), learning/education, and a liberation from dogmatic traditions (Lyotard, 1984; Vattimo, 1991, 1989/1992), the Information Age often invokes strong opposition and resistance when considered from a traditional romantic and counter-enlightenment perspective (Berlin, 1980) and from the view of a (cultivated) duality between reality and imagination (see PART I). With a view to making the Information Age eligible for musicianship, openness and inclusiveness is key.

Hereafter, we will investigate the relationship between musicianship, extra-disciplinary information, and the Information Age in some more detail.

6.3 Musical performership in the Information Age

6.3.1 *The performer's links to the Information Galaxy*

As far as the technological and theoretical elements of the Information Age are concerned it is probably fair to say that the influence of the Information Age on score-based performers is in a first instance connected to trivial implications with regard to an increase of personal access and distribution facilities.²⁶² Akin to non-musicians, performers use information and communication technologies in

²⁶² We are aware of the advances in digital score editions but it seems that the score-based performance culture is still very much focused on printed editions as primary sources of information, with a special interest even in first editions, Urtext-editions, manuscripts and autographs; also musical instruments have stayed to a large

relation to everyday activities, and, with knowledge more or less freed from hermetically closed expert-disciplines and traditions, also musicians have potential access to a wide variety of digitally available information – especially if they can rely on an institutional subscription to specialized electronic journals.

The performative element in PART I, where we accessed extra-disciplinary terrains such as philology, philosophy, evolutionary theory, sociology, library & information sciences from a musician's point of view, demonstrates that, nowadays at least, the means are available to familiarize oneself with a vast terrain of expertise. This is a new situation presented to musicians, especially in terms of efficiency. For sure, a great deal of the information that we consulted in relation to information and imagination, would also have been available in pre-Information Age times, in physical libraries or in the minds of dedicated scholars and professors, but the energy- and time investment to logistically make contact with those sources would have been quasi-insurmountable, especially in combination with a professional practice as a musician. Electronic access to journals, encyclopaedias and books, Interlibrary Loan Services (which often operate via a scanned PDF-file), podcasts and other communicative media, have created an infosphere whereby at least potentially the opportunity of extending one's epistemic horizon in the direction of GIP is supported in unprecedented ways. Digitally transferred information as disembodied knowledge can be considered a new currency that allows us to connect to a brave new world of opportunities.

But what about the meta-personal, and more systematically and institutionally structured information systems in the Information Age that should act as filters between user and extra-disciplinary information sources, and, as we saw in Chapter 4, are supposed to take into account the limited attention- and processing capacities of a human (and musical) mind? The RILM (*Répertoire International de Littérature Musicale*), which is the warehouse of all music-relevant information and 'the beating heart of music research' (Dunsby, 1995, p. 17)²⁶³, announces on a regular basis an impressive increase in contributions to the musical *infosphere*. The RILM-content is organized according to several super classes²⁶⁴: 1/ Reference and Research Materials; 2/ Imaginative Literature; 3/ Collected Writings; 4/ Universal Perspectives; 5/ Western Art Music; 6/ Traditional Music and Non-Western Art Music; 7/ Jazz and Blues; 8/ Popular Music; 9/ Sound Sources; 10/ Performance Practice and Notation; 11/ Theory, Analysis, and Composition; 12/ Pedagogy; 13/ Music and Other Arts; 14/ Music and Related Disciplines; and 15/ Music in Liturgy and Ritual. The category of 'universal

extent within the range of the well-known orchestral instrumentarium.

²⁶³ "facilitates and disseminates music research worldwide. It is committed to the comprehensive and accurate representation of music scholarship in all countries and languages, and across all disciplinary and cultural boundaries" <http://www.rilm.org/aboutUs/>.

²⁶⁴ <http://www.rilm.org/searching/classes.php>.

perspectives' is concerned with historical and ethnographical studies around the world but of particular interest to us is the category 'music and related disciplines' which is subdivided into:

- Philosophy, aesthetics, criticism
- Psychology and hearing
- Physiology, therapy, medicine
- Archaeology
- Engineering and sound recording; computers
- Physics, mathematics, acoustics, architecture
- Sociology
- Linguistics and semiotics
- Printing, publishing, music business

What we find here is a professional information system that accumulates an impressive volume of information that *prima facie* fits the extra-disciplinary information needs of a Generally Informed Performership. However, there are some major down-sides to this initial euphoria.

Firstly, RILM is about collecting 'music' research; even interpreting that mission in the widest possible sense, it still means that in all the publications, an explicit link with the term 'music' will have to be present. By consequence, RILM will only grant access to extra-disciplinary information already pre-filtered by the orientations and research-interests of dedicated disciplines. Since RILM is a joint project of the International Association of Music Libraries, Archives, and Documentation Centres [IAML]; the International Council for Traditional Music [ICTM]; and the International Musicological Society [IMS] we may assume that at least to an important extent the collection and the access facilities connected to it are tailor-made for these constituting interest groups and do not directly attune to performer's concerns; the choice of super-classes is certainly an indication of a musicology-driven outlook. Secondly, the category 'music and related disciplines' functions only as a label that can be checked off to limit one's keyword-driven search results and thus presents in no meaningful way an overview with regard to extra-disciplinary terrains or trends. If we add to that deficit the findings coming from Information Behaviour Research (see Chapter 4) that suggest that: 1/ artists (in general) have idiosyncratic rather than systematic information needs; 2/ that information serves primarily as motivational inspiration; 3/ that they prefer social mediation over the use of catalogues and indexes in libraries; and 4/ that underdeveloped information literacy skills are often a barrier to reach for information, and we can confidently assume that the mere existence of a catalogue such as the RILM-catalogue, which is anyway only accessible via subscription, has barely the potential to change the informational horizon of musicians in extra-disciplinary terms. Having a category in the search machine

of a discipline-based data-base does not automatically imply an opening of the gates to extra-disciplinary fields.

Another way of accessing extra-disciplinary information would be through dedicated publications. In recent years, we have seen an important increase of publications regarding the relation between music and the field of psychology. Titles such as *Psychology for Musicians, Understanding and Acquiring the Skills* (Lehmann, Sloboda, & Woody, 2007) or *The Science & Psychology of Music Performance: creative strategies for teaching and learning* (Parncutt & McPherson, 2002) have the incontestable merit of being information systems mediating between the vast field of psychology and musical practice. A closer look at the structuring of content in such books, however, shows that, quite logically in fact, these publications follow mainly the disciplinary agenda, interests, organisation and jargon of the field of psychology. They offer snippets of a puzzle in a scientific language that is often overpowering in its accuracy but at the same time at odds with information needs and existing Image-structures of musicians. Collegial experience in music education and performance learns that although a clear interest in matters such as motivation, performance anxiety, motor skill development is certainly present in the field of performance, most colleagues either retreat in a passive attitude of very selective awareness and holding on to interdisciplinary wisdom, take out one isolated element of the research to work with, or are totally overwhelmed by the apparent objectivity of these contributions and are left in frustration. The authors themselves seem to agree with this analysis when they write that “scientific writers tend to focus on simple hypotheses and assumptions that are easy to demonstrate and explain but are of limited interest to musicians. It is little wonder, therefore, that modern [...] students are often unaware of the basic findings” (Parncutt & McPherson, 2002, p. 285).²⁶⁵ What we are apparently left with, most of the time, are personal *google*-queries and a wide range of information that is distributed and reaches performers drop by drop via the classical media (TV, Press, radio, social media, specialized magazines in some cases); but such an information behaviour of course does not surpass a trivial involvement with Information Age tools.

From the perspective of information behaviour studies, it seems that the development of a dedicated information system is an element that is missing and crucially hampers a more structural interaction between musicians and the galaxy of information.²⁶⁶

²⁶⁵ It has to be remarked that in this particular publication an effort has been made to make progress in the matter by organizing a co-authorship for each of the chapters coupling an academic and a practitioner. Still I know very few colleagues (actually not one) who have this publication in their personal library. These publications are nowadays available in most Conservatory libraries.

²⁶⁶ The issue of developing adequate information systems for musicians will be subjected to an investigation in PART III, Chapter 11.

6.3.2 *The participation of musicians in societal debates*

From the considerations above, it is clear that a historical opportunity is presenting itself to musicians in terms of epistemic connectedness but that this occasion is only marginally explored. The question presents itself with regard to the urgency and necessity of such an information attitude? Since we defined the Information Age ultimately as an essentially open concept, the option for a territorial *status quo* or in some cases even a militant counter-attitude for musicianship vis-à-vis extra-disciplinary positions is at least a logical possibility. But then again we remember McLuhan's remark that "it is no longer possible to adopt the aloof and dissociated role of the literate Westerner" (McLuhan, 1964/1994, p. 4). How should we understand this incongruity? McLuhan argues against the sheer possibility of a dissociated *status quo* position given the omnipresence and powerful influence of the knowledge society.

Bringing McLuhan's observation to the realm of artistic practice then, it is indeed hard not to see how government-driven reorganizations of culture and education are often informed by a strong belief in statistics and scientific approaches, and that ultimately artistic practice is gently (or sometimes brutally) forced to adapt to the conditions that come into existence on such a basis. To give a concrete example: The Organisation for Economic Co-operation and Development [OECD] recently published a report regarding the role of the Arts in society. One of the key-points of departure is that "in knowledge-based societies, innovation is a key engine of economic growth, and arts education is increasingly considered as a means to foster the skills and attitudes that innovation requires, beyond and above artistic skills and cultural sensitivity" (Winner, Goldstein, & Vincent-Lancrin, 2013, p. 3). The insights that are presented throughout the document are largely based on the review-work of Boston College psychologist Ellen Winner and seek to forge a link between artistic training and the development of a transferrable sense for innovation; all at the benefit of global economy (see the tenets of an 'information society'). The conclusion with regard to the transfer quality of artistic creativity however is very nuanced:

Even though we find some evidence of the impact of arts education on skills outside of the arts, the impact of arts education on other non-arts skills and on innovation in the labour market is not necessarily the most important justification for arts education in today's curricula. The arts have been in existence since the earliest humans, are parts of all cultures, and are a major domain of human experience, just like science, technology, mathematics, and humanities. In that respect, they are important in their own rights for education. (Winner et al., 2013, p. 19)

Notwithstanding this balanced position, the Flemish minister for education in Flanders proposes in 2015 a new plan for part-time art education largely based on a (rather selective) reading of the 2013 OECD-document:

The Flemish government's new slogan, imagination works, accentuates the driving power of imagination for innovation in Flanders. This corresponds to the conclusion by the OESO with regard to recent research 'Art for Art's Sake'. 'People with an education in arts play a significant role in starting off innovative processes. Focusing on the arts therefore becomes an undeniable dimension of a strategy a land can deploy for innovation'. Non-routine and non-manual skills will be in increasing demand by the economies of the future. According to the OESO, future welfare will depend more and more on innovation and creativity. The research shows a strong correlation between arts education on the one hand and academic results and employment in an innovation on the other. (Vlaams Ministerie van Onderwijs en Vorming, 2015, p. 4)²⁶⁷

It is clear here that the Flemish ministry has allowed itself a few interpretative and ideologically inspired adjustments with regard to the original text. Whereas the authors of the original OECD-document speak of 'some evidence', this view is largely absent in the political text which claims that there is 'a strong correlation...'; and whereas the original document rightfully pays attention to the intra-disciplinary motivation for education in the arts, this perspective is hard to trace in the policy text.

This case is a special one in the domain of scientification, in the sense that the research text *an sich* is valuable and nuanced but is ideologically appropriated and distributed with the aim to impose ideas, originating from the ideology of an information society, with evidence-based authority. It is only one example of what we could call *scientification in and of the arts*, or the influence of scientific theory on decisions that affect the daily lives of musicians, *in casu* the lives of part-time art students and teachers. They will have to take into account, one way or another (in curricula or didactics) the 'evidence-based' and 'informed' view of governments without often being able or invited to formulate counter-arguments to a stated position. Indeed, the above-cited text has been passed on to schools and teachers in Flanders and met almost no explicit, structured resistance or critical comments. In Chapter 1 we witnessed punctual instances of scientification when for instance Peter Kivy selects one particular meaning of 'to inform' for the OED and takes it as a basis for disqualifying HIP. Kivy, in information behaviourist terms, acts here as information filter and uses his scholarly authority in an attempt to disqualify and ban a particular and thriving practice.

In *Why Knowledge Matters in the Curriculum* (Wheelahan, 2010), educationalist Leesa Wheelahan is concerned with the field of professional education and the absence of professionals in the social and political debate. She observes and regrets that knowledge is retreating from professional curricula: "the paradox is that while education is supposed to prepare students for the knowledge society, the modern curriculum places less emphasis on knowledge, particularly theoretical, disciplinary knowledge" (Wheelahan, 2010, p. 3). Wheelahan claims that the argument that is used to justify this

²⁶⁷ Own translation.

retreat is in many cases that the Knowledge Society has transformed the nature of knowledge by claiming that tacit, contextual, reflective and immediately applicable knowledge is more productive than the disciplinary and codified. The result is that students and professionals do not dispose of the means to participate in debates and conversations and are doomed to accept eternal truths dispensed by those in authority (Wheelahan, 2010, p. 162).

The focus [should be] on introducing students to the debates and controversies within disciplines and within their occupational field of practice and for creating the conditions for active agency so students can participate in these debates and controversies. Students need to be inducted into disciplinary systems of knowledge so they have access to the criteria used to judge knowledge claims, and over time, change the terms of the debate. Knowledge needs to be the starting point for considering pedagogies that will support students be part of this conversation. (Wheelahan, 2015, p. 760)

Wheelahan further argues that this problem will not be addressed by insisting that other 'ways of knowing' are also valuable and need recognition (Wheelahan, 2010, p. 162), but that the solution is in connecting professionals to the realms of disciplinary knowledge.

Turning our attention back to the field of music specifically we certainly find affinities with Wheelahan's analysis with regard to vocational training systems. One of the prominent theorists that has been referred to in artistic epistemology in recent years has been Donald Schön. Schön challenges in *The Reflective Practitioner* (1983) and *Educating the Reflective Practitioner* (1987) the technical rationality in professions and proposes to open the field of knowledge for a type of knowledge which he meaningfully calls professional artistry and is described as "the kinds of competence practitioners sometimes display in unique, uncertain, and conflicted situations of practice" (Schön, 1987, p. 22). Schön explicitly invokes the example of the musical masterclass as a model of properly engaging with coaching and reflection-in-action.

The artistic field has welcomed Schön's insights with great enthusiasm and has interpreted his contribution as a letter of safe-conduct for a relative and autonomous *status quo* of artistic practice. But is that really Schön's legacy? In his analysis Schön challenges a situation in professional practice (not music) where theory dominates the terrain (scientification) and is in need for a practical voice as a counterbalance, hence the notion of *reflection-in-action* and professional artistry. But these additional elements are not of the sort to eliminate theory from the horizon, Schön's reflective practicum is a tool to bring discipline-based theory and practice together: "my design for a coherent professional school places a reflective practicum at the centre, as a bridge between the worlds of university and practice" (Schön, 1987, p. 309). Our understanding of Schön is that when confronted with a situation of excessive technical rationality, *reflective practica* should be established in curricula in order to mediate between discipline-based theory and practice. The situation of musicians is totally different however. The whole idea of scientifically-led, foundational disciplines and the internally

generated dominance of theory is almost completely absent in the musical field that has historically developed from total immersion in cosmology in antiquity to an idealized, subjective and autonomous field of human activity in the 19th century. In a review of *The Reflective Conservatoire* (Odam & Bannan, 2005) Constantijn Koopman critiques the artistic and research projects presented by musicians (Koopman, 2007, p. 156) by observing that: 1/ the projects are often not more than reports on the actions and reflections by artists/researchers what they have done and what they have learned; and 2/ the aim of the research projects appears to be personal development rather than the acquisition of 'objective knowledge'.

Although since 2007, developments in the field of Artistic Research and Doctorates in the Arts have engendered precious examples of how practice and extra-disciplinary knowledge can be integrated, we are not yet in situation that could be labelled as affirmative in terms of a paradigm-shift. That being the case, the participatory role of musicians in larger societal debates via a structural link to the information galaxy is certainly a factor that needs our attention.

6.4 Summarizing the opportunities for GIP in the Information Age

The Information Age brings musicians in an unprecedented, historical situation qua personal information-potential level and offers, via informational access, alternatives to the status of music as autonomous practice. In order to realize the full potential of these opportunities, discipline-specific information systems that are able to act as facilitators between musician and information galaxy are probably the primary concern. However, the Information Age is not only about opportunities, there are also concerns with regard to safeguarding artistic identity, values and perspectives which are at risk in a process of scientification. In some punctual instances information seems to control us rather than vice versa.

In order to nourish the inherent characteristics and values of musicianship the necessary transition – as advocated by UNESCO – from an information society to a knowledge society where information can be critically assessed and debated, is still waiting for its full effectuation in artistic practice. The process of scientification proceeds in the meantime, on a societal, institutional, pedagogical and didactical level and unless an effort is made to communicate with other stakeholders of society on the basis of a common ground, it will be very difficult for musical practice to stand its ground. Such a common ground should, in our view, be based on shared information.

It seems then that we can add an element to our working-definition of GIP: GIP is not only concerned with bridging cognitive gaps and stimulating imagination, but also with strengthening musical practice's participation in political, social and cultural conversations. The open and emergent quality of the Information Age and knowledge society certainly allows for such a constructive development.

One of the seminal elements in support of a GIP situated within a Knowledge Society is education.

In the next chapter-section we will investigate how the field of Higher Music Education behaves in an Information Age.

Chapter 7: Meso-level – The European Higher Education Area [EHEA]

Given its cultural and linguistic diversity, the case for an advanced and inclusive information society in Europe is an interesting one. The policy documents that represent the European vision on a 21st century society bare witness to a striving for a Knowledge Society where everyone must be able to move easily, yet, also critically through the flow of information. The past decades in Europe have illustrated that the sheer availability of technology and theory is not enough to meet such ambitious standards (Dearnley & Feather, 2001, p. 95) and that a culture of shared values and attitudes is needed to create and sustain a positive state of informational connectedness. Within this context, education is considered to be a vital node and through programmes that stimulate trans-border rapprochement via information and knowledge networks, the European Union has invested a great deal in creating educational fundaments for the future.

In this chapter, we consider the establishment of a European Higher Education Area [EHEA] as a historical opportunity to operationalize the opportunities of an Information Age and to facilitate more concretely the reorientation of musicianship's epistemic basis into the direction of inclusiveness as it was argued in PART I.

7.1 The birth and development of a European Higher Education Area

In Europe, the roots of an ambitious information society policy are, as in other continents or states, to be found primarily in economic politics. Chapter 5 of the European commission's influential *White Paper*, presented in 1993, discusses the pragmatic and commercial opportunities of an information society in relation to the pressing challenge of unemployment (Commission of the European Communities, 1993, pp. 92–99). The general view in 1993 is that technology is at the centre of an information society and that the promotion and creation of ICT-infrastructures will have a direct impact on human welfare. In these early statements, the idea of a 'knowledge-driven' or 'knowledge-based' society in the EU is far less well-developed, possibly reflecting the greater cultural difficulties to be encountered in attempts to bring together attitudes rather than technologies (Dearnley & Feather, 2001, p. 101). It is only at the very end of the 20th century that the project of a European Higher Education Area really takes off as part of a grounded strategy to stimulate and support innovation and knowledge interaction in the Union. In Appendix 12, a chronological list of events is plotted that led to the official launch of the EHEA in 2010. An important point of departure thereby is the Bologna-declaration in 1999 which is strongly imbedded in the Lisbon-strategy – *Towards a Europe of Innovation and Knowledge* – and ignites a comprehensive process of educational harmonization and reorganization. The key-words and -ambitions formulated in the build-up of the EHEA are: mobility,

employability, common social and cultural space, comparable degrees, knowledge-based economy, lifelong learning, cultural heritage, research (and integration between education and research), interdisciplinary, a three cycles programme (bachelor, master, doctor), student-centred learning, education as an instrument against a broad array of challenges (economic, social, demographic changes, migration, extremism).

One of the less explicitly formulated but nevertheless very influential topics in the Bologna process is the status of *binarity*, or the dualism between a more theoretical level (university) and a more practical, vocational level of education (higher professional education). Although partly relegated to the authority of the member states, one of the central tenets of the EHEA-reform is to dispose of the binary system and to opt for a *unitary* structure where the boundaries of the university and non-university sectors evaporate. The idea first appears in a background paper of the Bologna meeting in 1999 where education experts Guy Haug and Jette Kirstein maintain that the differences between universities and higher professional education are gradually disappearing (Haug & Kirstein, 1999). Notwithstanding the rather limited statistical support on which their claim rests²⁶⁸, the perspective of *unitarity* starts to gain currency in the minds of policy-makers and instigates a trend to integrate universities and higher professional education. One of the crown jewels in this process is the realisation of a European Qualification Framework [EQF] in 2008. The EQF establishes a unitary educational system with eight progressive levels that are aligned to three categories of learning outcome descriptors: knowledge, skills and competence. The category of 'knowledge' is concerned with theoretical and/or factual knowledge; 'skills' are described as being cognitive (involving the use of logical, intuitive and creative thinking) and practical (involving manual dexterity and the use of methods, materials, tools and instruments); 'competence' is formulated in terms of responsibility and autonomy (European Commission, 2008). From a macro-historical perspective and in terms of its epistemic and institutional foundations, this blending of theory, skill, and competence pilots higher education into a fundamentally new situation – one which is in our opinion conducive to operationalizing and facilitating the concept of a Generally Informed Performership.

To lend support to this claim we need to go back to Aristotle who, in the sixth book of the *Nicomachean Ethics*, presents a three-part division of knowledge that will be very influential for the centuries to come²⁶⁹, and in our view strongly resembles the EQF's categories knowledge, skill and competence.

²⁶⁸ How Haug and Kirstein arrive at this conclusion is unclear. From the comparative analysis in 18 European countries (Officially 19 countries are mentioned, because of the two 'Belgiums' that are included, Dutch and French speaking), the outcome is that 74% have a binary system and only 27% countries a unitary system (Haug & Kirstein, 1999.; Kotthoff & Moutsios, 2007, p. 106).

²⁶⁹ Our point is that the notions 'knowledge', 'skill' and 'competence' that figure in the EQF are derivatives of Aristotle's categories.

7.2 The meme-pool of music education: from Aristotle to the European Qualification Framework

Aristotle distinguishes in the *Nicomachean Ethics* between five dispositions/qualities that enable the soul to reach truth either in affirmation or denial: real/'scientific'²⁷⁰ knowledge [*epistēmê*/ἐπιστήμη], art or technical skill [*technē*/τέχνη], prudence/practical insight [*phronēsis*/φρόνησις], wisdom [*sophia*/σοφία], and intelligence or intuition²⁷¹ [*noûs*/νοῦς]. He continues by claiming that the objects of genuine knowledge [*epistēmê*] exist of necessity and are therefore eternal and invariable; it is a type of knowledge that is arrived at via a meticulous process of induction and deduction and can therefore be effectively communicated by teaching and learning: "a man knows a thing scientifically when he possesses a conviction arrived at in a certain way, and when the first principles on which that conviction rests are known to him with certainty [Aristot. Nic. Eth. 1139b]"²⁷².

Next to the objects of necessity, there is (logically) also a class of things that can be variable. This class includes both 'making' [*poiēsis*/ποίησις] and 'doing' [*prāxis*/πρᾶξις]. The rational quality that is necessary in bringing into existence a thing that is not given by necessity [*poiēsis*] is technical skill [*technē*]; it resides in the maker and not in the thing made [Aristot. Nic. Eth. 1140a]. Prudence [*phronēsis*] holds a close link to the ethical aspects of human conduct as well as to the building of character; it comes into play in the context of doing/action [πρᾶξις] and deliberation [*Bouleuetai*/βουλεύεται] about variables:

[prudence] is not science, because matter of conduct admit of variation; and not art [*technē*] because doing and making are generically different: making aims at an end distinct from the act of making, whereas in doing the end cannot be other than the act itself. [Aristot. Nic. Eth. 1140b]

Intuition [*noûs*], according to Aristotle, is a fourth quality and concerns knowledge of the first principles on which scientific knowledge [ἐπιστήμη] is based; finally, wisdom [σοφία] turns out to be a quality that emerges from combining scientific knowledge and intuition.

Of primary concern to education are the first three qualities ('thinking', 'making' and 'doing') since they can be taught and within that tripartite cluster of rational qualities, the case of music is particularly interesting because it pertains to all three categories of knowledge and seems to develop accordingly in three parallel histories of music in education.

²⁷⁰ The adjectives 'scientific' and 'real' are often used in translations, it should be clear however that there the notion 'scientific' represents the antique values with regard to knowledge and not those of modernity.

²⁷¹ Sometimes translated as 'direct' or 'unmediated' insight.

²⁷² If not indicated otherwise, the source texts referred to are available via the *Perseus Digital Library* <http://www.perseus.tufts.edu/hopper/>.

This three-way evolution of theoretical, ethical and performative aspects of music education can be observed in the *Grove's Dictionary of Music and Musicians*, where the lemma 'music education' is post-classically²⁷³ discussed under three main entries: 'universities', 'schools' and 'conservatories'; three institutions which refer respectively to the *epistêmê*-, *prâxis*-, and *poïesis*-quality of music. The contemporary pertinence of Aristotle's classification can be further induced from the fact that at the beginning of the 21st century three monumental handbooks have been published each corresponding to one of Aristotle's categories: in *the Cambridge History of Western Music Theory* (Christensen, 2002) the chronicle of the relation between *epistêmê* and music is sketched by means of a comprehensive treatment with regard to the speculative²⁷⁴, descriptive, regulative²⁷⁵ and analytical traditions in music theory; *The Oxford Handbook of Music Education* (McPherson & Welch, 2012) is concerned with the role of music in general education and the development of identity (*praxis*); and finally the *Cambridge History of Musical Performance* (Lawson & Stowell, 2012) links music to the realm of production and *poïesis*.

Recounting and integrating these parallel histories in detail and bridging the period between Aristotle's seminal division and our time in terms of music in theory, ethics and performance is a task that exceeds the textual limits of our enquiry. Fig. 7.1 summarizes in a reductive and generalizing manner the key elements in support of the claim that in the pre-EHEA period the theoretical, practical and productive aspects of music were treated for the most part as separate realms as far as education is concerned, and that with the instantiation of the EHEA we are experiencing the potentiality of an integrative turn, one that is conducive to a concept such as a Generally Informed Performership. We will briefly elaborate on the three streams respectively.²⁷⁶

²⁷³ The query 'education' produces four results in the *Grove's Dictionary of Music and Musicians*: 'Music Education, Classical', 'Conservatories', 'Schools' and 'Universities'. The first of four results is not taken into consideration here because of its historical limitation to educational aspects of music in Ancient Greece and Rome; in this sense it serves as a pool of ideas and practices that feed into the three following categories.

²⁷⁴ "The 'speculative' tradition he characterizes as the 'ontological contemplation of tone systems'. This would encompass, then, not only the traditional programs of classical harmonics and canonicity but much research in the areas of acoustics and tuning theory during the seventeenth and eighteenth centuries and tone psychology in the nineteenth and twentieth centuries" (Christensen, 2002, p. 13).

²⁷⁵ "The second 'practical' tradition is characterized by musicologist Carl Dahlhaus as the 'regulation' and 'coordination' of these tone systems applied to compositional practice. As a regulatory discipline, such music 'theory' seeks to draw from practice normative rules of syntax and models of structure, while at the same time disciplining that practice through pedagogical strictures. Here we would have an even more expansive category of pedagogical writings crossing the centuries and touching on just about every parameter of music: counterpoint, harmony, rhythm, meter, melody, form, genre, and style" (Christensen, 2002, pp. 13–14).

²⁷⁶ The following three sections are based on Bower (2002); Christensen (2002); Chua (1999); Cohen (2002); "Education," (n.d.); Kristeller (1951, 1952); Lawson & Stowell (2012); (McPherson & Welch) 2012; Ritterman (2002); Shiner (2001); Wason (2002); Cohen (2010); Whitney (1990).

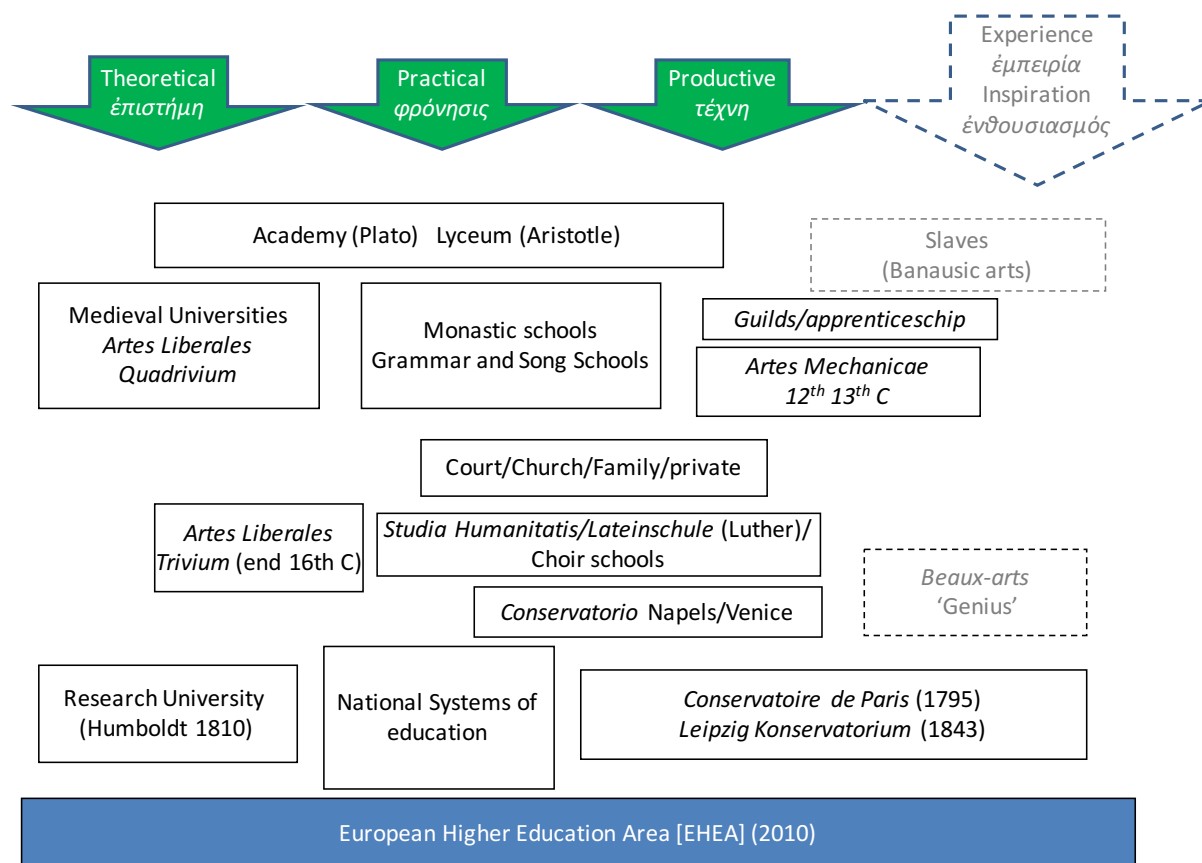


Figure 7.1. The institutional history of music in theory, education and performance.

7.2.1 The theoretical track in music education

By identifying the numerical relationships governing the basic intervals of music – the octave, the fifth, the fourth, the second – Pythagoras (6th century BCE) is generally considered as the father of the *musica speculativa* and of the theoretical track in music. The monochord, the one-stringed instrument upon which the Pythagoreans and all later acoustical scientists, up through the Middle Ages, conduct their experiments, occupies a central place in a number-ruled Pythagorean universe and gives rise to the influential notion of a ‘harmony of the spheres’: an inaudible, universal and eternal harmony founded on basic musical proportions. This intimate association between astronomy and music constitutes to a certain extent and at first sight the heydays of GIP, music as a full and central element of the cosmos. Both Plato and Aristotle refer to this framework in their philosophical work (see for instance Plato *Republic* 7.530e; Aristotle *Metaphysics* V.1013a & *Physics* II.3) and situate it alongside and in relation to the influential ethical perspective on music.²⁷⁷ The actual playing of musical

²⁷⁷ Objections come from a disciple of Aristotle, Aristoxenos (361-301 BCE) who challenges the entire idea that music can usefully be analyzed by focusing on harmonic relations. “To Aristoxenos, it is rather the ongoing flow of the melody that is constitutive of the major effects of music. In his view it is not so much the intellect per se, but rather our musical experience that must guide any effort to come to terms with what music does to us and to provide us with a reasoned account of its effects” (H. F. Cohen, 2010, p. 61). This opposition, between an approach by means of numbers that stand for ratios of string lengths and an

instruments however, apart from the monochord as scientific instrument, is to a large extent and quite explicitly excluded from this perspective which in effect downsizes the relation of this track to GIP to a quasi-zero level. An increasingly theoretical focus during the Hellenistic age pilots the study of Pythagorean principles thereafter into a vital component of Medieval thought. Here, the idea of music's relation to the cosmos takes shape by means of a threefold classification: 1/ *musica mundana or universalis* points to the numeral proportions between celestial bodies; 2/ *musica humana*, reflects the harmonious way in which body and soul are bound together and allows an ethical approach to music; and 3/ *musica instrumentalis* is concerned with instrumental and vocal music. Institutionally, harmonic theory figures in the Medieval university curriculum as one of the four *Artes Liberales* that, together with arithmetic, geometry, and astronomy, make up the *Quadrivium*, alongside the *Trivium*, dialectic, grammar, and rhetoric.

Music is thus accorded a place alongside its sister mathematical disciplines, arithmetic, geometry, and astronomy. Consequently, the instructor of this subject, the *musicus* is a mathematics professor on the quadrivium faculty. The craft of musical composition (and performance) as such has no place in this speculative concept of *musica* (Bartel, 1997, p. 12). Gradually however, *musica speculativa* concedes ground in favour of the propaedeutic writings and the concept of a *musica practica/activa* by Aurelianus (*Musica Enchiridis* - 9th century) and Guido of Arezzo (11th century); and finally, the linguistic turn in music at the end of the sixteenth century eventually transforms the mathematics of music into the rhetoric of music by transferring music from the *Quadrivium* to the *Trivium*, from cosmos to man. Humanity is now in control over the magic sound of music and “the transfer [severs] the identity of music: vocal practice, legitimised by the rhetorical flourishes of the will, [is] set against the mathematics of instrumental theory, and so [splits] the nature of music between man (humanistic values) and the cosmos (scientific facts)” (Chua, 1999, p. 61).²⁷⁸

Following this fundamental shift, the role of speculative music theory in university curricula fades away, blends to a certain extent with the practical tract, only to reappear in a new configuration in the 19th century.²⁷⁹ The birth of the Modern Research University in 1810 is an important institutional landmark since it occurs quasi-synchronous with the instantiation of the first professional music institutions in Paris (1795) and Leipzig (1843) and thereby epitomizes an institutional split between

approach that rather centres on the melody, has remained alive for many centuries. Still, in spite of an increasing sense that harmonic analysis alone cannot exhaust the investigation of the effect that music has on us, harmonic analysis has very much dominated the scene.

²⁷⁸ The causes for a degraded relation between cosmos and music are to be found in the sixteenth-century revolution in natural sciences which makes the idea of cosmic harmony less and less secure, and in the availability of humanist alternative where an ethical role for music is advocated based on the subordination of harmony to words (see Plato).

²⁷⁹ Acoustics and the physics of sound however are still studied by prominent scholars such as Joseph Sauveur (1653–1716), Leonhard Euler (1707–1783), Ernst Chladni (1756–1827) and Hermann von Helmholtz (1821–1894).

two communities. Until the late 19th century the academic side of music (musicology) is not present in curricula of the university as it develops since 1810, and it is the University of Vienna which is among the first to recognize musicology as a scholarly discipline by appointing music critic Eduard Hanslick (1825-1904) as professor of music history and aesthetics in 1861 with a promotion to full professor in 1870. German universities are more hesitant in acknowledging the field (Strasbourg, 1972) even though Germany ultimately surpasses all others in the potency of its musicology curricula. Content-wise, musicologist Guido Adler (1855-1941) redefines the contours of musicology at the end of the 19th century in *Umfang, Methode und Ziel der Musikwissenschaft* (1885) and thereby distinguishes a historical branch (palaeography, history, laws, instruments), a systematic field (laws in harmony, rhythm, melody; aesthetics and psychology of music; music education; and musicology/ethnography), and auxiliary sciences.

Nowadays, musicology covers a broad array of music related interests largely based on Adler's classification; historical musicology, systematic musicology, and cultural and ethno-musicology are the main strands to be discerned.

7.2.2 *The practical track in music education*

Next to the idea of music as the sensuous embodiment of intelligible harmony, classical philosophers are also committed to the practical force of music and to the educational merit of music in personal and ethical development. Within this context, a strong opposition is maintained to any form of specialized and professional education directed towards some extrinsic end such as competitions and entertainment. Music is above all credited with the capacity to induce various changeable passions in humans and to stimulate personal judgement between good and evil/bad, a crucial capacity in forming a person's enduring character (ethos). With the ultimate aim of producing such an ethically balanced, well-rounded and reasoning citizen, classical education focuses in the early years of the Platonic educational scheme on literature, music and gymnastics. Music's role therein is to forge an association with artistic beauty during childhood and by that, prime the student, almost unconsciously, to recognize and value the beauty of reason itself.

[...] education in music is most sovereign, because more than anything else rhythm and harmony find their way to the inmost soul and take strongest hold upon it, bringing with them and imparting grace, if one is rightly trained, and otherwise the contrary? And further, because omissions and the failure of beauty in things badly made or grown would be most quickly perceived by one who was properly educated in music, and so, feeling distaste rightly, he would praise beautiful things and take delight in them and receive them into his soul to foster its growth and become himself beautiful and good. The ugly he would rightly disapprove of and hate while still young and yet unable to apprehend the reason, but when reason came the man thus nurtured would be the first to give her welcome, for by this affinity he would know her. [Plat. Rep. 3.401d-402a]

In the same vein as Plato's reasoning, Aristotle credits music with the power to induce certain practical conditions and adds specific elements with regard to instrumental music making. He explicitly refers to music performance as an element of *praxis* and *phronesis* in the *Great Ethics* [*Ethica Megala*/Ἠθικά Μεγάλα/*Magna Moralia*] where he observes a striking resemblance between the concept of friendship and flute-playing: "[as in the act of friendship] to the flute- player the activity and end are the same (for to play the flute is both his end and his activity); but not to the art of housebuilding (for it has a different end beyond the activity)" [Arist. *Ethica Megala* Book 2, 1211B27] (Aristotle, 1915). Aristotle's perspective on music as *praxis* is further guided by two basic principles: first, unlike reading and writing, music should not be considered as useful or necessary, but rather in relation to elevated and gentlemanly leisure; secondly, although singing and the actual playing of the lyre and kithara (with one's own hands) are necessary activities for a free man, their ultimate aim is to be restricted to the context of making properly informed musical appraisals:

Everybody when listening to imitations is thrown into a corresponding state of feeling, even apart from the rhythms and tunes themselves. And since it is the case that music is one of the things that give pleasure, and that virtue [ἀρετήν] has to do with feeling delight and love and hatred rightly, there is obviously nothing that it is more needful to learn and become habituated to than to judge correctly and to delight in virtuous characters and noble actions. [Aristot. *Politeia*. 8.1340a]

Making music should by no means be pursued at a specialist and competitive level: "why need people learn to perform themselves instead of enjoying music played by others? [Aristot. *Politeia*. 8.1339b]", or:

In as much as it is necessary to take part in the performances for the sake of judging them, it is therefore proper for the pupils when young actually to engage in the performances, though when they get older they should be released from performing, but be able to judge what is beautiful and enjoy it rightly because of the study in which they engaged in their youth. [Aristot. *Politeia*. 8.1340b]

This focus on the educational and ethical value of music provides the central rationale for musical training throughout the Hellenic period and subsequently finds its way in the institutional curricula of medieval monasteries, grammar and song schools, and motivates various forms of private education (family, court, church).

When in the renaissance, the *Studia Humanitatis* replaces the old Trivium, it initially consists only of grammar, rhetoric, poetry, history and moral philosophy, but the revival of classical learning forms the core of humanistic study slowly spreads to other branches of philosophy, to mathematics, natural science, and eventually to music itself. It is precisely because the study of music does not belong to the traditional core of humanistic studies that so little attention is paid to it in the earliest, fourteenth-

century phase of Italian humanism: “in effect it [is] not until the second quarter of the fifteenth century that there are any significant indications that music should be recognized as a serious discipline worthy of scholarly attention” (Knighton & Fallows, 1992, p. 197). In the more exclusive private sphere, the influential publication of renaissance author Baldassare Castiglione’s *Il libro del Cortegiano* (1528) is worth mentioning because it also fits the framework of the classical, ethical perspective: the exercise, as well as the appreciation of poetry, music and painting are grouped together as pursuits appropriate for the courtier, the gentleman, or the prince.

Antiquity’s focus on the transfer quality of music in an ethical context gets a renewed impetus with the development of the concept of taste in the 17th and 18th centuries. Taste can only become a fully theoretical aesthetic term when the universals of Plato and Aristotle are replaced by the empiricism of the seventeenth and eighteenth centuries and in a period where a post-aristocratic, bourgeois society looks for new distinctive features. With the emergence of the modern category of literature, the rise of science, and the further development of a market economy, the intellectual and social basis of the old system of art the liberal arts/mechanical arts scheme is rendered obsolete and gives the idea of taste a larger role in the experience of arts. Taste is configured as a quality that can be acquired and imitated independent of intellect, via the practical confrontation with canonical works produced by geniuses; as such, taste constitutes the receptive counterpart of genius. It is this premise which becomes an important drive for imbedding music performance in the educational portfolio of the ambitious art-lover and connoisseur.

During the 19th century most European governments start to assume greater responsibility for a more general view on educational policy and subsequently establish their national systems of education. It is in a climate of social reform and educational expansion due to industrialisation that music becomes established as a school subject and that the foundations are laid for modern patterns of curriculum organization and teaching. The themes that are frequently appearing in 19th-century educational writings are the assumption that the study of music is of benefit to general academic performance and that it has value in the way it preserves the cultural heritage and promotes a sense of national identity. More recently and especially in the schemes of child-centred education, music is valued not so much for its alleged contribution to moral development, but rather as a form of experience and self-expression in an educational framework designed to extend children’s intellectual potential, imaginative and creative powers, and sense of the aesthetic. An inspired return to the link with the classical notions of *praxis* in and *phronesis* however is also today still very pertinent in scholarly educational literature (Elliott, 1995; O’Dea, 1993; Regelski, 1998). As we saw in the section on scientification (6.3.2), in Flanders plans crop up to forge an alliance and transfer between artistic creativity and an economy of innovation.

7.2.3 The productive track in music education

The third macro-historical track of music in education concerns music in production and performance and the role of *technē* therein. *Technē* is related to the rational aspect of production, but for a clear understanding with regard to this track, it is vital to include alongside *technē* also elements of a broader and more gnoseological nature²⁸⁰ such as experience and inspiration.

Empeiría [ἐμπειρία] is an epistemological faculty, which mediates between perception and know-how and is also related to memory. Plato makes an explicit distinction between experience on the one hand and knowledge (*epistēmē*/ἐπιστήμη) and skill (*technē*/τέχνη) on the other. The latter category is not focused either on generalities or on causes; rather it represents a familiarity with individual facts, which leads to habit and eventually enables a well-ordered life. Aristotle configures these ideas very precisely in the opening of the *Metaphysica*: experience consists of the knowledge of a finite number of similar individual facts originating from perception and kept in memory. In this respect, experience presents a plausible, if not logically basis for universal statements (Detel, n.d.). Already before Plato and Aristotle, Homer (800-750 BCE) summarizes these crucial building-blocks of musicianship when indirectly presenting the curriculum of the bard Phemius of Ithaca:

I implore you, Odysseus, show me respect and pity. There'll be sorrow for you later, if you kill me, a minstrel, for I sing to gods and men. I am self taught [αὐτοδίδακτος]. The god has planted in my heart [ἐνέφυσεν] all kinds of songs, and I'm good enough to sing before you, as to a god. [Hom. Od. 22.344-350] (Homer, 2007, p. 442)

In general terms then, and taking into account the variable interpretations of *technē* (Parry, 2014), it can be said then that in antiquity craftsmanship is to a great extent related to instinct²⁸¹ and to a kind of unthinking experience [ἐμπειρία], and is therefore substantially different from the rational processes involved in the liberal arts. From this point of view, technical arts or crafts are only (distantly) linked with higher types of knowledge and education (Whitney, 1990, p. 25).

Music production adds to *technē* and *empeiria* yet another element, that of inspiration and thereby reaches the *nec plus ultra* of gnoseological complexity (see Chapter 3).

However, from a practical educational perspective this complexity is reduced to one elementary embodied educational system: the well-known master-pupil relationship of individual instruction. This model attains great eminence by the 5th century BCE, when the Theban school introduces virtuoso *aulos* performances as part of the educational culture (*paideia*). However, it loses status when, according to Aristotle, vocational training blocks the way to personal development into a free and

²⁸⁰ Gnoseology refers to ways of knowing (gnosis) that are not limited to rational aspects (Eikeland, 2007, 2008).

²⁸¹ When Democritus [460-370 BCE] compares architecture and weaving with the building of nests by birds and webs by spiders, he came close to reducing technology to an instinct shared with animals.

rational man and is therefore relegated to the domain of the vulgar/*banausic* arts, an occupational field for slaves and illiberal people. This particular branch of low-rated human activity and production develops in the Middle-Ages into what is called more properly the *Artes Mechanicae*, a medieval concept of ordered practices or skills, and regains a more respected status when Hugh of St. Victor (12th century) juxtaposes alongside the seven liberal arts, seven mechanical arts.

These sciences [artes] are called mechanical, [...] because their concern is with the artificer's product, which borrows its form from nature. Similarly, the other seven are called liberal either because they require minds which are liberal, that is, liberated and practiced (for these sciences pursue subtle inquiries into the causes of things). [Book 2, ch.20] (St. Victor, 1961, p. 75)

The *Artes Mechanicae* originally contain *vestiaria* (tailoring, weaving), *agricultura* (agriculture), *architectura* (architecture, masonry), *militia* and *venatoria* (warfare and hunting), *mercatura* (trade, commerce), *coquinaria* (cooking), and *metallaria* (blacksmithing, metallurgy). In *Didascalicon* St. Victor includes navigation, medicine, and theatrical arts instead of commerce, agriculture, and cooking. A closer look at St. Victor's text reveals that the author initially adheres to Boethius' treatment of music:

The varieties of music are three: that belonging to the universe, that belonging to man, and that which is instrumental [...] There are also three kinds of musicians: one that composes songs, another that plays instruments, and a third that judges instrumental performance and song. [Book 2, ch.12] (St. Victor, 1961, pp. 69–70)

Further in the book – more in particular in the chapter that deals with 'theatrics' – it is suggested that instrumental music-making is also part of the *Artes Mechanicae* pertaining to the *arts of entertainment*. These arts are very inclusively formulated and refer to wrestling, dancing, playing dice, making music with songs and instruments and chants [at banquets], and singing the praises of the gods (*sic*) [Book 2, ch.27.] (St. Victor, 1961, p. 79). Notwithstanding these references to the institutionalized arts, performing musicians are still largely educated by family members and through apprenticeships (with written contracts) or guilds, as well as in church schools; the master/teacher served as mentor, indeed as an agent for the young musician.

In the 17th century, with the emergence of the modern category of literature and the literary work, the rise of science and the further development of a market economy the intellectual and social basis of the old system of art the liberal arts/mechanical arts scheme is rendered obsolete as the image of the artist transforms (Shiner, 2001). The establishment of opera companies in courts and cities in the 17th century, and the burgeoning of public concerts in the 18th century, increases the demand for musicians beyond what family training and apprenticeship can meet. Furthering and professionalizing the model of the early Italian conservatories – which were in fact orphanages from which opera companies draw promising singers, the *Conservatoire National Supérieur de Musique et de Danse de*

Paris sees its birth in 1795 as a result of deliberations at the post-revolutionary National Convention. The new school, which is free to all qualified students, is a product of the general educational reforms initiated during the revolutionary period. The Paris Conservatoire is a practical and specialist training school, much in the tradition of other institutions in France, and next to that also an institution that aims at conserving the music of the French nation, in the manner of the *Bibliothèque Nationale*. The conservatoire aims at replacing the old master-apprentice learning system with uniform approaches to pedagogy often emphasizing technique. Nevertheless, the teacher-student relationship remains the essential nucleus of education.

In founding the Leipzig Conservatory in 1843 Mendelssohn deviates from the productive aims of the conservatory when his primary concern is no longer to train young musicians solely for orchestras, opera houses or choruses, but to provide, in line with the idea of *Bildung*: “higher education in music, both theoretical and practical: in all branches of music regarded as a science and an art” (§1 of the 1843 prospectus)(Seaton, 2001, p. 135). Accordingly, students are no longer accepted as children, but at the age of about 14 to 17. Throughout the 19th century formal and informal musical training exists side by side. Pupils often study privately with teachers outside their conservatories or take only part of the curriculum offered by a school. Some conservatories do little more than match teachers with students. During the later part of the 19th century, conservatories respond to the growing professionalization of musical life by drawing a sharper distinction between the training of professional and amateur musicians.

Notwithstanding institutional adaptations, by the end of the 20th century, the conservatoire culture is still very much grafted on its 19th century origins. In an anthropological approach to a conservatory’s cultural system, anthropologist Henry Kingsbury notes that:

The primary method of tuition in the conservatory is private lessons in a given instrument or voice. When the musical education environment is that of a one-to-one relationship, having one teacher serve as stand-in for another is not like having a substitute teach a mathematics class, but rather is more like a change of subject matter. This applies as well to the classroom teaching of subjects such as music history or music theory. (Kingsbury, 1988, p. 36)

Psychologist John Sloboda summarizes the characteristics of this ‘classical conservatoire culture’ as: 1/ a concern with accurate and faithful reproduction of a printed score, rather than with improvisation or composition; 2/ the existence of a central repertoire of extreme technical difficulty; 3/ definitions of mastery in terms of ability to perform items from a rather small common core set of compositions within a culture; and 4/ explicit or implicit competitive events in which performers are compared with one another by expert judges on their ability to perform identical or closely similar pieces (Sloboda, 2005, p. 278). From these observations can be inferred that within the context of the productive tract,

the strong memetic roots in traditional and romantic systems seem to have survived and are still pertinent today (Haynes, 2007, pp. 75–76).

7.3 Conservatories in the EHEA

Our primary claim in this chapter is that a new situation presents itself at the dawn of the 21st century which allows for a cross-fertilization between the three educational tracks that we discussed above. With the advent of the EHEA, next to an institutional integration of professional school and universities, new contentual standards are being set by the EQF which integrate the three historical tracks under the labels ‘knowledge’, ‘competence’ and ‘skill’. It is not only a matter of combining theoretical, practical and productive knowledge, the process of integration promoted by the EQF also stimulates the crossing of disciplinary boundaries:

- At level 7 (master) and 8 (PhD) of the framework we find in the category ‘knowledge’ descriptions such ‘highly specialised knowledge’ or ‘knowledge at the most advance frontier of a field or work’, combined with ‘critical awareness of knowledge at the interface between different fields’.
- In the category ‘skills’, ‘specialised problem-solving skills’ are situated alongside ‘the integration of knowledge from different fields’.
- As competencies are the management and transformation of work and study contexts included.

This integrated educational framework with special attention to cross-disciplinarity looks very promising as a facilitating context for a GIP. But what has it caused in the field. Let us turn for some operational consequences to an objective marker with regard to the epistemic status of musicianship: the conservatoire curriculum. A sample survey of current conservatoire curricula²⁸² is shown in Appendix 11. The survey includes the study-programmes 10 conservatories (worldwide and for the academic year 2016-2017), and focusses on the study-programmes of musicians who have piano as their principle instruments. The table is structured according to a classical ordering between ‘practical’ and more ‘theoretical’ elements of the programme²⁸³. Within the former category a distinction is made between instrumental skills, professional skills (business-training, practical aspects of the profession) and body-related elements (Alexander-Technique, embodiment). Within the field of theory we see the presence of the traditional elements of music theory (*solfège*, analysis, harmony, counterpoint), humanities-oriented subjects (history, liberal arts, aesthetics, languages, cultural currents), a selection

²⁸² The sample survey focused on score-based instrumental training (not composition, improvisation).

²⁸³ This duality is not pragmatic and not absolute: ear-training for example is certainly in the twilight zone between theory and practice. In Chapter 9 the presumed duality between theory and practice will be discussed in more detail.

of specific 'other' fields (sociology of artistic practice, music therapy) which are often part of an elective menu and in cooperation with universities, a cluster of subjects that are related to research, and finally a number of subjects that are pedagogy-oriented. The 'instrumental skills'-part and the traditional 'music theory'-part are generic whereas the body-related subjects and the extra-disciplinary elements (humanities + other) are mostly tailor-made to institutional priorities. Importantly, most conservatories have a module specifically directed at developing research skills.

How are these curricula different to training programmes before the Information Age, especially in relation to extra-disciplinary information? Going back to the roots of the conservatoire, situated around 1800, may provide benchmarked indications.

The '*Musick Plan*' (1799) by Mozart's clarinettist Anton Stadler for instance allows a perspective on eighteenth-century Austrian training. Stadler advocates a six-year course in which all students learn aspects of theory, performance and composition and in addition emphasises the importance of a good general education:

Education, therefore, and literature are necessary for the true musician, if he wants to become great, because if he is entirely without all other knowledge he becomes a half- thing. Whoever wants to understand music must know the whole of worldly wisdom and mathematics, poetry, elocution, art, and many languages. (quoted from Poulin, 1990, p. 219)

As far as extra-disciplinarity is concerned the *Musick Plan* is obviously quite ambitious.

In the regulations of the early Paris conservatoire (1800) a surprisingly similar ambition can be found in terms of an educational division in four levels: 1/ study of elementary musical principles, *sofèze*, preparation to sing; 2/ the study of singing, declamation and instruments; 3/ vocal and instrumental study of ensemble pieces, harmony, counterpoint; and 4/ additional (public) courses with regard to the relation between the sciences (physical, mathematical, philosophical, poetical) and music (Constant, 1900, pp. 231–232). Again, although the 19th century Paris conservatoire was very pragmatic and subservient in its mission, the latter level attests to an inclusive view on musicianship. The curriculum of the Leipzig-conservatoire finally - next to Paris the other influential European model in professional music education – organizes its instruction in the middle of the 19th century into a theoretical part (harmony, form & composition, score-reading, conducting techniques, Italian language) and a practical one (singing and instrumental playing); in addition students are encouraged to take advantage of extracurricular activities such as attending rehearsals of the *Gewandhaus* orchestra, concerts and the opportunities that are offered by the University and its various educational departments to pursue a broad scientific education in all subjects (Seaton, 2001, pp. 135–136)²⁸⁴.

²⁸⁴ This paragraph is based on Leonard Phillips's translation of the Leipzig Conservatory statutes appearing in Schumann's *Neue Zeitschrift für Musik* on 25 December 1843. See also Wasserloos (2004, 2010).

From these selected indications, it can be induced that at least the intentions with regard to instrumental conservatoire-training – and as far as they are imbedded in curricula – are structurally very much in line with the today's state of affairs. The ambition to imbed musical practice and theory in a wider context of scientific and humanistic enquiry is thus certainly not a new ambition and is also valued and strived for at the beginning of the 19th century. The implementation is at first sight akin to current conservatoire curricula and primarily a matter of free exploration via electives rather than one of structural, systemic commitment. Flanking the well-known and established master-apprentice educational approach as a primary information system, the extra-disciplinary excursions in music performance curricula are fragmentary and mainly disciplinary (and not trans-disciplinary) oriented. How is the current situation different than 200 years ago then?

Firstly, with the central position of the printed score and the master-apprentice learning style as primary information systems it is likely and possible that current conservatoire-teachers offer their students informal guidance into information literacy (see Bartold Kuijken's view in Chapter 2) and thereby follow Lyotard's advice:

If education must not only provide for the reproduction of skills, but also for their progress, then it follows that the transmission of knowledge should not be limited to the transmission of information, but should include training in all of the procedures that can increase one's ability to connect the fields jealously guarded from one another by the traditional organization of knowledge. (Lyotard, 1979/1992, p. 52)

Secondly. The presence of information as disembodied knowledge allows conservatoire students to also explore at a personal level new extra-disciplinary terrains. In the 21st century the access-factor is hardly a problem anymore and the explosion of publications also results in a more interesting spectrum of extra-disciplinary expertise. Only some 20 years ago – a considerable period in Information Age terms – musicologist John Dunsby is still doubtful about the availability of knowledge for musicians but this situation has changed over the last decades as we will demonstrate in the case studies in PART IV:

A young musician who is contemplating hundreds of hours of practice a year over many years, and virtually every day if progression to be arrested, skills even lost, and has every right to ask, 'What will it be like? What will I need to know? How will I learn to think about what I'll be doing?' and a host of similar question. I suspect there are very few occasions when the individual teacher replies, 'Well I suggest you read this and that'. [...] there is precious little 'this and that' to which we can turn, but I hope there will be a great deal more in the future. (Dunsby, 1995, p. 5)

Finally, and in our view, most importantly and crucially, most curricula of the 21st century contain an aspect of research. It is this last element that is probably the most visible one in the operationalization

of an integrative turn with regard to the three historical tracks in higher music education. In the next chapter, we will investigate how it can be configured in support of a GIP.

Chapter 8: Micro-level: Artistic Research [AR]

It is within the context of a European Higher Education Area that the notion of ‘Artistic Research’ [AR] takes root. Artistic research is here broadly and pragmatically understood as “research conducted by or with Artists for the Arts” (AEC/polifonia third cycle workinggroup, 2007, p. 14). The concept is grounded in a European vision for higher education as a unitary combination of theory, skill and competence (as indicated in the previous chapter), and as a three-cycle process whereby mainly the third cycle conforms to actions that produce new knowledge.

We could learn from Machlup’s inclusive model (6.2.4) that knowledge production allows for a broad interpretation in terms of practical, intellectual, small-talk, spiritual and incidental forms of knowledge production. In academic circles, however, ‘research’ is mostly considered to be the concept with exclusive rights to the domain of knowledge production in the strict sense. It is within this continuum of, and negotiation between possibilities that artistic practice aims at defining its position with regard to research.

The Organisation for Economic Co-operation and Development [OECD] provides a general point of reference by defining ‘research’ very broadly as:²⁸⁵

Any creative systematic activity undertaken in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this knowledge to devise new applications.

Includes fundamental research, applied research in such fields as agriculture, medicine, industrial chemistry, and experimental development work leading to new devices, products or processes.

In this definition, research is still a very malleable term that allows for a vast array of interpretations. Within this permissible context, one of the primary reflexes of the arts (education) world has been a territorial one, in the sense that institutions opted to validate and develop a type of research based on a re-interpretation and re-conversion of an existing situation. Such an orientation can be inferred from statements such as: “visual artists and musicians have always researched, without it being named as such”²⁸⁶; or

My playing is my research. More simply, my playing is reading – physicalized reading. And that close reading has led to some thoughts which do not comprise fully realized analyses in the conventional musicological sense, but do, it seems to me, offer empirical evidence that performance – with its attendant reading, hearing, and rereading, and rehearing – constitutes research. (Brubaker, 2007, p. 67)

²⁸⁵ <https://stats.oecd.org/glossary/detail.asp?ID=2312>.

²⁸⁶ <http://www.koncon.nl/en/departments-study-programmes/master-specialisations/master-artistic-research/> consulted November 2016.

These particular views, often very meaningfully labelled by the term 'Practice as Research', take as a basis for AR a methodological and systematic amplification of an already inherent musical search behaviour (where the prefix intensifies the activity itself) and are primarily directed at contributing to niches and models of knowledge development that are not covered by traditional academia (Cobussen, 2007). The approach to AR has further developed and evolved in the last decennium and in *The Conflict of the Faculties* (2012) Henk Borgdorff comes to a representative definition of AR that is useful in differentiating between art practice-in-itself and art practice intended-as-research.

Art practice qualifies as research if its purpose is to expand our knowledge and understanding by conducting an original investigation in and through art objects and creative processes. Art research begins by addressing questions that are pertinent in the research context and in the art world. Researchers employ experimental and hermeneutic methods that reveal and articulate the tacit knowledge that is situated and embodied in specific artworks and artistic processes. Research processes and outcomes are documented and disseminated in an appropriate manner to the research community and the wider public. (Borgdorff, 2012, p. 53)

However, Borgdorff, in an earlier statement, declares that a notion such as 'appropriate' leaves ample space for a range of divergent opinions and approaches.

In the editorial of the inaugural issue of the *Journal for Artistic Research* [JAR] (2011), Editor-in-Chief, Michael Schwab, also points to this state of indeterminacy by positing that 'artistic research' is "a term that has been, and still is, suspended in its definition"²⁸⁷ (Schwab, 2011).

Given such a potentially chronic definitional deficit, several options seem viable in order to come to grips with an element that seems to play a pivotal and transformational role in the development of musical practice. We will not opt for a full overview on the 'short' history of AR nor attempt to develop a definition. Hereafter, we will limit ourselves to outlining the directions that AR has taken by proposing three archetypical modes of AR and follow that up with a more punctual understanding of the informational mode as a supportive context and *condition sine qua non* for GIP.

8.1 Three modes of Artistic Research

In "Lighting from the Side" (Nyrnes, 2006) arts researcher Aslaug Nyrnes proposes an alternative to strict definitional approaches to AR via an interactive and processual organization of three 'topoi'²⁸⁸. She distinguishes between three languages that are implied in a process of artistic investigation:

²⁸⁷ <http://www.jar-online.net/index.php/issues/editorial/480>.

²⁸⁸ 'topoi' in this AR-context point to the typical places in a landscape that are frequented by artist-researchers.

1. One's 'own language' (including body language): "The artistic process is always, in various ways embedded in the researcher's own words and expressions. That verbal language includes a wide range of forms: everyday phrases, concepts from more or less internalised theoretical knowledge, phrases from prose and narratives [...] as well as forms such as metaphors, analogies, parts of narratives, fragments of different kinds" (Nyrrnes, 2006, p. 14).
2. 'Theory' or 'systematic language' which is characterized by the use of functionally related concepts, "an artificial, constructed way of viewing the world as opposed to natural or organic" (Nyrrnes, 2006, p. 16).
3. An 'artistic language' which develops into an artistic object or production. This *topos* is concerned with the artistic material itself which by the process of drawing, of writing poetics, of composing, of writing a film script, or of developing a dance production or a performance evolves into an artistic product (Nyrrnes, 2006, p. 17).

Nyrrnes further claims that artistic research is not about choosing between one of these three languages but rather about integrating them by moving around in this topological landscape in a non-linear way and without a fixed starting-point or finish-line. Artistic Research, perhaps in contrast to art, should be about finding a balance between the three *topoi*; research that simply combines the researcher's own language with theoretical language "is bound to be dull and dry" (Nyrrnes, 2006, p. 20) and research that cuts short the discussion of theory implies a lack of interest in "moving beyond the private sphere of experience into an inter-subjective language" (Nyrrnes, 2006, p. 20). Nyrrnes' approach is inherently balanced but does not bar the possibility to make meaningful distinctions between three archetypical types of practitioner-researchers based on a primary emphasis on one of the *topoi*.

Hereafter, we propose three AR-orientations based on their topological emphasis.

A first orientation focuses on the product of artistic action ('material language') and connects the research largely to the claim that musical knowledge can be articulated and communicated "wholly in sound" (Lawson, 2007, p. 64), and thus that the artistic product is at the centre of the original contribution to knowledge and understanding:

[...] knowledge can articulate itself outside of discursive practices, outside spoken and written language, and that this kind of knowledge cannot be generated otherwise than in or through the production of art. The art work is not a practical aid which rushes in to help the discursively presented conclusions; it is itself the statement and the conclusion. (Cobussen, 2007, p. 19)

Within this AR-subclass, artist-researchers enrich the field of musical practice by focusing on the production of new musical artefacts (compositions, new instruments or instrumental techniques, new

performance style, new repertoire). It is an action-based, hands-on approach that is closely and implicitly connected to the experimental and creative habitus of the musician-craftsman who brings into existence new musical things. For future reference, let us call the researchers that comply to this orientation Artistic Experimental Researchers [AERs].

The second archetype of artistic researchers, let us entitle them Artistic Reflective Researcher [ARRs], does not focus on the product but rather on the artistic process and the tacit knowledge implicit in the creative act. The researchers representing this archetype have an artistic practice that they intend to scrutinize and verbalize via a process of self-reflection:

Musicians have highly specialized knowledge and highly specialized skills, but as a rule these competences remain within the individual artist who possesses them. At best we hear the products of these competences when we hear the artists' performances or compositions. Research should be committed to making this enormous treasure of implicit knowledge and skills of artists explicit, to bringing those things into the open for all of us to see, to understand and, hopefully, to use. By helping implicit artistic knowledge to become an object to be shared and discussed by others, research will be able to make a large contribution to the understanding of the art among a larger population and, consequently, to the promotion and development of the arts in general. (AEC/Polifonia Third Cycle Working Group, 2007, p. 13)

The epistemological *ratio legis* that accompanies this orientation is to be found mainly in the work of Ryle (1949) and Polanyi (1958), as well as Schön (1983). These authors claim that human action implies a kind of knowledge that is non-discursive and hidden: a knowing-how (Ryle, 1949), personal knowledge (Polanyi, 1958), tacit knowledge (Polanyi, 1966), reflection-in-action (Schön, 1983). In *The Reflective Practitioner*, Schön typically identifies this kind of knowledge that is implicit within skilful action (reflection-in-action) and that can be made explicit by reflecting on that action (reflection-on-action). Schön's glorification of this type of epistemic 'artistry' is often referred to as a legitimate basis for the existence of this particular strand within AR. One of the prime examples of an ARR would be sociologist and jazz-pianist David Sudnow's reflections in *Ways of the Hand* (Sudnow & Dreyfus, 2001).

A final and third strand of AR which is clearly present in the field but not so prominently discussed in the meta-practical discourse on AR, represents AR-projects with a topical focus on exploring new sources of information as a basis for further artistic implementation in process and product. Within the context of information-oriented AR, the focus of attention has until now predominantly been on the integration and retrieval of historical information (see 2.1). Historically Informed Performance [HIP]). We claim however that under the umbrella of this third strand a new subcategory of enquiry can develop, one that is more inclusive in its informational scope. It concerns AR with no primary interest in elucidating an existing artistic situation through reflection, nor in creating new situations via a process of experimentation of production, but research that is primarily directed at integrating

and assessing the information originating from a variety research fields. While it addresses research questions that arise from cognitive gaps within practice or from demands for guidance and inspiration, this third research strand prioritizes an outward look and explores and hunts the information galaxy for locating potentially relevant insights to then translate these into an artistic discourse. It is an action that requires the interpretation and analysis as well as the creation of new information from blending the incoming elements. In a 2007 AEC-document, an implicit acknowledging of this type of research can be found:

Artistic Research is – not unlike environmental science or medical research – a research field with an overall purpose in need of collaboration and support from different established research disciplines. Therefore, Artistic Research cannot be dissolved into or identified completely with any combination of its component disciplines. Artistic Research should be able to make use of any research tool, method, or knowledge base across the entire range of traditional research disciplines and methods. (AEC/Polifonia Third Cycle Working Group, 2007, pp. 15–16)

Let us identify this group of researchers as Artistic Information Researchers [AIRs].

With this tripartite framework in mind, it is now possible to link each of these three Artistic Research Archetypes, to specific mental spaces within musicianship, namely: The Reflective Practitioner, the Creative and Experimental Artist, and the Informed Musician²⁸⁹ (see Fig. 8.1). The Artistic Reflective Researcher [ARR] amplifies the drive of artists to reflect on what and how they produce and create and does this in a systematic way allowing a discourse to evolve regarding shared processual concerns. Artistic Experimental Researchers [AERs] use the research space offered by AR to transgress boundaries that a standard artistic practice sets with regard to investment of time, support and resources. Finally, Artistic Information Researchers act as an embodied information system between a galaxy of information and the challenges that present themselves to informavorous artists; they hunt, digest and recontextualise information for presentation to an artistic community.

Via this framework, a direct link between practice and research becomes apparent and offers the perspective of a supportive, cumulative and intricate dialectic between the two domains. Moreover, since we are aware that the underlying processes of experimentation, reflection and information do not operate in isolation (Nyrrnes, 2006) but rather in concordant or cyclical terms (Kolb, 1984), both in practice and research, we can also imagine crossing connector lines (see Fig. 8.1) where for instance reflective practitioners build on knowledge generated by the field of AIR.

²⁸⁹ The adjective 'generally' is omitted here because this category also involves HIP.

The existence of cross-area interests further indicates the possibility of establishing topical and dedicated research teams as well as mixed research-teams where research topics are approached from the three specialized angles.

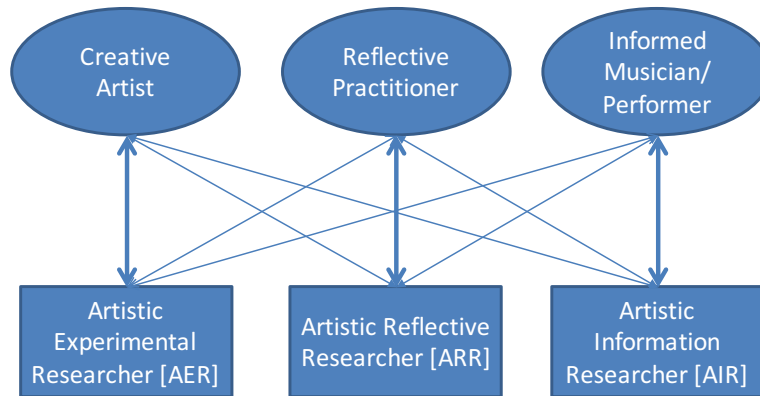


Figure 8.1. Artistic orientations and their research environment.

From the previous chapter, we concluded that considering the extent of the information galaxy, GIP is in need of transpersonal support. By sketching the contours of Artistic Research in terms of three archetypes we indicate a research space that is ideally suited to develop such a supportive function. In general, it is believed that the development of a space within AR where AIRs can build a knowledge-base of extra-disciplinary seminal source material that addresses directly or indirectly the concerns of performers, artistic researchers of all kinds will be able to find a contextual focus much earlier in the course of their research and will be able to concentrate more on their essential and punctual contribution to knowledge and understanding. More specifically then, it is maintained that without AIR's a Generally Informed Performership is close to a utopia and deemed to be restricted to personal development. Combining a full-time artistic practice with an extensive information horizon simply exceeds the human processing capacity if one is not able to rely on the shareable fruits of research in this area. The Artistic Information Researcher seeks to explore the informational horizons for valuable bits of information, integrates them in an artistic discourse and relates them to the efforts of her/his fellow AIRs. Although the Generally Informed Performer is always free to direct her/him directly to the information galaxy, AIRs contribute to a mediating information system.

Within the discourse on AR, experimentation and reflection have enjoyed the focus of attention in the construction of a practice-based research agenda for the 'last scion in the family of research' (Coessens, Crispin, & Douglas, 2009, p. 44) and may have led to a neglect towards a scholarship of cross-disciplinary integration (Boyer, 1990, p. 18). We argue however that this is not due to a general lack of interest per se or any shortage of interesting 'stuff' in other fields of enquiry such as philosophy, psychology, physiology and neuroscience. The prioritising of a look inward is rather related to the

absence of a supportive environment and understanding that indicates and facilitates the opportunities of information.

8.2 An extended definition of GIP

In this chapter, we discussed three contexts that seem to be supportive of an informational turn in musicianship. On a *macro*-level, a dedicated framework regarding the Information Age was configured which allows for openness and emergence but also indicates the historical opportunity that an information and knowledge society offer to musicianship. The aspect of *scientification*, or the dominance of scientific theory in the political and socio-cultural debate, led to the conclusion that the Information Age not only facilitates the development of a Generally Informed Performership but also necessitates it with a view to creating a common ground for debate and discussion. From an operational and *meso*-level point of view we further analysed the role of a European Higher Education Area in the development of GIP. By going back to the rough grounds of music education we could identify three tracks of development (theoretical, practical, productive) that historically merge in the 21st century and are conducive to an integrative turn in musician- and performership. Finally, and on a *micro*-level, we claimed a research space for GIP within the structure of Artistic Research where Artistic Information Researchers are focussing on a look outward and on mediating between the concerns of artistic practice and the information galaxy. The need for such a dedicated context follows from the ambition to transgress the personal level of extra-disciplinary search behaviour.

These new considerations enable us to review and refine the definition of GIP that we developed by the end of PART I. The following approach is now proposed (the new elements are underlined):

A Generally Informed Performership [GIP] is a mental space within the broader category of musicianship where a score-based performer looks in an active, prospective, and systematic manner for information originating from extra-disciplinary fields as a complement to intra-disciplinary paths of artistic training, learning, and development, and allows this information to potentially make a difference to her/his Image of music-making, and the actions and imaginations that build upon that Image.

The effectuation of a GIP builds on the increased transfer-capacity of knowledge in an Information Age, on the integrative turn in education and on a dedicated research space within the framework of Artistic Research.

Definition 3: Generally Informed Performership [GIP], (extended definition).

PART III: The practice of being informed – three bottlenecks

Our investigation is directed at exploring the potential impact of an epistemic and operational framework wherein musical performers' decisions, problem-solving, imaginative, and creative processes are informed not only by traditional and intra-practical information sources such as musical scores, teachers and guiding examples but also by an extended, extra-disciplinary information-base. In Part One, we arrived at delineating the basic contours of such a Generally Informed Performership [GIP], and in Part Two, we identified and discussed three contexts that seem to be conducive to effectuate such an informational turn at the beginning of the 21st century. In this third PART, our attention is on three *difficultating* elements that regularly and persistently surface in the context of operationalising informed practices. Addressing these bottlenecks directly relates to the 'how?'-question of a Generally Informed Performership.

The relation between theory and practice is a first obstacle (Chapter 9). It resembles the information-imagination dyad that we discussed in PART I but holds a more focused orientation towards the craft-side of performership rather than the artistic/creative side to which 'imagination' is more closely allied. Following a basic presentation of the backgrounds that feed this particular polarity, a pragmatic, processual and triangular model will be introduced and proposed as a way out of this positional conflict. The formulation of a 'Generally Informed Performers' Practice' [GIPP] is the spin-off that concludes Chapter 9. The second bottle-neck (Chapter 10) potentially hindering an effectual information flow between musical practice and extra-disciplinary fields, is the particular organization of the academic field into 'humanities' and the 'sciences' ('two cultures') versus the epistemic organisation and status of musical practice. In the context of the modern system of the arts, music, as an autonomous practice, has tended to isolate itself from the worldly debate by claiming meta-physical and *noumenal* qualities and taking recourse to concepts such as genius and individual taste; if musicians wish to be open for a dialogue with extra-disciplinary expertise, a common epistemic ground is mandatory. It will be argued that from a pragmatic perspective, a bio-cultural understanding of the musical phenomenon is a promising point of departure for establishing such a constructive interaction. Finally, and as already indicated in PART I, a Generally Informed Performership is also in need of a practice-based information system in order to be operational in a practical way, one that structures a chaotic flood of information based on performers' shared concerns (Dunsby, 1995). A discipline-specific attractor model will be proposed as a first step in the direction of systematically developing such an information system for score-based performers.

Chapter 9: Regarding theory and practice

“There is nothing as practical as a good theory” (Lewin, 1964, p. 169).

Connecting the realm of musical practice to a broader field of epistemic enquiry inevitably leads, next to a perceived dualism between information and imagination – as amply discussed in PART I – to another long-standing issue of debate, that of the relation between theory and practice, or between thought and action.

Integrating thought with action effectively has plagued philosophers, frustrated social scientists, and eluded professional practitioners for years. It is one of the most prevalent and least understood problems of our age. Universities have shunned it on the ground that effective action was too practical or – the best kiss of death – vocational. (Argyris & Schön, 1974, p. vii)

In Chapter 7 it was already indicated how the institutional history of music education bears witness to this tenacious tension, and how, in our times, the framework of a European Higher Education Area is committed to transgress the boundaries between theory (‘knowledge’) and practice (‘skills’ & ‘competences’) via the European Qualification Framework. However, the performative act of creating an institutional and educational framework seems to be only one of many elements necessary to bridge an ideological ‘gap’ that has been pertinent in western culture for centuries. Indeed, and akin to the ‘information’ and ‘imagination’ duality, ‘theory’ and ‘practice’ are in common parlance strongly linked to distinctive and opposing realms of human activity: ‘theory’ as tied to man’s capacity to abstract, to think and to reflect, and ‘practice’ as concerned with human action in particular situations.²⁹⁰ Connecting the two realms, as is implicitly the case in the concept of ‘informed practice’, therefore poses persistent epistemic challenges that have been copiously explored throughout history, and are a central issue of debate in our time. Within this chapter, theory and practice will be first considered from a definitional and historical perspective (as in Chapters 1 & 3, but in abbreviated form) before turning to scholarship related to professional knowledge and adult learning that offers a pragmatic alternative for a *status quo*.

²⁹⁰ See ‘On the common saying: That may be correct in theory, but it is of no use in practice’ (Kant, 1793/1996).

9.1 Territorial understandings

A look at the definitions of 'practice' and 'theory' in the *Oxford English Dictionary* gives us first, general indications about the issue at hand. As far as 'practice' is concerned, at least four meanings are relevant:

- The carrying out or exercise of a profession [def. 1].
- The actual application or use of an idea, belief, or method, as opposed to the theory or principles of it; performance, execution, achievement; working, operation; (Philos.) activity or action considered as being the realization of or in contrast to theory [def. 2a]; The action of doing something [def. 2c].
- The habitual doing or carrying on of something [def. 3a].
- Repeated exercise in or performance of an activity so as to acquire, improve, or maintain proficiency in it [def. 4].

In the definitional cluster, links between practice and profession, application, action, and habit are noticeable, as well as a clear opposition between 'practice' and 'theory'.

If, in turn, we look at the definitional perspectives on 'theory' also four significant perspectives can be selected:

- The conceptual basis of a subject or area of study. Contrasted with practice [def. 1a].
- Abstract knowledge or principles, as opposed to practical experience or activity [def. 2].
- A conception of something to be done, or of the method of doing it; a systematic statement of rules or principles to be followed. [def. 3]
- An explanation of a phenomenon arrived at through examination and contemplation of the relevant facts; [def.6a]; More generally: a hypothesis or set of ideas about something [def. 6b].

A paradox can be observed here: although 'theory' is generally contrasted with notions such as 'practice', 'experience', and 'activity', the third definitional perspective [def. 3] suggests that theory is nevertheless closely connected with 'something to be done', a practice in other words; the fourth definition [def.6b] implies that theory follows up on an action (examining, contemplating) or experience. The appearance of the two concepts in each other's definitional spectrum is indicative for an intrinsic relationship that seems to be *prima facie* of a two-way sequential nature: theory is derived from practice or in other cases precedes it. As with information and imagination, these initial and apparent incongruities between opposition and alliance need to be submitted to a closer examination to see if they hold the potential for a (re-)engineering of an integrated conceptual space.

9.2 A short history regarding the standard-view

The identification of two modes of coping, one which is concerned with material change and the other with understanding and explaining invariable environmental forces, thus changing the self as far as ideas is concerned²⁹¹ is a basic division that runs through the history of Western thought (Dewey, 1929, p. 3). To meaningfully arrive at a reconfiguration of this traditional doctrine, we must go back to the rough grounds of our Western civilization to find the seminal insights that led to the perception of a gap between these two modes of survival. Indeed, the relation between practice and theory has been debated in philosophy since its beginnings in the Socratic tradition. In pre-Socratic usage, 'theory' is a visual term entailing the action of seeing or observing. A *theoros* [θεωρός] is, next to an envoy sent to consult an oracle, also someone who travels to see men and things.²⁹²

Theoria took the form of pilgrimages to oracles and religious festivals. In many cases, the *theoros* was sent by his city as an official ambassador: this "civic" *theoros* journeyed to an oracular centre or festival, viewed the events and spectacles there, and returned home with an official eyewitness report. An individual could also make a theoric journey in a private capacity: the "private" *theoros*, however, was answerable only to himself and did not need to publicize his findings when he returned to the city. (Nightingale, 2004, p. 3)²⁹³

It is Plato who first draws a parallel between the observer at a theatre and the philosopher, and calls the philosopher a special kind of *theoros*. In Plato's view, theoretical activity is not restricted to the moment the rational contemplation of the Forms; rather, it encompasses the entire journey, from departure to contemplation to return and reportage.

The philosophic theorist will, when he returns, 'give an account' of his vision which is open to inspection and to questioning. In addition, he will translate his contemplative wisdom into practical and sometimes political activities: theoretical wisdom provides the basis for action. In the good city, moreover, the theoretical philosophers will rule the polis. (Nightingale, 2004, p. 5)

Plato's philosopher is altered and transformed by the journey of *theoria*. He returns as a stranger to his fellow-citizens and brings an alterity into the city by possessing a divine perspective. Notwithstanding the functional relation between theory and practice in Plato, the connotation of 'alterity' to everyday life sets the scene for an epistemic differentiation later in history. It is Aristotle,

²⁹¹ Changing the self 'in idea' is not limited to rational and scientific analysis, but also includes mysticism, metaphysical beliefs and superstition, which all serve the practical purpose of secure well-being within a referential framework or Image of the world.

²⁹² <http://www.perseus.tufts.edu/hopper/morph?l=gewros&la=greek#lexicon>.

²⁹³ This dual function of theory can serve as a seminal case regarding the distinction between personal theory and formal theory. Personal theory is for personal use and is not in need of reporting back, whereas formal theory is specifically linked to this requirement. From this an analogy can be inferred with regard to the distinction between a Generally Informed Performer, who seeks information for personal use, and an Artistic Information Researcher, who operates in a more systematic manner.

the master of distinctions, who severs the boundaries of practice and theory and more in particular the influence of theory on practice. Aristotle discusses *theoria* in two contexts, as a way of living and as an epistemological category. In both contexts theorizing is presented as an exclusively contemplative activity which may or may not lead to *praxis* (doing, in an ethical sense). *Theoria* is a distinct occupational activity, an end in itself, completely cut off from the social and political realm. For Aristotle, the theoretical way of living [*theoretikos bios*] fulfils the human potential at its best; the ethical/practical life puts the human being also into an independent position but comes second since it does not transcend the contingencies of reality; lowest in hierarchy is *poiesis* (making), an activity that is bound to the pattern of means and ends and therefore evaluated as dependent and coerced by the contingencies of nature and fate. In fact, it can be said that *theory* and *praxis* are both forms of praxis: the praxis and life-style of the theoretician and the praxis and life-style of the practitioner. For this reason “the problem never arises for the Greeks in the sense of a contrast of theory as inactivity to praxis as activity; both are activities that presuppose a high degree of leisure in the sense of being independent of those activities that serve only to sustain life” (Lobkowitz, 1977, p. 16).

The theory-practice relation, however, is not only a distinction between differential different ways of living. As well-known, and already discussed in previous chapters, Aristotle establishes a critical epistemic distinction between *theory* (thinking, the inquiry into the fundamental reason and causes), *praxis* (doing, human action in the realm of ethical-political practices), and *poiesis* (making, the production of things)²⁹⁴ in the *Nicomachean Ethics* where it is asserted that the end of doing and making is to cause change, whereas the end of *theoria* is knowledge of the object itself; all three classes pertain to the domain of reasoning and are differential forms of rationality. This is different in the opening of the *Metaphysics* [Aristot. Met. 1.980b-1.981b] where Aristotle makes crucial distinctions between knowledge and craft (*technē*) on the one hand, and experience (*empeiria*) on the other, a differentiation that is in our view more fundamental to the theory-practice debate than the one presented in the *Nicomachean Ethics*. Aristotle’s perspective on the relation between theory and experience in the *Metaphysics* is rendered below, in abbreviated form with punctual reference to the key-words and -concepts in Greek.

²⁹⁴ Book VI of the *Nicomachean Ethics* is often referred to as the *locus classicus* where Aristotle sets epistēmē apart from other knowledge forms, *phronēsis* and *technē*. In the *Metaphysics* and in the *Topica* too, however, Aristotle makes slightly different distinction by distinguishing between different species of the genus epistēmē. One specified form of epistēmē is theōrêtikê or theoretical, another form is praktikê or practical and a third form is poiêtikê or craft knowledge (Eikeland, 2008, p. 81). So, from a technical perspective and more specifically in relation the term ‘theory’ reference to the *Metaphysics* is more accurate with regard to the practice-theory debate.

The other animals live by impressions [φαντασίαις] and memories [μνήμαις], and have but a small share of experience [ἐμπειρίας]; but the human race lives also by art and reasoning [τέχνη καὶ λογισμοῖς]. It is from memory that men acquire experience [ἐμπειρίας], because the numerous memories of the same thing eventually produce the effect of a single experience.[...] Experience seems very similar to science and art [ἐπιστήμη καὶ τέχνη], but actually it is through experience that men acquire science and art [ἐπιστήμη καὶ τέχνη] [...] Art arises when from many notions gained by experience one universal judgement about a class of objects is produced.

With a view to action experience seems in no respect inferior to art, and men of experience succeed even better than those who have theory without experience. [...] But yet we think that knowledge and understanding [εἰδέναι] belong to art rather than to experience, and we suppose artists to be wiser [σοφωτέρους] than men of experience (which implies that Wisdom depends in all cases rather on knowledge); and this because the former know the cause, but the latter do not. [...] Hence we think also that the master-workers in each craft are more honourable and know in a truer sense and are wiser than the manual workers, because they know the causes of the things that are done (we think the manual workers are like certain lifeless things which act indeed, but act without knowing what they do, as fire burns, - but while the lifeless things perform each of their functions by a natural tendency [φύσει], the labourers perform them through habit [ἔθος]); [...] in general it is a sign of the man who knows and of the man who does not know, that the former can teach [...]

It is generally assumed that what is called Wisdom is concerned with the primary causes and principles, so that, as has been already stated, the man of experience [ἐμπειρος] is held to be wiser than the mere possessors of any power of sensation [αἴσθησιν], the artist [τεχνίτης] wiser than the man of experience [τῶν ἐμπείρων], the master craftsman wiser than the artisan; and the speculative sciences [θεωρητικὰ] to be more learned than the productive [ποιητικῶν].

From the elements that Aristotle presents, we can infer that a continuum rather than a split between theory and practice (as experience) is asserted. The basic building block on which all seems to depend is sensation, then comes memory as a facilitator of experience, which is in turn considered to be a *conditio sine qua non* for knowledge and wisdom (see Fig. 9.1 for an overview and the Greek concepts that are connected to each of the steps)²⁹⁵. It is essential however that Aristotle does not include any way back from theory to practice in this model: theory is not considered to generate a beneficial impact on matters that are concerned with the production of particulars via experience.

²⁹⁵ A special thanks to Dr. R.M. van den Berg (Leiden University, classical languages and cultures) for generously answering questions in relation to the interpretation of Aristotle's *Metaphysics*.

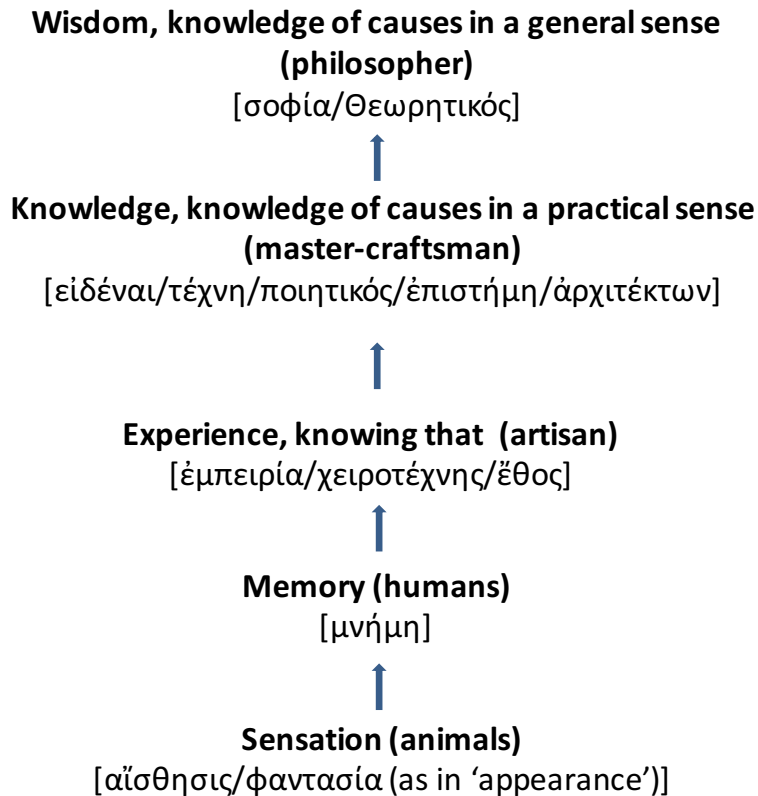


Figure 9.1. The road from sensation to wisdom according to Aristotle.

In the Western history of ideas, the hierarchy between theory and practice as presented by Aristotle changes profoundly with the rise of Christianity. For a Christian, one does not need to be brilliant, a philosopher, in order to achieve wisdom. Acceptance and belief require no sophisticated mental operations; even the illiterate and the enslaved can achieve the Christian equivalent of wisdom: salvation. Theory becomes identified with belief, with faith, as something immutable, a revelation, a truth of human life located outside this earthly existence. Also the unambiguous superiority of contemplative over active life is challenged; for Christians, deeds of charity serve a world which is not the Christian's homestead, and yet they have to be carried out almost as if they were the only thing which really matter: "the Christian emphasis upon charity and love as opposed to mere knowledge has resulted, and from now on evermore radically will result, in an emphasis upon practice as opposed to theory until eventually practice will become the sole source of meaning and salvation" (Lobkowitz, 1967, p. 74).

Theory as a guide to practice, then, is a modern understanding of the theory-practice relationship. It follows from the fact that modern philosophers and scientists, starting from around 1600 CE, claim that their new type of theory is the sole legitimate form, not only of science, but of sound knowledge in general. It is from this perspective that the view takes root that a *scientizing* of human action is

possible and that this impact can be extended and transferred, in a second phase, to the area of production.

Not only for Descartes and Hobbes but even for Malebranche, Leibniz, and Wolff it goes without saying that the Aristotelian thesis of the impossibility of scientizing praxis or of the ultimately unscientific nature of practical knowledge is based simply on the inadequacy of ancient and medieval theory. (Lobkowitz, 1977, p. 23)

In the scientific era of positivism, the foundational character of theory vis-à-vis practice becomes a powerful idea which is still pertinent in our time (see Chapter 6 on 'scientification'). However, the relation between theory and practice never settles. In 1793 Kant addresses the matter from a pragmatic point of view in 'On the common saying: That may be correct in theory, but it is of no use in practice'²⁹⁶ (Kant, 1793/1996) and forges a link between theory and practice via the concept of judgement. Kant first defines the terms:

A sum of rules, even of practical rules, is called theory if those rules are thought as principles having a certain generality, a so that abstraction is made from a multitude of conditions that yet have a necessary influence on their application. Conversely, not every doing is called practice, but only that effecting of an end which is thought as the observance of certain principles of procedure represented in their generality. It is obvious that between theory and practice there is required, besides, a middle term connecting them and providing a transition from one to the other, no matter how complete a theory may be; for, to a concept of the understanding, which contains a rule, must be added an act of judgment by which a practitioner distinguishes whether or not something is a case of the rule. (Kant, 1793/1996, p. 279)

Akin to Aristotle, Kant remarks that certain theoreticians can be at loss in practical situations where an expert opinion is required because of three possible reasons: either because there is no rule available; by lacking an appropriate sense of judgement; or because the theory is still incomplete and needs to be supplemented by engaging in further experiments and experiences, from which to abstract new rules. Kant claims that in the latter case, it is not the fault of theory if it is of little use in practice, but rather of there having been "not enough theory, which the man in question should have learned from experience and which is true theory even if he is not in a position to state it himself and, as a teacher, set it forth systematically in general propositions" (Kant, 1793/1996, p. 279). Kant concludes that theory is a *condition sine qua non* to reach a level of practical proficiency in a science; experimenting and experiencing without putting together certain theoretical principles or considering a systematic framework will not take anyone further than theory could take him.

The connection between theory and practice is not settled with Kant. In his monumental *Philosophy of the Inductive Sciences* from 1840, polymath William Whewell dedicates a chapter on the relation

²⁹⁶ [Über den Gemeinspruch: Das mag in der Theorie richtig sein, taugt aber nicht für die Praxis].

between theory and practice, entitled 'of Art and Science' [vol.2, part II, book XI, chapter 8]. Whewell challenges the common opinion that Art²⁹⁷ is the application of Science to the purposes of practical life. He maintains that the Arts of life already appear when, as yet, nothing of science exists and infers from this observation that it is impossible to imagine that *every* art has been preceded by the science which renders a reason for its processes. According to Whewell, the object of Science is *Knowledge*; the object of Art are *Works*; Art is satisfied with producing its material results whereas in science the operations of matter are interesting only so far as they can be embraced by intelligible principles. There are many acts that can be performed by the guidance of nature and under the impulse of an unknown principle which Whewell calls *Instinct*, without seeing or seeking the reason why he does so. However, when man's speculative nature seeks and finds the reasons why he should act in a particular way, then they are performed by the aid of a different faculty, called *Insight*. Art, according to Whewell is separate from Instinct because of its progressive character but also not essentially combined with Insight. Whewell concludes that Art, in its earlier stages at least, is widely different from Science, independent of it, and anterior to it. At a later period, Art may borrow aid from Science (Whewell, 1840, pp. 271–277).

Further in the 19th century we find influential views that challenge the hierarchy between theory and practice, notably in Karl Marx's *Historical Materialism*, and in the 20th century, where phenomenologists such as Merleau-Ponty aim at uncovering of a pre-theoretical and pre-objective layer of experience as a basis for knowledge. We will not present a full report on these evolutions in modern and post-modern times here²⁹⁸, rather, our focus will be on a particular perspective that holds the promise of functionally and pragmatically integrating theory and practice. Retrospectively, Bacon is among the first to articulate that ambition; he claims that theoretical knowledge has to prove itself by 'fruits and works' (Lobkowitz, 1967, p. 89) and should be judged in terms of, and pursued for the sake of, its practical usefulness: "truth is shown and proved by the evidence of works rather than by argument, or even sense" (quoted in Lobkowitz, 1967, p. 90). Bacon's seminal insight is of little influence on his contemporaries but the idea then resurfaces at the end of the 19th century and the first half of the 20th century within the context of pragmatism.

9.3 A processual and pragmatic approach: inquiry, experience, habit, belief

In 1878 philosopher and mathematician Charles Saunders Peirce formulates the optimal way of 'attaining clearness of apprehension', also known as the pragmatic maxim: "Consider what effects,

²⁹⁷ Art is still used in its meaning of craft in this text.

²⁹⁸ See Lobkowitz (1967) for an extensive historical analysis from Aristotle to Marx.

that might conceivably have practical bearings, we conceive the object of our conception to have. Then, our conception of these effects is the whole of our conception of the object”²⁹⁹ (Peirce, 1878). The background for a pragmatic conceptualization of the relation between theory and practice is the dissolution of the contemplative ideal of the relation between subject and object, and the advancement of a new way of knowledge development. Whereas rationalists form knowledge by the exercise of reason, and empiricists rely on sensory experiences, pragmatists emphasize the experimental nature of certain forms of experience: one tries something out and finds that it either works or fails, whatever the case may be (*fallibilism*). In the view of Dewey, traditional epistemologies, whether rationalist or empiricist, make too sharp a distinction between thought, the domain of knowledge, and the world of fact to which thought is directed. In these knowledge systems thought is believed to exist in a separate realm, as the object of awareness and as a unique aspect of the self. The commitment of modern rationalism to a doctrine of innate ideas, as well as the empiricist commitment to an introspective methodology and a representational theory of ideas, has, according to Dewey, effected this dichotomy. This epistemic state of affairs holds evident problems with regard to the relevance of thought (theory) to the world of practice: if thought constitutes a domain that stands apart from the world, how can it ever be accurate about that world? It is as an answer to this question that pragmatists develop a new model of understanding.

The pragmatist answer is strongly informed by an evolutionary perspective³⁰⁰ which considers human life as being continuous with — and not in opposition to — the natural and physical world; pragmatists emphasize action, interaction, integration, and adaptation between organism and environment as a basic procedure in life. A change of situation might necessitate a change of performance in order for it to be successful, thereby perhaps changing also the associated knowledge and beliefs. This practical view on knowledge implies that there is nothing other than the practice itself — there may even not be an generalizable truth or an empirical reality underlying it (Jarvis, 1999, pp. 41–42). Instead of purely contemplating the object of knowing, the knower is considered from an action and production point of view, which is prior to the theoretical relation of the knower and the known. Dewey summarizes the pragmatist analysis and a new project for philosophy in *Reconstruction in Philosophy* (Dewey, 1920):

The division of the world into two kinds of Being, one superior, accessible only to reason and ideal in nature, the other inferior, material, changeable, empirical, accessible to sense-observation, turns inevitably into the idea that knowledge is contemplative in nature. It assumes a contrast between theory and practice which was all to the disadvantage of the latter. But in the actual course of the development of science, a tremendous change has come

²⁹⁹ <http://www.peirce.org/writings/p119.html>.

³⁰⁰ The pragmatists were all strongly influenced by Charles Darwin, whose *Origin of Species* was published in 1859.

about. When the practice of knowledge ceased to be dialectical and became experimental, knowing became preoccupied with changes and the test of knowledge became the ability to bring about certain changes. Knowing, for the of experimental sciences, means a certain kind of intelligently conducted doing; it ceases to be contemplative and becomes in a true sense practical. Now this implies that philosophy, unless it is to undergo a complete break with the authorized spirit of science, must also alter its nature. It must assume a practical nature ; it must become operative and experimental. (Dewey, 1920, p. 121)

The focus on experience as the *locus* of meaning and inquiry is an extension of this insight which eventually leads to an anti-dualist stance, rejecting any separation between body and mind, emotion and reason, thinking and doing, and practice and theory. Pragmatism advances a processual world-view, where the individual is constantly reacting to and reflecting on the consequences of its interactions with the environment. Within such a context, experience is the ongoing transaction of organism and environment aiming at a subsequent state of affairs thought to be more desirable. “Since the reality of objects cannot be known prior to experience, truth claims can be justified only as the fulfilment of conditions that are experimentally determined, i.e., the outcome of inquiry” (Audi, 1999, p. 730). In pragmatic philosophy, pure theorizing — the Platonic-Aristotelian ‘*theoria*’ — is not completely banned or absorbed by practice, but by radically functionalizing theory, it is made less powerful and deprived of its foundational purpose (Gimmler, 2004); (scientific) knowledge is instrumental and inherently fallible, a tool for organizing experience satisfactorily. It is in the process of ‘inquiry’ that these ideas are most clearly formulated.

‘Inquiry’ is the method for arriving at beliefs about the world (not absolute truths) in a disciplined and self-controlled way. A canonical statement is found in Peirce’s classic paper ‘The Fixation of Belief’ (Peirce, 1877). According to Peirce, inquiry is a ‘struggle’ to replace doubt with ‘settled belief’ which in turn leads to the settlement of a habit, a rule of action, a tendency to act in certain ways in certain situations of a similar nature. The goal of thought is thus to create, via beliefs, habits of action (Gavin, 2008, p. 354). The relation between experience, habit³⁰¹, inquiry and belief can be summarized as follows: when experience conflicts with an inquirer’s settled belief, (s)he is immediately thrown into doubt and doubt essentially involves a struggle to escape. Inquiry is that struggle to regain belief and to install new habits of action (Misak, 2008, p. 75). See Fig. 9.2.

³⁰¹ Philosopher and pioneering psychologist William James zooms in on ‘habits’ in chapter 4 of *The Principles of Psychology* (1890, pp. 104–127). To James, creatures are ‘bundles of habits’ that are malleable via plasticity: “Plasticity [...] means the possession of a structure weak enough to yield to an influence, but strong enough not to yield all at once. Each relatively stable phase of equilibrium in such a structure is marked by what we may call a new set of habits” (James, 1890, p. 105). Habit economizes the discharge of nervous and muscular energy. While we are inattentive to actions carried out through habit, we become immediately aware of them if something goes wrong (James, 1890, p. 121).

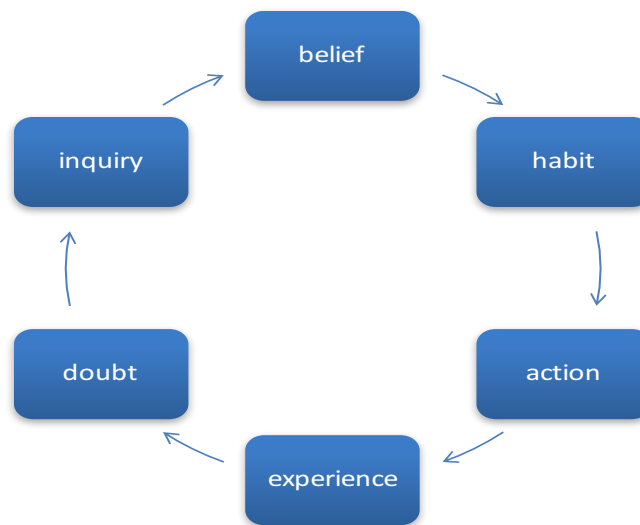


Figure 9.2. Peirce's pragmatist circle.

Peirce argues moreover that the only method of inquiry that can make sense of our struggles with inconsistent beliefs is the scientific approach. Science reveals how hypotheses can be subject to experimental tests: a knower is an agent, who makes experimental interventions in the world in order to obtain empirical support for held beliefs and learns from the experiences that actions and interventions elicit (Hookway, 2016).

Dewey's conception of reflection and inquiry, found in *How We Think* (Dewey, 1910) and *Logic: the Theory of Inquiry* (Dewey, 1938) builds on the same principles: inquiry begins with a problem that arises from 'an indeterminate situation'; inquiry then aims for "the controlled or directed transformation of an indeterminate situation into one that is so determinate in its constituent distinctions and relations as to convert the elements of the original situation into a unified whole" (Dewey, 1938, pp. 104–105). Whereas Peirce aims at 'fixing' belief, Dewey considers the situation as being indeterminate and in need for transformation via inquiry. By this, Dewey challenges the common assumptions that all that changes are our beliefs about the situation. In his view, also the situation itself is transformed: we begin in a situation where we do not know our way around based on our habits, and inquiry comes to an end when we do. The 'pattern of inquiry' that Dewey describes is common to practical problem solving: it transforms and evaluates the features of the situations in which we find ourselves; it is a *modus operandi* grounded in adaptive responses of pre-human organisms to their environments in circumstances that check efficient activity in the fulfilment of basic needs. What is distinctive about intelligent inquiry however is that "it is facilitated by the use of language, which allows, by its symbolic meanings and implication relationships, the hypothetical rehearsal of adaptive behaviours before their employment under actual, prevailing conditions for the

purpose of resolving problematic situations” (Field, n.d.). Dewey captures concept of inquiry in logically distinct steps (Dewey, 1910, p. 72):³⁰²

1. A felt difficulty
2. Its location and definition
3. Suggestion of possible solution
4. Development by reasoning of the consequences and bearings of the suggestion
5. Further observation and experiment leading to its acceptance or rejection; that is, the conclusion of belief or disbelief.

Inquiry begins thus with a problematic situation, a situation where instinctive or habitual responses of the human organism to the environment are inadequate for the continuation of ongoing activity in pursuit of the fulfilment of needs and desires. The second phase of the process involves the isolation of the data or subject matter which defines the parameters within which the reconstruction of the initiating situation must be addressed. In the third, reflective phase of the process, the cognitive elements of inquiry (ideas, suppositions, theories, etc.) are entertained as hypothetical solutions to the originating impediment of the problematic situation, the implications of which are pursued by reasoning in the abstract. The final test of the adequacy of these solutions comes with their employment and observation in action and experiment. If by a reconstruction of the antecedent situation fluid activity is achieved, then the solution no longer retains the character of the hypothetical that marks cognitive thought; rather, it becomes a part of the new circumstances of life.

The error of modern epistemologists, as Dewey sees it, is that the reflective stages of this process have been isolated into pre-existing constituents and as guides for an incorrigible foundation of knowledge. For Dewey, however, any proposition accepted as an item of knowledge has this status only provisionally, contingent upon its adequacy in providing a coherent understanding of the world as the basis for human action. Both Dewey and James argue that the traditional correspondence theory of truth, according to which the true idea is one that corresponds to reality, only begs the question of what exactly the correspondence of idea with reality is. They maintain that an idea agrees with reality, and is therefore true, if and only if it is successfully employed in human action in pursuit of human goals and interests, that is, if it leads to the resolution of a problematic situation. Dewey introduces ‘warranted assertibility’ to describe the distinctive property of ideas that results from successful inquiry (Dewey, 1938).

In the pragmatist framework theory becomes an instrument in reconstructing an indeterminate and unsatisfactory practical situation, the adjoining beliefs and habits, and experience. Instead of being

³⁰² For a full exposition of ‘the pattern of inquiry’ see *Logic: the Theory of Inquiry* (Dewey, 1938, pp. 101–119).

separated fields of expertise, theory and practice are allies in a process of surviving, coping and imagining new conditions for experience.

In the following section, it will be examined how contemporary scholarship further operationalizes a pragmatic integration between theory and practice by the inclusion of ‘personal theory’.

9.4 Personal theory in a triangular model.

In scholarship related to professional knowledge and adult learning (Polanyi, 1958; Carr, 1980; Usher & Bryant, 1989; Schön, 1983; Jarvis, 1999) ‘personal theory’ (Jarvis, 1999), or ‘informal theory’ (Usher & Bryant, 1989; Usher, Bryant, & Johnston, 1997), is presented as a specific way out of the theory-practice dualism. Since this area of scholarship has barely reached the discourse of artistic practice in an explicit manner³⁰³, we briefly outline the backgrounding framework.

Professional education scholars that work within a pragmatist tradition – and are usually abundantly referring to the work of Schön, Polanyi and Ryle – use the notion of ‘personal theory’, or an equivalent of it, to challenge the modernist view that theory is privileged as ‘real’ knowledge, whilst practice, seen as consisting merely of skills, is taken to be the application of that knowledge for the solving of problems (Usher & Bryant, 1989, p. 71). They thereby primarily target curricula that are hierarchically organized into: 1/ theoretical studies based on ‘foundational disciplines’³⁰⁴; 2/ professional studies; and 3/ supervised practice. The overall aim is to situate and define a spectrum of differential knowledges (tacit, practical, propositional, formal, informal), to make their boundaries permeable, and to forge a fruitful cooperation between them without regressing into a dualist trap.

An important element that is called in support of such a pragmatist-inspired view is the underdetermination of practice by theory. Practical judgements are always made in conditions and concrete situations of ‘bounded rationality’ where theoretical knowledge is often incomplete and inadequate to fully understand practice situations. To pragmatists, this is a logical consequence of the fact that theoretical knowledge aims at being impersonal and universal, and is focused on explaining the world, not on acting on it and in it (Usher & Bryant, 1989, p. 75). However, while theory seems to be unable to account for practical decisions, that does not imply a total banishment from the practical realm, at least not in the view of professional education theorists. It is in the justification of practical judgements that theoretical knowledge is granted a pivotal role. The limitation however is that, since the justification itself requires a judgement as to which ‘bits’ of theoretical knowledge are relevant to the particular practice situation, the answers to these questions cannot be found in theoretical

³⁰³ The work by art theorist Grete Refsum, who refers to ‘personal theory’ in the field of design, is a notable exception (Refsum, 2009).

³⁰⁴ Foundational disciplines are the academic disciplines that serve as a basis for professional activity; anatomy, for example, is foundational for medical professions, mathematics for engineering.

knowledge itself. They require a process of deliberation and interpretation which is an essential aspect of judgement and action in practice situations. It is an element that must be found within practice itself.

9.4.1 *Practical knowledge*

From this limitation on theoretical knowledge follows the need for a category of practical knowledge. By practical knowledge is meant the practitioner's own knowledge that has been pragmatically legitimated in and through practice. In this process, the practitioner develops her/his own personal and qualitative ways of doing things in accordance with her/his own values, beliefs, and feelings. Jarvis (1999, pp. 45–49) sketches the contours of practical knowledge by asserting that it is a combination of:

- Process knowledge ('knowing-how')
- Content knowledge (provided by the academic/foundational disciplines that underly practice)
- 'Tacit knowledge' ("one knows more than one can tell")
- Beliefs and values

Practical knowledge is the basis for assessing the relevance of theory and gains performative impact if the implicit assumptions and routines are made explicit via a process of reflection. Although practical knowledge is primarily driven by the demands of practice, it combines learning from doing and thinking about practice with learning from other information sources, such as content knowledge learned from foundational disciplines or extra-disciplinary knowledge.

9.4.2 *Personal theory*

It is from the interaction with these forms of theory that the notion of 'personal theory' surfaces as a more specific concept³⁰⁵. The *ratio legis* for advancing this type of 'theory' in practice situations is related to the fact that action always involves intentionality.

Intentions are embedded in conceptual frameworks which are referred to as 'informal theory'. The argument is that practice presupposes that the practitioner has an informal theory. If 'theory' is interpreted in this sense, then the relationship between theory and practice is not contingent but conceptual, i.e. necessary. Informal theory becomes a condition of practice. (Usher et al., 1997, p. 133)

Here, an intrinsic alliance between practice and theory is forged as it was already suggested from the first territorial analysis (see 9.1). With this notion of personal theory, it is the inseparability rather than the duality of theory and practice which is emphasised. Personal (or informal) theory is considered to

³⁰⁵ There is a variety of concepts that come close to the meaning of 'personal theory' (tacit or personal knowledge) but it is the presence of the term 'theory' that is of particular interest to us here.

be an intrinsic part of the experiential world of practitioners (and humans at large), it is a kind of knowledge that we all have and use in particular situations; it is not abstract and decontextualized, yet equally is not merely intuitive and unsystematic. It is situated theory both entering into and emerging from practice.

9.4.2.1 The functions of personal theory

From a functional perspective personal theories are primarily concerned with enabling practitioners to work within the concrete, segmental situations in which they find themselves, by relating their activities to both what is desirable and what is possible within those circumstances, and to assess the outcomes of their activities in the light of these considerations. Since without such a 'theory', practice would be random and purposeless, it can be said that personal theory 'forms' practice. It enables practitioners to make sense of what they are doing (Usher & Bryant, 1989, p. 80).

A second function attributed to personal theory is its contribution to the identification of problems. In practice situations, finding the problem requires 'problem-setting' as a prerequisite of any kind of problem-solving, and problem-setting requires a framework to 'understanding' the practice situation; an 'understanding' which is not derived from abstract theory or general principles but is situational and action-oriented (Usher & Bryant, 1989, p. 81).

Thirdly, personal theory allows for the development of a situational repertoire which helps the practitioner to cope with different kinds of problematic situations; this repertoire enables the new and unfamiliar to be related to similar but different situations successfully handled in the past. Every practice situation, therefore, potentially enables an extension and reconstruction of the repertoire.

9.4.2.2 The weaknesses of personal theory

There are also some inherent weaknesses attached to relying on personal theories in this form.

Firstly, because these theoretical preconceptions are largely the product of habit, precedent and tradition they are rarely formulated in any explicit way or informed by any clearly articulated process of thought (Usher & Bryant, 1989, pp. 84–85). The essentially and, to a large extent idiosyncratic and implicit nature of personal theories, inhibits in some cases collegial dialogue about efficacy and leads to discussions that get bogged down in endlessly repetitious arguing.

Secondly, the most common function of personal theory is to eliminate practice problems rather than improve practice; the concern is with 'fire-fighting' rather than 'fire-prevention'.

Thirdly, as business theorist Chris Argyris and Schön claim (Argyris & Schön, 1974), people seem to act according to two theories of action; one theory of action is the theory-in-use and is the tacit companion to our actual behavior while the second theory of action, espoused theory, is the account that is

publically communicated and formulates a 'practically correct' version of one's doings³⁰⁶. With the presence and interference of these two personal theories of action, confusion and misinterpretation becomes very likely.

Fourthly, informal theory tends to tap only the most immediate and obvious causes, and explanations may be of a simple, linear kind rather than multiclausal or interactive. It follows that personal theory can be limited in the scope and depth of the reflection which it is able to incorporate.

And finally, inseparably as it is in practice, personal theory as it is ingrained into everyday routines may impede reflection and critical scrutiny, and stimulate an unquestioned traditionalism.

9.4.2.3 The role of theory in a process of reflection

The answer of professional education researchers to these weaknesses is quasi-invariably the inclusion of some kind of reflection in practice, allowing the practitioner to objectify personal theory and to stay open to change and not merely trying to cope in routine and habitual ways. Reflection-in-action involves looking to our experiences, connecting with our feelings, and attending to our theories in use. It entails building new understandings to inform our actions in the situation that is unfolding.

The practitioner allows himself to experience surprise, puzzlement, or confusion in a situation which he finds uncertain or unique. He reflects on the phenomenon before him, and on the prior understandings which have been implicit in his behaviour. He carries out an experiment which serves to generate both a new understanding of the phenomenon and a change in the situation. (Schön, 1983, p. 68)

Within this context of reflection-in-action, contemporary scholars have repositioned the role of formal, disciplinary theory (Usher & Bryant, 1989, p. 92) and of information that originates from a variety of sources, which in this context is called formal theory or metatheory.

[Metatheory] is information stemming from the academic disciplines and driven by the internal logic of the discipline rather than by the exigencies of practice. There are two elements to metatheory. The first is the content knowledge for practice, learned by studying the academic disciplines that underlie practice [...] Then there is the knowledge about the profession or occupation, based in academic disciplines such as sociology, philosophy, and economics; The latter makes no pretence of being applicable to practice but it tends to contextualize it. The learning is cognitive, but it may be useful information when the practice as a whole is in the spotlight. (Jarvis, 1999, p. 146)

The notions of 'metatheory' and 'formal theory' come close to our understanding of extra-disciplinary information (or extra-practical information in this case) and are valued because they provide a critical

³⁰⁶ When someone is asked how he would behave under certain circumstances, the answer he usually gives is his espoused theory of action for that situation. This is the theory of action to which he gives allegiance, and which, upon request, he communicates to others. However, the theory that actually governs his actions is this theory-in-use (Argyris & Schön, 1974, pp. 6–7).

perspective which allows a process of continual reassessment and review of personal theory in a socio-practical field.

One way of formulating a possible relationship between formal and personal theory is by using the notion of 'review'. This involves accepting that the purpose of formal theory is representation and explanation, and that of informal theory is judgement, interpretation, and understanding; the relationship between theory and practice is then not one where the former is 'applied' to the latter, but where representations and explanation can assist judgement, interpretation, and understanding. (Usher & Bryant, 1989, p. 93)

Formal theory can be a useful tool or resource by providing a means to view practice in a different way and hence to reformulated the problem. Here, theory is not applied to practice; rather, the process can be conceptualized as one where practice is reviewed through theory.

The place of formal theory can be seen as a component in a process of dialogical engagement; the existence of practice problems indicates a failure of informal theory, and resolution requires an engagement of informal theory with something outside itself [...] the dialogical engagement is therefore constituted by the mutual interaction of formal and informal theory, the resolution being an emergent synthesis. A resolution where formal theory overwhelms informal theory would only be apparent, since it could not suggest situated action appropriate to practice. Equally, the overwhelming of formal theory would again only lead to an apparent resolution, since the latter would be but a reformulation of the other. (Usher & Bryant, 1989, p. 94-95)

Educational philosopher Wilfred Carr also formulates this dialogical relation:

The relationship of theory and practice is not one of applying theory to practice; nor is it a matter of deriving theory from practice. Rather by recovering self-reflection as a valid category of knowledge, the critical approach interprets theory and practice as mutually constitutive and dialectically related. The transition is not from theory to practice or practice to theory, but from irrationality to rationality, from ignorance and habit to knowledge and reflection. (Carr, 1986, p. 183)

Finally, we are also reminded of McLuhan's saying that "we do not know who discovered water [but] it was almost certainly not a fish. Anybody's total surround, or environment, create a condition of non-perception" (quoted in Lukasiewicz, 1994, p. xxi). The added-value of theory in practice is that it places habits, automatisms, routines in another perspective and opens them for new elements and change.

9.4.2.4 Defining the role of personal theory in the practitioner-researcher's action cycle

We can now come to integrating the various aspects that are involved. Fig. 9.3 (apart from the dotted lines) is based on the framework that Jarvis develops in *The Practitioner-Researcher* (Jarvis, 1999, p. 133); it represents an action-cycle³⁰⁷ where the dual implication of theory (theory as

³⁰⁷ Learning theorist David Kolb (Kolb, 1984) argues along similar lines constructing a cycle that involves: 1.

information/personal theory) is incorporated: 1/ a practitioner enters a work situation [practice situation 1]; 2/ learns and reflect on the practice; 3/ incorporates into the reflection any formal or meta-theory in the context of review; and 4/ learn and develop her/his own personal theory which is then tested. We added two dotted lines as an answer to the following questions:

1. Is it always necessary for personal theory to be impacted by meta-theoretical information via reflection on practice or can there be an immediate line between personal theory and meta-theory? Or in other words, is the sole function of meta-theory to justify and to review reflections in and on practice? We understand that from a pragmatic point of view, and in order to make that point, any reference to technical rationality is banned. From the investigation in PART I however, we can deduce that information is not limited to justification, problem-setting and reviewing and does not always originate from a cognitive gap or an information need in a practical situation. One of the impacts of information can be that the practitioner is a novice in a particular area and has never thought of a certain solution or has never heard about it. In such cases, meta-theoretical information is directly related to personal theory.
2. Do the reflections of practitioners become part of the field of meta-theory, once they are verbally articulated? In a context of dialogue, as it is envisaged by pragmatically oriented education theorists, it seems only logical that the fruits of reflections become integrated in a meta-theoretical galaxy.

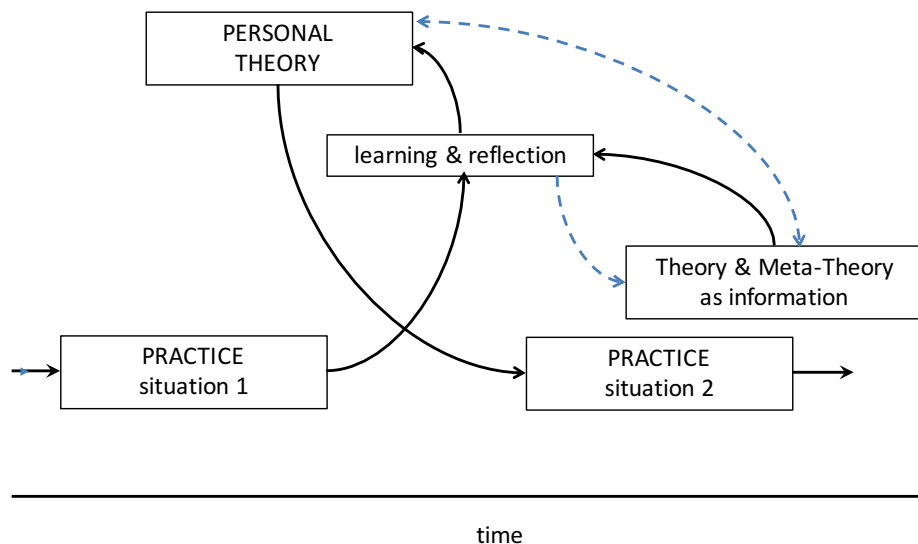


Figure 9.3. An action cycle involving personal theory and meta-theory (Jarvis, 1999, p. 133).

Next to adding two extra, dotted lines, there is another element that can be taken into consideration in extending the primary relation as represented in Fig. 9.4. In the assessment of evidence-based

concrete experience; 2 reflective observation; 3. abstract conceptualization; and 4. active experimentation.

health care public health researchers John Gabbay and Andrée le May (Gabbay & le May, A., 2004; Gabbay & le May, 2011) observed that health professionals do not go through the steps that are traditionally associated with the linear-rational model of evidence based practices. Rather than directly accessing new knowledge in the literature or from the internet and other written sources, the practitioners nearly always took shortcuts to acquiring what they think would be the best evidence base by consulting nearby and trustworthy sources (magazines, professional networks, colleagues). Gabbay and le May call the knowledge thus acquired ‘mindlines’; collectively reinforced, internalized tacit guidelines, which are informed by brief reading and mainly by interactions with colleagues, opinion leaders, patients, and pharmaceutical representatives and with other sources of largely tacit knowledge. Based on the indications that we collected in PART I with regard to the information behaviour of practitioners, we may then come to the model in Fig. 9.4 where the element ‘peers, colleagues, opinion leaders’ is added to the informational realm and gives rise to the personal theory and mindlines.

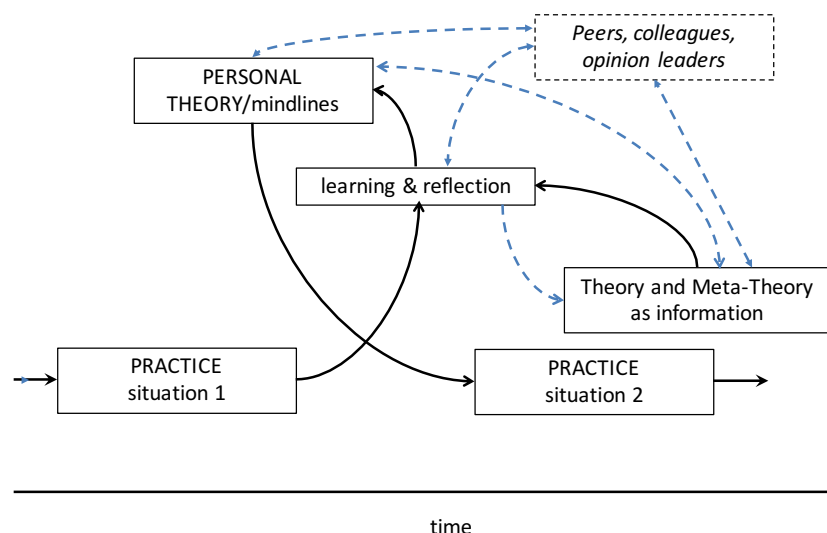


Figure 9.4. An extended action cycle including intra-practical references.

It might be clear by now that the ‘solution’ that is presented here with regard to the theory-practice divide is strongly reminiscent of the one that we configured in relation to the information-imagination duality, and also allows for topologically situating the differentiations that we proposed in Chapter 8 with regard to three archetypes of practitioners (the creative artist, the reflective practitioner and the informed practitioner). If we 1/ substitute ‘personal theory’ by ‘Image’; 2/ add to ‘learning and reflection’ the notion of ‘experience’; 3/ explicitly mention extra-disciplinary information as part of ‘meta-theory’; 4/ consider experiment as a part of practical doing; and 5/ include all the parallel languages that we have mentioned so far, then we come to an overview such as in Fig. 9.5.

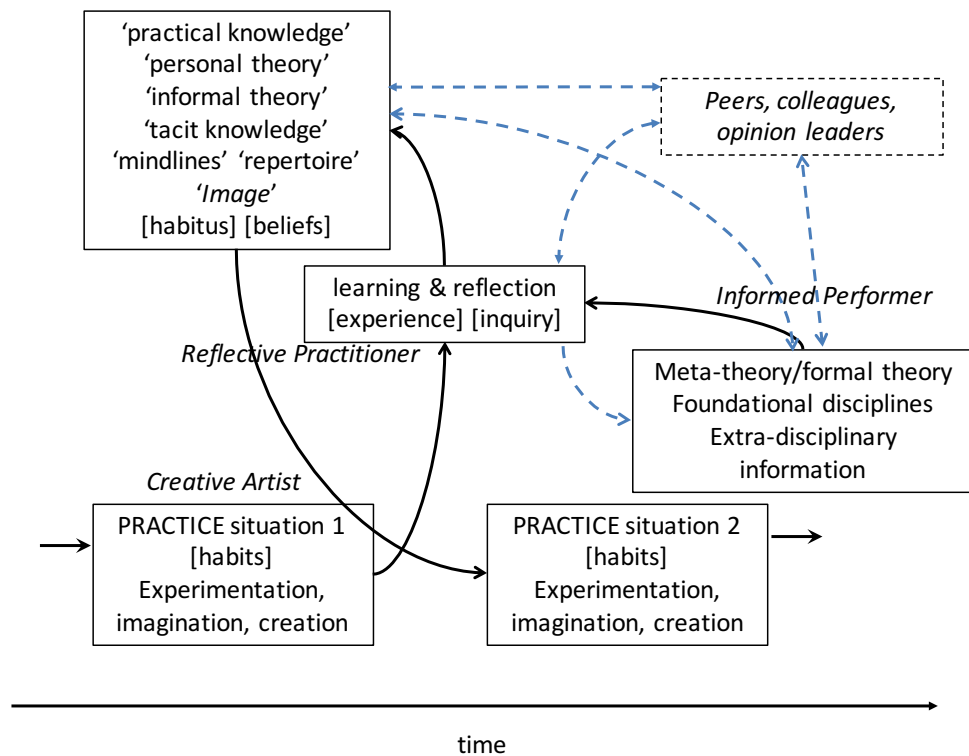


Figure 9.5. An integrated action cycle.

If we finally bring the considerations, sketched above, back to the concreteness of musical performance, we have to be aware of the crucial fact that the idea of ‘personal theories’ is tailored to practices that can be easily linked to foundational disciplines and thus to fields of expertise where the ‘danger’ of technical rationality is prominently present. As already remarked in Chapter 8, the practice of musical performance does not fit that particular profile since it does not include such foundational disciplines – at least not in the sense that for instance biology is foundational for medicine. There are professional schools of music or conservatories where performers learn their craft/art mainly via instruction by a master, or even succeed at reaching a high level of performance solely via the mechanism of individual score-based ‘deep learning’. However, in our view, these particularities do not compromise the existence and prominence of personal theories in music performance. Personal theories are for instance indirectly referred to by Borgdorff who includes an ‘immanent perspective’ as one of the possible relations between theory and practice:

There is [...] no such thing as ‘innocent’ practice. Practices are ‘sedimented spirit’ (Adorno). Action theory, phenomenology, and philosophy of science have taught us that every practice, every human action, is infused with theory. Naive practice does not exist in this respect. All practices embody concepts, theories, and understandings. (Borgdorff, 2012, pp. 20–21)

More concretely, anyone who has ever been involved in collectively judging performances (be it at an exam or competition) will have experienced discussions that do not have the accomplishments of the

candidate as their intentional object but rather the ‘personal theories’ of members of the judging committee. In fact, we could say that musical practice is pervaded by personal theories.

The main difference between the general framework that we presented above and the field of score-based performance is, in our opinion, the quasi-non-existence of foundational disciplines in the music performance curriculum. This does not need to imply an abolishment of a category of ‘meta-theory’ but rather an unusual focus on extra-disciplinary information instead of foundational disciplines. within the context of a Generally Informed Performership, as discussed in PART I and taking into account the foregoing considerations, we can proceed to formulating a discipline-specific understanding of ‘personal theory’.

In score-based performance, personal theory refers to a systematic and transmissible understanding gained from reflection on practical experience. It consists of beliefs, opinions, understandings and rules of thumb that have been pragmatically abstracted from particular practical contexts or that have been retained from existing practice traditions and models. Personal theory is the epistemic backbone by which practitioners judge new practice situations and is amenable to revision if new situations necessitate it. If personal theories are unable to provide efficacious answers to practice-based questions, or in cases where reviewing or assessing these personal repertoires is called for, the practitioner will dialogue with extra-disciplinary modes of information, including academic theory.

Definition 4: Personal theory.

9.5 On (social) practices

Until now, we have considered the role of practice and theory in the context of individual coping. Basil Bernstein brings the notion of personal theory to a supra-personal level by introducing the term ‘reservoir’ to refer to the total of sets of ‘repertoires’, or personal theories, possessed by any one individual (Bernstein, 1999a, p. 159). In a more general sense, contemporary sociological theory (Schatzki, Knorr-Cetina, & Savigny, 2001) has engaged itself with the upscaling of personal theory to the echelon of social practices. The main element that practice theorists share is that practices are considered to be at the middle between methodological individualism – reducing social phenomena to individual agency and action – and methodological holism and structuralism – the explanation of phenomena in terms of their relationship to a larger, overarching system or structure. Under the umbrella of ‘practice theory’ – what’s in a name? – two waves or generations of practice theorists can be distinguished: the first generation (Bourdieu, 1972/1977; Foucault, 1975/1979; Giddens, 1979) has laid the foundations for a practice-centred understanding of society, while the second one (Schatzki,

1996; Schatzki et al., 2001; Reckwitz, 2002) has tested these foundations and has refined the framework by adding punctual extensions (Postill, 2010, p. 6).

Bourdieu develops a logic of social practices emphasizing the importance of embodied understandings within the social world. He argues that people do not continuously calculate according to explicit rational and economic criteria but rather operate in a particular domain according to an implicit practical logic and bodily dispositions ('habitus'). With the central concept of 'habitus'³⁰⁸, Bourdieu aims at capturing the ways in which the social order is being internalized and embedded in the agent's body in the form of mental schemes of perceptions, thoughts, and actions.

The habitus [...] is a product of the incorporation of objective necessity, it produces strategies which, even if they are not produced by consciously aiming at explicitly formulated goals on the basis of an adequate knowledge of objective conditions, nor by the mechanical determination exercised by causes, turn out to be objectively adjusted to the situation. Action guided by a 'feel for the game' has all the appearances of the rational action that an impartial observer, endowed with all the necessary information and capable of mastering it rationally, would deduce. And yet it is not based on reason. You need only think of the impulsive decision made by the tennis player who runs up to the net, to understand that it has nothing in common with the learned construction that the coach, after analysis, draws up in order to explain it and deduce communicable lessons from it. The conditions of rational calculation are practically never given in practice: time is limited, information is restricted, etc. And yet agents *do* do, much more often than if they were behaving randomly, 'the only thing to do'. This is because, following the intuitions of a 'logic of practice' which is the product of a lasting exposure to conditions similar to those in which they are placed, they anticipate the necessity immanent in the way of the world. (Bourdieu, 1990, p. 11)

As a generative principle, the habitus allows for situated improvisations which then lead to practice formation in specialist domains of practice; Bourdieu calls these domains (such as art, photography, sociology) 'fields' [*des champs*] which operate according to their own 'logic'. They are the 'game' that Bourdieu mentions in the citation above. Only the players with sufficient 'know-how' and belief in the game ('*illusio*') will be willing to invest time and effort playing it, and to arrive eventually at skilful playing, a good fit between the 'habitus' and the 'field' is mandatory. Other theorists have proposed variations on Bourdieu's 'habitus'-motive. Foucault's concept of 'discipline' (Foucault 1979) is a prominent example. Like habitus, discipline is a structure and power that impresses itself on the body forming permanent dispositions. Sociologist Stephen Turner opts in *The Social Theory of Practices* (Turner, 1994) for a group of concepts that seem to account for what Wittgenstein phrases in relation

³⁰⁸ [The habitus is] the durably installed generative principle of regulated improvisations [which] produces practices which tend to reproduce the regularities immanent in the objective conditions of the production of their generative principle [the habitus], while adjusting to the demands inscribed as objective potentialities in the situation, as defined by the cognitive and motivating structures making up the habitus (Bourdieu, 1972/1977, p. 78).

to 'one's picture of the world' ³⁰⁹ as "the inherited background against which I distinguish between true and false?" (Wittgenstein, 1951/1969, §94):

I saw that there was a large family of terms that were used more or less interchangeably with 'practices'. Among them were some of the most widely used terms in philosophy and the humanities, such as tradition, tacit knowledge, *Weltanschauung*, paradigm, ideology, framework and presupposition. (Turner, 1994, p. 2)

Turner observes that habits die with individuals and that "if something persists in history, it cannot be habits alone. Traditions do persist. So traditions cannot consist of habits" (Turner, 1994, p. 78). In conceptualizing the terrain of social practices, Turner turns to the notions of 'tradition', 'culture', 'mores', and 'paradigm' to capture the factor of continuation and stability that practices bring to personal theories and practical decisions.

A second generation of practice theorists holds on to the focus on the human body as the centre of practices and conceives them as "embodied, materially mediated arrays of human activity centrally organized around shared practical understanding" (Schatzki et al., 2001, p. 11). Both practice theorists Andreas Reckwitz and Theodore R. Schatzki make a useful distinction between 'practice' and 'practices' (Reckwitz, 2002, p. 249; Schatzki, 1996, pp. 90–91) ³¹⁰. 'Practice' in the singular is an emphatic term to describe the whole of human action. It denotes the doing, the actual activity or energization, the continuous happening at the core of human life qua stream of activity and reminds us that existence is a happening taking the form of ceaseless performing and carrying out. It is the type of 'practice' that the Western philosophical tradition tends to oppose to theory. 'Practices', in plural, however are something different. Schatzki considers 'practices' very general as "a temporally unfolding and spatially dispersed nexus of doings and sayings" (Schatzki, 1996, p. 89) and by the inclusion of 'sayings' stresses an inclusive approach, one which allows for the coordination of elements such as personal theories, explicit understandings, formal theories, rules, and skills. Reckwitz is more concrete (with a characteristic emphasis on 'routines'):

[practices are] a routinized type of behaviour which consists of several elements, interconnected to one other: forms of bodily activities, forms of mental activities, 'things' and their use, a background knowledge in the form of understanding, know-how, states of emotion and motivational knowledge. (Reckwitz, 2002, p. 249)

Examples of such practices are: a way of cooking, of consuming, of working of investigating, of taking care of oneself or of others. Practices are thus a routinized way in which bodies are moved, objects are

³⁰⁹ Wittgenstein's understanding of 'world-picture' or 'picture of the world' comes close to the concept of 'Image' that we developed in PART I.

³¹⁰ This distinction is not explicitly present in the OED and also difficult to trace in specialised sociological dictionaries which often lack an entry on 'practice' (Bruce & Yearley, 2006; Turner, 2006; Scott, 2014).

handled, subjects are treated, things are described and the world is understood, it implicitly includes the notions of 'personal theory' and 'Image'. But whereas the Images that surfaced in PART I, were personal, practices are always social, as it is a 'type' of behaving and understanding that appears at different locales and at different points of time and is carried out by different body/minds. 'Practice' (in its first meaning) actualizes and sustains 'practices' (second meaning) and personal theory in a multitude of single and often unique actions that reproduce and fill out the patterns that practices allow for. The single individual then acts as the performer of a practice (in the second meaning), or of a number of coordinated practices, and participates in the conventionalized activities of understanding. The prominent keywords and interconnected concepts in practice theory are 'body' (embodiment), 'mind', 'agents', 'things', and 'knowledge(s)'.

- The body occupies a central place in practice theory. Trained in a certain way³¹¹, it acts as a repository for understandings and as a (re-)producer of practice-related acts. The body is thus not a mere 'instrument' but the routinized actions are themselves bodily performances of practices. Moreover, the role of the body is not confined to modes of handling certain objects but holds also for mental activities such as talking, reading or writing.
- Social practices are at the same time sets of mental activities (activities with no direct relation to a material or bodily component). They necessarily imply certain routinized ways of understanding the world and one's role therein.³¹² In practice theory, this is not a contradiction: a practice such as musical performance consists of a routinized set of bodily actions, but these are necessarily connected with certain know-how, particular limits to interpretation, and embracing ends, projects, tasks, purposes, beliefs, emotions, and moods – the teleoaffective element as Schatzki calls it (Schatzki, 1996, p. 89). If somebody 'carries' (and 'carries out') a practice, he or she must take over both the bodily and the mental patterns that constitute the practice. These mental patterns are not the 'possession' of an individual 'deep inside', but part of the social practice.
- In practice theory, agents are body/minds who 'carry' and 'carry out' social practices. Thus, the social world is first and foremost populated by diverse social practices which are carried by agents. As carriers of a practice, they are neither autonomous nor fully conformist: "They understand the world and themselves, and use know-how and motivational knowledge, according to the particular practice". There is a very precise place for the 'individual' – as distinguished from the agent: "As there are diverse social practices, and as every agent carries out a multitude of different social practices, the individual is the unique crossing point of practices, of bodily-mental routines" (Reckwitz, 2002, p. 256).
- Next to bodies, minds, and agents, 'things' and 'objects' are also necessary components of many practices – just as indispensable as bodily and mental activities. Carrying out a practice very often means using particular things in a certain way. They 'mould' social practices, or, better, they enable, extend or limit certain bodily and mental activities (see for instances the role of musical instruments), certain knowledge and understanding as elements of practices.

³¹¹ See also *les techniques du corps* (Mauss, 1934).

³¹² See Boulding's notion of 'Image' in PART I.

- A specific social practice contains specific forms of knowledge. For practice theory, this knowledge is more complex than 'knowing that'. It embraces ways of understanding, knowing how, ways of wanting and of feeling that are linked to each other within a practice. In a very elementary sense, in a practice the knowledge is a particular way of 'understanding the world', which includes an understanding of objects (including abstract ones), of humans, of oneself. This way of understanding is largely implicit and largely historically-culturally specific; it is this form of interpretation that holds together already for the agent herself (the carrier of the practice) the single acts of her/his own behaviour, so that they form parts of a practice. This way of understanding is a collective, shared knowledge.

The notion of '(social) practices' allows personal theory and its relation to extra-disciplinary information to be situated in a broader practical context. It forms the background against which we can now reformulate and extrapolate the target domain of information in a context of score-based musical performances.

9.6 Performers' Practice

In the field of score-based performance next to the verb 'to practice', 'a practice' is best known in the notion of 'performance practice'. In the OED the following description is attached to the concept:

performance practice *n.* [after German *Aufführungspraxis* (1924 or earlier)] *Music* the way in which music is or has been performed, esp. as concerns issues of authenticity or appropriateness of style in the performance of music from a particular repertoire or date; the study of this as an academic discipline.

In the *Oxford Companion to Music* a similar understanding is advanced:

A term borrowed from the German 19th-century *Aufführungspraxis* to describe the mechanics of a performance that define its style. (Parrott & Da Costa, n.d.)

In *die Musik in Geschichte und Gegenwart* (MGG), *Aufführungspraxis* is defined as:

The area of music-research and -praxis, which is concerned with all aspects by which notated music is turned into sound.³¹³

Finally, In *the Grove's Dictionary of Music and Musicians*, finally, the term 'performing practice' is chosen over 'performance practice':

As applied to Western music, the subject involves all aspects of the way in which music is and has been performed, and its study is of particular importance to the modern performer concerned with historically informed performance. Topics that may be considered aspects of performing practice include notational ones (i.e. the relationship between written notes and

³¹³ [Mit *Aufführungspraxis* bezeichnet man den Bereich von Musikforschung und –praxis, der alle Aspekte der Umsetzung notierter Musik in Klang umfasst].

the sounds they symbolize, especially such matters as rhythm, tempo and articulation); improvisation and ornaments; instruments, their history and physical structure and the ways in which they are played; voice production; matters of tuning, pitch and temperament; and ensembles, their size, disposition, and the modes in which they are directed. Performing practice is generally approached through the study of treatises and instruction books, critical writings and iconographical material, as well as actual instruments and music. (Brown et al., n.d.)

Although definitions are available that would allow for a generous interpretation such as: “the area of music research and praxis that entails all [own emphasis] aspects of transforming scored music into sound” (Gutknecht, n.d.) or “the conventions and knowledge that enable a performer to create a performance” (Randel, 2003, p. 648), we can infer from the brief definitional exploration above that the understanding of ‘performance/performing practice’ is restricted to punctual elements which have a close link to the very act of performing (instruments, scores, tuning, ornaments, tempi). From a historical perspective and in sociological terms: performance practice seems to be primarily about the doings and sayings that are being recovered from earlier times which relate to knowledge and understandings that were once embodied by agents (musicians) who used things (instruments, scores) with a view to stage a performance. By linking the term ‘performance practice’ to Historically Informed Performance we have tacitly agreed to limit ‘practice’ in musical performance semantically to a very restricted aggregation of elements and have closed the option of understanding ‘practice’ more broadly as an array of activities that a performer deploys in function of a performance; these activities would include studying, practicing, experimenting, reflecting, reading, rehearsing, listening, taking lessons, and especially in the case of GIP, also informing oneself. In a more systematic way this broader approach to musical practice as a social practice could be defined as follows:

Musical practice as a social practice indicates an interconnected array of activities (such as analysing, listening, creating, sound-making, reflecting and rehearsing) directed towards the production of music, underpinned by shared implicit (embodied) and explicit (theoretical) understandings, and embedded within a larger cultural and social context.

Definition 5: Musical practice as a social practice.

In such a definition, the personal negotiation between theory and practice is nested in a social practice where the dualism evaporates since explicit, theoretical understandings are a form of knowledge that is intrinsically included in the practice. If we take our semantic exploration a bit further and relate it to a Generally Informed Performership it could be said that GIP is a subdomain of musical practice where a performer has a specific interest including extra-disciplinary information in her/his knowledge-base. We have seen in PART I that delineating the target of information is not a trivial consideration but an essential one; if the ‘performance’ is to be informed, one expects to hear an audible difference qua instruments, ornamentations, tuning; but if, on the other hand, the performer – and more in particular

her/his Image is to be informed – then a whole array of informational avenues opens itself that are not directly linked with the punctual recovery of certain ways of doing. We have until now opted to use to terms ‘performer’ and ‘performership’ as the target-domain of information. However, taking into account the possibilities that are now on the table with regard to the term practice and at the same time respecting the existing understanding with regard to ‘performance practice’, we suggest to introduce the new concept of a ‘performers’ practice’ to specify the broad array of activities that a performer is involved in. A ‘Generally Informed Performers’ Practice’ [GIPP] would then refer to a (social) practice that promotes the integration of extra-disciplinary information in its values, attitudes, beliefs, and actions. Agents within a GIPP would act as Plato’s private *theoroi*, they would leave their homesteads and visit extra-disciplinary and -practical domains, and use the information that they assembled to reflect on, or to expand their personal knowledge base [GIP] or the knowledge base of the practice [GIPP]. Within GIPP Artistic Information Researchers [AIRs] (see Chapter 8) would function as civic *theoroi*, musicians that have taken upon themselves the mission of systematically scrutinizing extra-disciplinary terrains and to report on their findings upon repatriation and by this contribute to the mindlines and reservoir of personal theories that is available within GIPP.

A Generally Informed Performers’ Practice [GIPP] is an interconnected array of activities and understandings within the broader category of score-based performership that is underpinned by a shared and active interest in extra-disciplinary information as a factor in developing personal theories, and as a complement to intra-disciplinary paths of artistic training, learning, and development.

Definition 6: A Generally Informed Performers’ Practice [GIPP].

Chapter 10: Looking for common ground

In PART I, and in the previous chapter, a conceptual way out of the classic dichotomies between information and imagination, and between theory and practice was proposed by triangulating and processualizing these divisive dualities via the introduction of two mediating elements: the human *Image* as the target domain of information, and *personal theory* as a partner in dialogue with systematic theory and metatheory. It was claimed that the interposition of these intermedia is a structural pre-requisite in support of a *Generally Informed Performership* (or *Performers' Practice*) and a facilitator in constructively digesting information originating from extra-disciplinary fields of inquiry. In this chapter, we further assess the operationalisation of such a relation by looking for common ground on which musical practice could communicate with *academia*³¹⁴ on a structural basis. Our investigative strategy is one in which we explore the fields of *academia* (10.1) and *art practice* (10.2) to come via a practice-based extension of the concept of consilience to the advancement of a bio-cultural approach to music as a pragmatic and epistemic platform to dialogue with extra-disciplinary terrains. A bio-cultural perspective on performership is intended as a further specification of the notion 'general' in GIPP that was used until now to indicate the extension of informational interests beyond historical and philosophical fields of enquiry.

10.1 Navigating *academia*

Coming to grips with the vast field of knowledge production in terms of organisation and classification is a longstanding concern that is even more acute in the present age of disciplinary fragmentation and specialisation than in the past. We already encountered Aristotle's seminal three-partite, product-oriented division, Bacon's faculty-driven organisation, Machlup's pragmatic approach, and there is – not explicitly mentioned yet – the division of *academia* in disciplines (Stichweh, 2001) which all could serve as a basis for developing an epistemic compass in the world of university scholarship. Evidently, it is not within the reach of this investigation to present an extensive treatment on this issue here. Our ambition is more focused and will therefore be limited to a basic classification that follows the inception of modern science in the seventeenth century: the division between the sciences and humanities (Gould, 2011, p. 18) also referred to as the two cultures debate (Snow & Collini, 1959/2012).

³¹⁴ *Academia* is used here as a collective for "the world of university scholarship" [OED, *academia*, def.2]. The term is as such also prominently used in Henk Borgdorff's *The Conflict of the Faculties: Perspectives on Artistic Research and Academia* (2012).

10.1.1 Two (or more) cultures?

The original motive for the 'two cultures' divide (Snow & Collini, 1959/2012) finds its origins in late-seventeenth-century intellectual life as a debate between the *Ancients* and *Moderns* [*La Querelle des Anciens et des Modernes*]. The conflict starts off as a literary and artistic debate on progress in the arts and then leads into a more general opposition between classic- and renaissance-thinking *versus* a modern confidence in progress and in the scientific method as a means to arrive at a better, future world. Many early leaders of the scientific revolution boost the modern cause by championing the power of new knowledge – based on observation and experiment – over the renaissance penchant which considers ancient wisdom as the best recipe for intellectual growth. With the arts as primary battle-field, the *Moderns* believe that, akin to scientific practice, also new forms of writing must necessarily surpass ancient styles while supporters of the *Ancients* argue that science's insistence upon the supremacy of novel discovery cannot be transferred to the field of literature and culture. The literary Ancients thus differentiate between the accumulative character of science and the absence of such a process of improvement in the more subjective and additive domain of literary style: "the core of the debate between Ancients and Moderns, after all, [resides] in a literary struggle, not in a contest between science and the humanities" (Gould, 2003/2011, pp. 84–85).

The debate extends further into a generic and methodical direction when hermeneutical philosophers, such as Friedrich Schleiermacher (1768-1834) and Wilhelm Dilthey (1833-1911), postulate a difference between 'Verstehen' [to understand] and 'Erklären' [to explain], and apply these two notions to the humanities [*Geisteswissenschaften*] and sciences [*Naturwissenschaften*] respectively: in the humanities, internal, lived experiences are studied by means of a hermeneutical, interpretative method, whereas the sciences study external objects captured by the senses and then subjected to a process of further experimentation and explanation.

The term 'understanding,' as it is first applied to an individual inner state, designates the interpretation of that psychic state in the context of the whole of psychic life and conditioned by its milieu. In the realm of human affairs this [term] corresponds to what we designate as 'explanation' in the realm of knowledge of nature. Strictly speaking, explanations of human affairs can be expected only to the extent that a reduction to exactly definable (and preferably quantitatively determinable) external facts is possible. But understanding is the domain of all who are actively involved in human affairs, and differs from explanation by participating in life, which is possible only on the basis of life.³¹⁵ (Dilthey, 1883/1989, p. 439)

A more general awareness of an apparent duality gains urgency when novelist and scientist Charles Percy Snow (1905-1980) advances the notion of 'two cultures' in the *Rede Lecture* delivered at

³¹⁵ In the social sciences, the two approaches can be combined, a point stressed by German sociologist Max Weber (1864-1920).

Cambridge University in May 1959. Writing in the middle of the twentieth century, Snow draws on his life experience both as a working scientist and as a modestly successful novelist. He observes a growing gap between literary intellectuals and professional scientists: the two cultures are not only speaking different languages but also live in 'two galaxies' (Solymosi, 2013, p. 85).

I believe the intellectual life of the whole of western society is increasingly being split into two polar groups. [...] at one pole we have the literary intellectuals, who incidentally while no one was looking took to referring to themselves as 'intellectuals' as though there were no others [...] — at the other scientists, and as the most representative, the physical scientists. Between the two a gulf of mutual incomprehension — sometimes (particularly among the young) hostility and dislike, but most of all lack of understanding. They have a curious distorted image of each other. Their attitudes are so different that, even on the level of emotion, they can't find much common ground. [...] The non-scientists have a rooted impression that the scientists are shallowly optimistic, unaware of man's condition. On the other hand, the scientists believe that the literary intellectuals are totally lacking in foresight, peculiarly unconcerned with their brother men, in a deep sense anti-intellectual, anxious to restrict both art and thought to the existential moment [...] This polarisation is sheer loss to us all. To us as people, and to our society. It is at the same time a practical and intellectual and creative loss. (Snow & Collini, 1959/2012)

In a second edition of *The Two Cultures*, published in 1963, a new essay is added, *The Two Cultures: A Second Look*, in which Snow rather optimistically suggests that a new 'third culture' is about to emerge and will close the communications gap between the literary intellectuals and the scientists. However, no structural platform is offered by Snow to systematically operationalize and back-up this evolution.³¹⁶

Next to Snow's observations, another landmark in the two-cultures-debate surges around the millennial transition when scholars revisit a variant of the divide under the notion of the 'Science Wars', a scholarly conflict between 'realists', scientists who uphold the objectivity and progressive nature of scientific knowledge, and 'relativists', postmodern scholars housed in faculties of the humanities and social sciences who regard science as just one system of belief among many alternatives and stress the culturally embedded status of all claims for universal factuality (Gould, 2003/2011, pp. 18–19). The stage for the conflict is set by Paul R. Gross and Norman Levitt, a biologist and a mathematician respectively, in *Higher Superstition: The Academic Left and Its Quarrels with Science* (Gross & Levitt, 1994). The authors counter politically activist attacks upon science generated by humanists and social scientists who, in their view are ignorant of both the workings and the content of the physical and biological sciences. The science wars rise to a climax in 1996 with the publication of a special issue of the journal *Social Text* devoted to the science wars. In 'Transgressing the Boundaries: Toward a

³¹⁶ In *The Third Culture* (1995), author John Brockman claims the emergence of a third culture where scientists are communicating directly with the general public: "third-culture thinkers tend to avoid the middleman and endeavour to express their deepest thoughts in a manner accessible to the intelligent reading public" (Brockman, 1995, p. 18).

Transformative Hermeneutics of Quantum Gravity' (Sokal, 1996a), physicist Alan Sokal offers a postmodern interpretation of some fundamental issues in physics (the unification of quantum mechanics and general relativity) but shortly after publication Sokal admits the satiric quality of the paper intending to demonstrate that much postmodern scholarship is intellectually vacuous. Sokal articulates his justification for the hoax as follows:

One of my goals here is to make a small contribution toward a dialogue on the Left between humanists and natural scientists – “two cultures” which, contrary to some optimistic pronouncements (mostly by the former group), are probably farther apart in mentality than at any time in the past fifty years.[...] my main concern isn't to defend science from the barbarian hordes of lit crit (*sic*) Rather, my concern is explicitly political: to combat a currently fashionable postmodernist/poststructuralist/social-constructivist discourse—and more generally a penchant for subjectivism—which is, I believe, inimical to the values and future of the Left. (Sokal, 1996b, pp. 338–339)

The hoax becomes the object of a legendary academic controversy: on the one side the radical scientists committed to the notion of objective truth in science, on the other side a group of sociologists, historians, philosophers of science, and other postmodern intellectuals; they view science as a social construction, arguing that science should not be granted the status of final arbiter of ultimate truth.

From a more neutral standpoint, sociologist Basil Bernstein analyses the duality in terms of two distinctive knowledge structures within a vertical discourse³¹⁷ (see Fig. 10.1):

A vertical discourse takes the form of a coherent, explicit, and systematically principled structure, hierarchically organised, as in the sciences, or it takes the form of a series of specialised languages with specialised modes of interrogation and specialized criteria for the production and circulation of texts, as in the social sciences and humanities. (Bernstein, 1999, p. 159)

In a hierarchical knowledge structure, the knowledge is integrated; the concern is not to invent new terms or nuances for existing elements such as a 'molecule' or 'energy', rather the goal is to accumulate context-independent bits of knowledge. In a horizontal knowledge structure the production of knowledge is tied to specific segments and context of human existence and leads to the development of idiosyncratic, parallel languages. An example of such a development can be found in the satellite terms that encircle practical knowledge; there we find a number of concepts with comparable semantics: practical knowledge, knowing how, tacit knowledge, personal knowledge,

³¹⁷ Bernstein opposes vertical discourse to a horizontal discourse. The latter is 'common-sense' knowledge: a form of knowledge which it is likely to be “oral, local, context dependent and specific, tacit, multi-layered, and contradictory across but not within contexts [...] the crucial feature is that it is segmentally organised” (Bernstein, 1999a, p. 159).

knowing in practice, experiential knowledge, artistic knowledge, intuitive knowledge, embodied knowledge, informal theory, personal theory (see for an overview Higgs & Titchen, 2001, pp. 37–39).

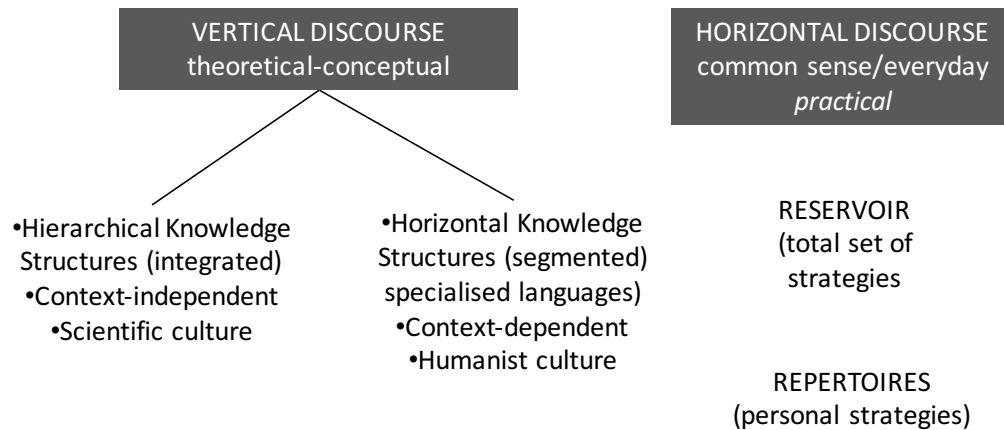


Figure 10.1: Basil Bernstein's view on the two cultures within vertical discourse.

In *The Three Cultures: Natural Sciences, Social Sciences, and the Humanities in the 21st Century* (2009), psychologist Jerome Kagan includes the rise of a third separate culture, generally termed 'social sciences' and comprising the fields of sociology, anthropology, political science, economics, and psychology. This third culture has human life as its subject matter but approaches it with an experimental and scientific instrumentarium. Kagan's three-partite division conforms to what is generically known as the alpha-, bèta, and gamma-classification: the alpha-sciences study the products of human action (history, languages), the bèta-group studies non-human nature (physics, biology) and the gamma-sciences study human action itself (psychology, sociology, economy). Kagan identifies several dimensions of primary differences between the three cultures such as the primary questions asked, the sources of evidence, the vocabulary used, and the criteria of judgement. In his characterization of the three cultures, Kagan points especially to varying conceptions of "truth and the related notions correct, valid, coherent, and right" (Kagan, 2009, p. 40). Kagan presents four common ways in which scientists, social scientists, and humanists relate to truthfulness.

1. Correspondence: an idea is true when it corresponds to a real thing or event that exists outside of and independently of any observers. Kagan's example: "the moon is or is not present in the sky" (Kagan, 2009, p. 40).
2. Logical consistency: an idea is true when it does not contradict and/or offers logical support to other ideas known (believed) to be true – often seen as foundational or a priori. Kagan's example: "if velocity equals the ratio of distance over time then distance equal[s] the product of velocity and time" (Kagan, 2009, p. 40).
3. Semantic coherence: an idea is true when it fits with or seems highly plausible in light of the

larger contextual narrative woven to interpret or understand the facts of a case. Kagan's example: "a historian's suggestion at the end of a narrative of World War II that Churchill did not attend Roosevelt's funeral because of his lingering anger over being embarrassed by Roosevelt during their meetings with Stalin has a claim to truth if this idea strikes most readers as coherent with the complete text" (Kagan, 2009, p. 40).

4. Compelling feeling: an idea is true when it does effect specific emotions that are either pleasing or upsetting to the believer in her/his relation to the idea. Kagan's example: "the feeling accompanying the thought that parental sacrifice for a child is right and abuse is abhorrent" (Kagan, 2009, p. 40).

Even though Kagan recognizes that all four of these notions of truth can be found or are at work in each of the three cultures, he finds that natural scientists tend to trust only the first two; social scientists the first and third; and that humanists rely on the last two. Kagan concludes that some benefit may result from greater humility across the three cultures, through which each group recognizes that it is potent in its own territory but impotent in the territory of the other.

10.1.2 Towards consilience within Academia

Various constructions have been developed with a view to dissolve the apparent gaps between scholarly cultures. *Texts* have been granted a pervading a unifying role in deconstructivist philosophies and in neo-pragmatist thinking; other voices within the debate have claimed that by relegating the findings of the natural sciences to the sphere of texts and literature, these epistemic 'constructions' have the tendency to devaluate and annihilate the potential impact power of discipline-based research outcomes and eventually arrive at an epistemic *status quo*. In the remainder of this chapter, we will zoom in on one of these rival perspectives which is proposed mainly by natural scientists but has also infiltrated literary thinking. It is a line of thought generally referred to as 'consilience' and is best known from the work of (socio-)biologist Edward O. Wilson (°1929). By tracking the historical evolution of 'consilience' we can assess how this framework operates as a functional compass in navigating extra-disciplinary territories.

10.1.2.1 Intra-scientific consilience

Whewell starts of with empirical work in the field of mineralogy but his most distinctive work is situated in his contribution to the history and philosophy of science. Whewell's name is amongst other things connected to the coinage of the noun 'scientist' in an 1834 article in the *Quarterly Review* (see OED).

Whewell publishes a three-volume treatise on *The History of the Inductive Sciences* in 1837 (Whewell, 1837), followed three years later by *The Philosophy of the Inductive Sciences, Founded Upon Their*

History (Whewell, 1840). In both (monumental) works, Whewell focuses on arriving at conclusions, general laws, and theories via the accumulated and repeated observations and experiments with actual phenomena of nature rather than deducing particularities from first principles. In the 1840 treatise [vol.2, part II, book XI, chapter 5 & 6] the author introduces the notion of ‘consilience’ in relation to two modes of inductions. The first mode is a collection of facts that, after repeated observation, leads to correct predictions of facts of the same kind (for instance, most fluids expand when they freeze). Whewell however points to the limits of this mode of inquiry, it provides only general information about a limited set of objects. What he ultimately envisages is an inductive method that expands beyond the repeated observation of the same set of occurrences; Whewell terms it ‘consilience of inductions’. In this second mode, instead of twenty observations on the same phenomenon, twenty entirely distinct and apparently unrelated observations about a set of objects are examined. This collection of unrelated facts does not make sense at first, no thread unites them into any communality. However, when one succeeds at recognizing that each of these apparently disparate facts can be made to cohere and if one kind of explanation can bring a diversity of facts together, one can speak of a higher form of understanding.

The evidence in favour of our induction is of a much higher and more forcible character when it enables us to explain and determine cases of a kind different from those which were contemplated in the formation of our hypothesis. [...] the cases in which inductions from classes of facts altogether different have thus jumped together, belong only to the best established theories which the history of science contains. [...] I will take the liberty of describing it by a particular phrase; and will term it the Consilience of Inductions. (Whewell, 1840, pp. 230–231)

Whewell constructs the neologism ‘consilience’ from *salire* (lat. ‘to jump’), and *con* (lat. ‘together’) to indicate the jumping together of items that appear to be so separate (Gould, 2003/2011, p. 209). For concrete examples of theories that synthesize an apparent mix of large numbers of complex and independent items under the explanatory rubric of a single causal theory, Whewell refers to the theory of universal gravitation and the wave-theory of light.

A next point in Whewell’s argument on consilience is the way it can be related to truthfulness; good and true theories are identifiable by their capacity to simplify by subsumption and to harmonize apparently unrelated items with a single coordinating explanation. Whewell sees a promising future here for simplification and harmonization and supports this vision by the image of a river or a genealogical tree.

The streams of knowledge from various classes of facts will constantly run together into a smaller and smaller number of channels; like the confluent rivulets of a great river, coming together from many sources, uniting their ramifications so as to form larger branches, these again uniting in a single trunk. The genealogical tree of each great portion of science, thus

formed, will contain all the leading truths of the sciences arranged in their due coordination and subordination. (Whewell, 1840, p. 241)

10.1.2.2 Reductive consilience across the sciences and humanities

After Whewell's coining of the neologism, the term 'consilience' disappears from the epistemic radar until it is recovered at the end of the 20th century in Wilson's *Consilience: The Unity of Knowledge* (1998). Wilson, a biologist and a pioneer in the concept of socio-biology (Wilson, 1975), explicitly refers to Whewell's concept of *consilience* and rephrases the 'jumping together' of knowledge as "the linking of facts and fact-based theory across disciplines to create a common groundwork of explanation" (Wilson, 1998, p. 6). The use of the word 'explanation' refers directly to a scientific perspective on things as a point of departure to colonize the vast field of scholarly knowledge production and the reference to Whewell's consilience is followed by the formulation of a clear ambition, namely, to expand the possibility of consilience beyond science and across the great branches of learning including the social sciences and humanities. Referring to Snow's analysis of a gap between the humanities and the sciences (Wilson, 1998, p. 42), Wilson advocates a reductionist version of consilience as a basis for uniting the sciences and humanities.

The natural sciences have constructed a webwork of causal explanation that runs all the way from quantum physics to the brain sciences and evolutionary biology [...]. The explanatory network now touches the edge of culture itself. It has reached the boundary that separates the natural sciences on one side from the humanities and humanistic social sciences on the other. (Wilson, 1998, p. 136)

With regard to a perceived gap between the sciences and the humanities, Wilson sees a solution in the relation and interaction between 'biology' and 'culture'.

There is only one way to unite the great branches of learning and end the culture wars. It is to view the boundary between the scientific and literary cultures not as a territorial line but as a broad and mostly unexplored terrain awaiting cooperative entry from both sides. The misunderstandings arise from ignorance of the terrain, not from a fundamental difference in mentality. The two cultures share the following challenge. We know that virtually all of human behaviour is transmitted by culture. We also know that biology has an important effect on the origin of culture and its transmission. The question remaining is how biology and culture interact, and in particular how they interact across all societies to create the commonalities of human nature. [...] That, in my opinion, is the nub of the relationship between the two cultures. (Wilson, 1998, p. 138)

More concretely, Wilson proposes the concept of *gene-culture coevolution* as an answer to bio-cultural incongruity. This perspective implies that the mind is the brain at work, and culture is the creation of manifold individual minds composing a civilization wherein a cultural legacy is handed on from one generation to the next. Gene-culture co-evolution, in short, implies that the human lineage has added

to the process of genetic evolution the parallel track of cultural evolution, and, that the two forms of evolution interact intrinsically.

Wilson is convinced that genes influence human behaviour, but he is not a naive genetic determinist. He leans heavily on a notion borrowed from developmental genetics: genes lay down 'epigenetic rules', inherited regularities of development or predispositions³¹⁸ which affect and guide (not determine) how an organism looks or behaves. An epigenetic rule is an innate bias that depends more (or less) on the environment (natural and cultural) in which one is situated, to exert its influence. The trick is, according to Wilson, that these underlying genetic predispositions tend to trickle up, "bias[ing] cultural evolution in one direction as opposed to another, and thus connect[ing] the genes to culture" (Wilson, 1998, p. 164).

The epigenetic rules operate, according to Wilson, at two levels. Primary epigenetic rules are automatic and filter and code stimuli in the sense organs all the way to perception by the brain. It is hardwired. Secondary epigenetic rules are regularities in the integration of large amounts of information and draw on memory, experience and emotional colouring. They lead the mind to predisposed decisions through the choice of certain memes and overt responses over others (Wilson, 1998, p. 138).

As culture is reconstructed each generation in the minds of individuals and is transmitted orally or supplemented by writing or art, it can grow infinitely large; however, the fundamental biasing influence and role of the epigenetic rules, being genetic and deep-seated, stays constant according to Wilson. However, two points of view are defensible in relation to the impact ratio of genes: nurturists think that culture is held on a very long genetic leash, if held at all, so that the cultures of different societies can diverge from one another indefinitely; hereditarians believe the leash is short, causing cultures to evolve major features in common.

A final aspect to note in Wilson's thinking is that within the context of gene-culture co-evolution, free will can be rescued from the overall determinism of biological necessity. In Wilson's view, our sense of making choices for which we are responsible is a necessary adaptive illusion related our inevitable ignorance of the totality of material factors involved.³¹⁹

³¹⁸ A note on 'dispositions' and 'pre-dispositions': 'disposition' is a term that has been discussed extensively by Ryle in *The Concept of Mind* (Ryle, 1949). 'Disposition' generally refers to a potentiality (see Aristotle '*dunamis*') which implies a "natural tendency or bent of the mind" [OED, disposition, def. 6]; this meaning has generally lost ground in favour of an understanding of disposition as a (culturally) acquired action tendency. 'Pre-disposition' is then used to refer to a pre-existing tendency that has its origins in nature (the earliest examples mentioned in the OED date from the 18th century and relate to pre-dispositions offered by the seasons and the body).

³¹⁹ Physicist and cosmologist Stephen Hawking speaks of 'effective theories': "In the case of people, since we cannot solve the equations that determine our behaviour, we use the effective theory that people have free will. The study of our will, and of the behaviour that arises from it, is the science of psychology. Economics is also an effective theory, based on the notion of free will plus the assumption that people evaluate their possible alternative courses of action and choose the best. That effective theory is only moderately successful in

So there can be no simple determinism of human thought, at least not in obedience to causation in the way physical laws describe the motion of bodies and the atomic assembly of molecules. Because the individual mind cannot be fully known and predicted, the self can go on passionately believing in its own free will. And that is a fortunate circumstance. Confidence in free will is biologically adaptive. Without it the mind, imprisoned by fatalism, would slow and deteriorate. Thus in organismic time and space, in every operational sense that applies to the knowable self, the mind does have free will. (Wilson, 1998, pp. 131–132)

Wilson's ultimate project is one of installing hierarchies of reductionism, from maximally complex sciences of large and complex systems, such as human societies, to minimal and mathematics-based theories about several basic particles that construct material reality.

Wilson's purpose in writing *Consilience*, lies in his firm belief (not a proven fact) that the chain of reductionism heretofore so successful in stretching from particle physics well into the reaches of biological complexity, is now able to make a move upward in beginning to understand the workings of the human brain, and then moving through the social sciences and eventually, and ultimately, into the traditional humanities of arts, ethics, and even parts of religion. According to Wilson the social sciences, and notably the fields of anthropology, sociology and economics, proceed by using solipsistic, self-referential systems governed by idiosyncratic sets of rules. Only when explanations of cultural and economic behaviours are carried back, largely by way of cognitive psychology, to their causal basis in biology will an analysis be grounded and scientific. Within such a consilient context, evocation of the meaning and quality of life and experience will continue to be the province of the arts, however, their appreciation will be enhanced by an informed criticism newly aware of a cultural and genetic basis. The choice between a transcendental and an empirical foundation for ethics for example will vanish, leaving only the latter, while religion will in this particular scenario be a vehicle for incorporating the highest values of humanity in the poetic form of myths consistent with reality.

As an example of consilience Wilson mentions the great success versus comparative failure between two disciplines for study of equally complex systems: the medical and the social sciences. This divergent evolution lies according to Wilson in the ability of medicine, and the failure of social science, to achieve reduction to sciences of more-basic constituents, better understood and more easy to manipulate (Wilson, 1998, pp. 197–198).

10.1.2.3 Consilience extended to the domain of literary studies

By the end of the 20th century a (small) section of the humanities, and especially literary studies, takes up Wilson's incentive and develops a specific interest in evolutionary theory as an alternative to

predicting behaviour because, as we all know, decisions are often not rational or are based on a defective analysis of the consequences of the choice" (Hawking & Mlodinow, 2010, p. 33).

postmodern relativism and traditional literary criticism. The ‘literary Darwinists’, of which evolutionarist Joseph Carroll (2004) is probably the most eminent representative, take to heart the vision of *The Descent of Man* (Darwin, 1871/1981), *Sociobiology: The New Synthesis* (Wilson, 1975), and *Consilience* (Wilson, 1998). Following Darwin, they sympathize with the idea that

Man with all his noble qualities, with sympathy which feels for the most debased, with benevolence which extends not only to other men but to the humblest living creature, with his god-like intellect which has penetrated into the movements and constitution of the solar system—with all these exalted powers—Man still bears in his bodily frame the indelible stamp of his lowly origin. (Darwin, 1871/1981, p. 405)

Literary Darwinists recognize a genetic stamp not only in the human body but also in the human mind and advocate an intellectual unification in the manner of Wilson’s *consilience*. Philosopher Noël Carroll summarizes this new movement in the humanities and art studies as follows:

Explanations of the emergence and continued robust existence of art may profit from evolutionary considerations. And, sometimes, the history of art, as the cases of film and TV suggest, could be amplified by noticing the ways in which culturally and historically specific artistic problems may be successfully addressed by activating our nearly universal, evolved, cognitive, perceptual, and emotive capacities. That is, sometimes art history and human psychology may work hand in hand; art history may tell us what to look for, and then psychology may help us find it. It is time for the two cultures—the humanities and the sciences—to come together. And there may be no better meeting place than the topic of art and human nature. (Carroll, 2004, p. 105)

In this citation, we find a development that is already on its way in Wilson’s discussion of *consilience*: there are no definite answers to be found either in the sciences nor in the humanities, hence a collaboration seems a logical opportunity.

In *A Biocultural Approach to Literary Theory* (2012), interdisciplinary scholar Nancy Easterlin further operationalizes this take on literary criticism by combining cognitive and evolutionary research with traditional humanist methods with the aim to open up new possibilities for literary interpretation. She pleads for a fair-minded and creative application of cognitive and evolutionary research and charts a middle course between “overly reductive approaches to literature and traditionalists who see the sciences as a threat to the humanities” (Easterlin, 2012).

10.1.2.4 A dialogical alternative to consilience: of foxes and hedgehogs

An interesting assessment of and critique on Wilson’s concept of *consilience* is provided by palaeontologist and evolutionary biologist Stephen Jay Gould in *The Hedgehog, the Fox and the Magister’s Pox: mending the gap between science and the humanities* (Gould, 2003/2011). Gould criticizes Wilson’s project of reductionism by pointing to the emergence and contingency or randomness found in some complex, nonlinear or non-additive systems as main arguments *contra*

reductive consilience. By emergence is meant that new entities, properties, and interactions are found in complex systems which cannot be related to knowing the properties of the components, or of laws governing at the level of those components alone:

If [...] emergent properties simply do not exist at the lower level, and can't be inferred, as a consequence of their non-additive character, from knowledge of lower-level components or their interactions at their own level, then these properties have 'emerged' at the higher level, and have no standing within any reduced science on the consilient chain. (Gould, 2003/2011, p. 223)

Thus, reductionism can only fail in attempts to model, explain, or describe such high-level systems, and we must search for and depend upon new emergent principles embedded in these higher, more complex levels of being (Gould, 2003/2011, pp. 221–224).

Next to emergence, historical contingency is the second element which in some systems may cause effects that do not necessarily lead to a single causal attribution; therefore narrative and hermeneutic methods, drawn from the humanities, may be required rather than classical deductive mathematical formulas that aim at describing linear relations and consequences. Gould highlights evolution by natural selection as a primary example of how entities such as ourselves are not a necessary, but rather a contingent product: “unique historical events in highly complex systems happen for ‘accidental’ reasons, and cannot be explained by classical reductionism” (Gould, 2003/2011, p. 225). Gould goes back to Whewell's notion of consilience as a literal ‘jumping together’ in the mind of diverse facts or phenomena initially appearing as unrelated as a more promising avenue of cooperation between the sciences and humanities. The most instructive example of consilience in the history of science, according to Gould, is the establishment of a theory of evolution as the unifying principle behind the relationships and history of life.³²⁰

Indeed, I would argue that *the Origin of Species* may achieve its most accurate sound bite of description as the most brilliant example ever constructed for the power and efficacy of consilience as a method of proof in natural history. Darwin could not “see” evolution by direct observation in the large, and he well understood that numerous cases of small change in observable time (breeds of pigeons or dogs, improvement of crop plants) do not prove that large transformations occurred by a similar natural cause. So Darwin used consilience as his primary method. [...] Moreover, Darwin explicitly attacks creationism most severely for its failure to forge consilience. Over and over again, Darwin tells us how evolution makes coordinated sense of a set of observations, whereas creationism can only regard each separate item as distinct and wondrous. (Gould, 2003/2011, p. 211)

³²⁰ NB: Darwin was a student Whewell's.

To deliver the material for such an integration of unconnected facts, Gould is a strong believer in holding onto the autonomy of several *magisteria*, or domains of interest, for producing manageable and punctual information.

So, Gould comes to defend a union of equals allying the sciences and humanities and based on autonomy and mutual respect, not on a hierarchy where the humanities are subsumed under a reductionist framework of physical science. Gould formulates his vision on the operationalisation of consilience by invoking two archetypical ways of coping with and adapting to a situation. He thereby refers to philosopher Isaiah Berlin³²¹ who divides writers and thinkers into two categories (Berlin, 1953/1997). On the one hand, hedgehogs view the world through the lens of a single defining idea (see Plato, Hegel, Nietzsche, Proust), try to keep out of harm's way but will use their one great trick if overtaken by the hunters' dogs: the animal rolls up into a ball, with its small head and feet, and its soft underbelly, tucked up neatly and completely within the enclosing surface of spines (Gould, 2003/2011, p. 4). Foxes, on the other hand, draw on a wide variety of experiences which cannot be boiled down to a single idea (see Herodotus, Aristotle, Desiderius Erasmus, Shakespeare, Goethe as primary examples of foxes); when pursued by hunters, foxes figure out a new and sneaky way to escape each time. When turning more punctually to the authorship of Leo Tolstoy, Berlin contends that Tolstoy escapes definition into one of the two groups and represents a hybrid form.

Gould sees in Berlin's treatment of literature two levels of metaphorical meaning for human contrasts. The first level speaks of psychological styles, often applied for quite practical goals.

Foxes owe their survival to easy flexibility and skill in reinvention, to an uncanny knack for recognizing (early on, while the getting remains good) that a chosen path will not bear fruit, and that either a different route must be quickly found, or a new game entered altogether. Hedgehogs, on the other hand, survive by knowing exactly what they want, and by staying the chosen course with unswerving persistence, through all calumny and trouble, until the less committed opponents eventually drop away, leaving the only righteous path unencumbered for a walk to victory. (Gould, 2003/2011, p. 5)

The second level is about favoured styles of intellectual practice: diversify and colour, or intensify and cover.

Foxes (the great ones, not the shallow or showy grazers) owe their reputation to a light (but truly enlightening) spread of real genius across many fields of study, applying their varied skills to introduce a key and novel fruit for other scholars to gather and improve in a particular orchard, and then moving on to sow some new seeds in a thoroughly different kind of field. Hedgehogs (the great ones, not the pedants) locate one vitally important mine, where their particular and truly special gifts cannot be matched. They then stay at the site all their lives, digging deeper (because no one else can) into richer and richer stores from a mother lode

³²¹ Berlin has also written extensively on the divorce between the humanities and the sciences. As representatives of both cultures, Berlin opposes the epistemic attitudes of Giambattista Vico and Voltaire (Berlin, 1980).

whose full generosity has never before been so well recognized or exploited. (Gould, 2003/2011, p. 5)

Gould uses the fox and hedgehog as models for how the sciences and humanities should or could interact. He believes that neither pure strategy can work, but that “a fruitful union of these seemingly polar opposites can, with goodwill and significant self-restraint on both sides, be conjoined into a diverse but common enterprise of unity and power” (Gould, 2003/2011, p. 5). If we lose sight of the one overarching goal underneath the legitimately different concerns and approaches of these two great ways, then we are truly defeated. But the way of the fox cannot prevail either, because too great a flexibility may lead to survival of no enduring value — mere persistence with no moral or intellectual core intact. Gould advocates the virtue of fruitful union of apparent opposites.

10.1.2.5 Pragmatic consilience

In *What Science offers the Humanities: integrating Body and Culture* (Slingerland, 2008) linguist Edward Slingerland takes an explicitly pragmatist and naturalist approach to the relationship between the sciences and the humanities. In his view, the humanities have more to learn from the sciences than vice versa. He argues that, for the humanities to progress, its scholars need to take seriously contributions from the natural sciences — in particular research on human cognition — which demonstrate that any separation of the mind and body is entirely untenable. Slingerland promotes an outright, vertical integration:

While the humanities do concern themselves with human-level structures of meaning characterized by emergent structures irreducible (at least in practice) to the lower-level structures of meaning studied by the natural sciences, they are not completely *sui generis*. If we are to take the humanities beyond dualistic metaphysics, these human-level structures of meaning need to be seen as grounded in the lower levels of meaning studied by the natural sciences, rather than hovering magically above them. (Slingerland, 2008, p. 9)

Central in the rapprochement between the humanities and the sciences is the notion of ‘embodied cognition’ or the idea that human cognition is inextricably grounded in, and structured by the body and its sensory-motor systems. According to Slingerland, this relation to a living body is the main bridge between the sciences and humanities.

Another element that is strongly present in Slingerland’s account of consilience is the rejection of objectivism in favour of a pragmatism. He thereby adds a fifth perspective on truth to Kagan’s four ways of looking at truthfulness (see 10.1.1). Objectivism holds that there is an objective reality independent of human activity and that this reality is discovered or revealed to humans through the activity of scientific inquiry. The pragmatic account of truth, as we saw in the previous chapter, is the notion that truth is the successful achievement of goals and that active engagement with one’s

environment instead of passive representation of the world better accounts for our experience as embodied organisms embedded in biocultural environments. This take on truth is summarized by James in *Pragmatism, a New Name for Some Old Ways of Thinking* (James, 1907):

[truth means] that ideas (which themselves are but parts of our experience) become true just in so far as they help us to get into satisfactory relation with other parts of our experience, to summarize them and get about among them by conceptual short-cuts instead of following the interminable succession of particular phenomena. Any idea upon which we can ride, so to speak; any idea that will carry us prosperously from any one part of our experience to any other part, linking things satisfactorily, working securely, simplifying, saving labour; is true for just so much, true in so far forth, true instrumentally. (James, 1907/1922, p. 58)

In the introduction to *Creating Consilience: Integrating the Sciences and the Humanities* (Slingerland & Collard, 2012), published a few years later, Slingerland already adopts a more nuanced with regard vertical integration:

Consilience is often framed in terms of bringing the study of humanistic issues into the same framework as the study of non-human species and non-biotic phenomena [...]. However, we think this way of describing the undertaking is not only unhelpful but also inaccurate. It is unhelpful in that it can give the impression that consilience involves the sciences engulfing the humanities [...]. It is inaccurate because it was clear, before the consilience project was initiated, that significant changes would have to be made to the framework used to study non-human species and non-biotic phenomena in order to deal with a number of humanistic issues. Thus, in our view, it is better to think of consilience as an attempt to develop a new, shared framework for the sciences and humanities. (Slingerland & Collard, 2012, p. 4)

Slingerland formulates the elements of such a framework under the label of a 'second wave' of consilience and advances three key-elements in support of it. First, the second wave of consilience should move beyond eliminative reductionism and respect emergent levels of truth (see Gould's criticism). A kind of dual consciousness is in order that cultivates the ability to view human beings simultaneously under two descriptions, as physical systems and as persons: "on the one hand, we are convinced that Darwinism is the best account we have for explaining the world around us, and, therefore, that human beings are merely physical systems. On the other hand, we cannot help but feel the strong pull of human-level truth" (Slingerland & Collard, 2012, p. 28). Secondly, within the context of the nature-nurture debate it should be accepted that culture and genes exist in a co-evolutionary relationship, and that human culture can play a role in transforming human cognition on both individual and evolutionary time scales (see Wilson). Finally, disciplinary chauvinism should make place for recognizing that consilience is a two-way street.

10.1.2.6 Reconstructive consilience

In a chapter in *the Handbook of Neurosociology* (Franks & Turner, 2013), philosopher Tibor Solymosi³²² advocates a reconstructive consilience which requires the tying together of the advances in cognitive neurobiology with the insights of 'classical' pragmatism. For his project, Solymosi leans specifically on Dewey's idea of the abandonment in philosophy of searching for absolute truth favours instead the application of scientific principles to our practical understanding of moral and social life (Dewey, 1920). Solymosi considers the conflict between science and the humanities as a variety of the conflict between realism and idealism and shows how facts (as facts-of-a-case) as well as values (as ideals, or ends-in-view) are essential components of problem-solving; they only get separated when attempts are made to make a fact into something that exists independently from lived experience. However, when we understand truths as the products of problem-solving activities that are then applicable to other human problems, the fruits of inquiry from both science and the humanities can be mutually beneficial. This is especially so when we consider the differences between the subject matters of common sense, philosophy, and science. Common sense inquiries begin with practical affairs of everyday life; these inquiries become refined into literature and tradition as each seeks to pass down lessons of experience to the next generation, often but not always in a self-critical manner. Science begins with the same subject matter of ordinary affairs; it differs from the humanities in its concern for creating artificial and experimental situations through which specific variables can be isolated and controlled, and which transforms the natural phenomenon into a scientific phenomenon. In doing so, scientists establish new relations in the world which permit scientists and humans to interact with their environments in more stable and often novel ways. Ideally, the products of scientific inquiry feedback into our everyday commonsense experience. Unfortunately, this feedback has not occurred to the degree that would be transformational to human social life. This lack of sufficient feedback and subsequently the impossibility of feeding forward into productive anticipation is at the heart of the conflict between the cultures of the sciences and of the humanities.

Dewey considered it a new task for philosophy to be a transformative and reconstructive power by navigating between the two cultures in such a way that their territories are not opposed or traversed with difficulty.

Over-specialization and division of interests, occupations and goods create the need for a generalized medium of intercommunication, of mutual criticism through all-around translation from one separated region of experience into another. Thus philosophy as a critical organ becomes in effect a messenger, a liaison officer, making reciprocally intelligible voices speaking provincial tongues, and thereby enlarging as well as rectifying the meanings with which they are charged. (Dewey, 1925, p. 410)

³²² Practical note: In the handbook, the author's name is incorrectly referred to as 'Solymoski'.

Following up on Dewey's analysis and appeal, Solymosi presents the framework of *neuropragmatism* as a concrete step in the direction of this kind of reconstructing philosophy. *Neuropragmatism* does so by taking the results and the methods of science seriously as the means for achieving ideals, and, through reflective deliberation, both these ideals and facts are modified to fit the specific situation. In other words, "criticism of science by commonsense is just as valuable as science's criticism of commonsense for the end-in-view of viable growth in ameliorative experience" (Solymosi, 2011, p. 163).

10.1.3 Section-summary

Above, we navigated through the vast field of academic knowledge production and identified several research- and knowledge-cultures that each claim a piece of the cake of truth. From this exploration, it could be inferred that extra-disciplinary, academic fields diverge qua subject-matter and methodological approach, and that intra-academically integration and communication are an important point of concern; especially in terms of different research-cultures that strive for prominence, autonomy and dominance. A look at the scholarly attempts at re-conciliating these different cultures shows that a continuum of options is available ranging from claims to full territorial autonomy, to attempts that hierarchically and vertically reduce, integrate, and order the elements of scientific culture. It could also be noted that currently a discourse is being developed that holds a hybrid middle-position by promoting disciplinary autonomy (the hedgehog-attitude) while simultaneously looking for opportunities in terms of translation, bio-cultural cohabitation via the notion of embodied cognition, complementarity and eclecticism (the fox-mentality). It is a line of thought that builds on the framework of classical pragmatism and situates the 'jumping together' (*con-salire*) of information originating from distinct disciplines and research cultures with an approach to truthfulness that is determined and judged by the viability and the effect of entertaining a certain belief.

In the next section we will see if a line of thought can be identified within the field of music-related research that resonates with the tenets of a bio-cultural dialogue as it is represented in recent scholarship by Gould (2003/2011), Slingerland (2012) and Solymosi (2013).

10.2 Five consilient-friendly views on the relation between art, life and music

In its acquired and cherished state of autonomy and despite the attempts to objectify some of its technical and craft-oriented aspects, Western Art Music *in globo* has developed to a large degree into

a practice that produces internal goods according to its own standards of excellence³²³ (see Wilson's critique on economics and sociology in 10.1.1). In doing so, the field surrounding Western Art Music draws mainly on an internal knowledge-base and an own history and tradition that serve as sources for reflection, interpretation, inspiration and experimental action. This solipsistic state of affairs is to an important extent related to a romantic view on music: if music provides direct access to a *noumenal* and metaphysical realm, why then should talented musicians care about the constraints and characteristics of a world of physical phenomena? In other words, if the musical work is the embodiment of a 'possible' world, why should musicians care and want to understand the 'real' world? This ideology of music's intangible and unmediated quality and the embodiment of it in the musical work, is indeed a major obstacle to connecting musical practice to a wider field of knowledge production. In an effort to understand music in terms of ecological psychology, psychologist Eric Clarke specifically refers to this incongruity when claiming that "as a cultural construction, the idea of autonomy continues to perform a powerful ideological role, both as a barrier and a dynamic force in the critical power of music" (Clarke, 2005, p. 205).

In this section, we explore alternatives to an autonomous epistemic state of music with a focus on orientations that resonate with the attempts in *academia* to come to a coherent and dialogical landscape of enquiry.

10.2.1 Art as experience

We already presented John Dewey in the previous chapters as one of the great thinkers of early American pragmatism, embodying the ambition to reconcile the dualisms between reason and emotion, thinking and doing, theory and practice, and fundamentally, between body and mind. Inspired by Darwin's theory of natural selection, Dewey advocates a naturalistic approach to human understanding, with a central place to our biological structures and functions where knowledge arises from an active adaptation of human organisms to their environments (Rylander, 2012, p. 15).

The primary postulate of a naturalistic theory of logic is continuity of the lower (less complex) and the higher (more complex) activities and forms. The idea of continuity is not self-explanatory. But its meaning excludes complete rupture on one side and mere repetition of identities on the other; it precludes reduction of the "higher" to the "lower" just as it precludes complete breaks and gaps. The growth and development of any living organism from seed to maturity illustrates the meaning of continuity. (Dewey, 1938, p. 23)

³²³ See musicologist Karol Berger in *A Theory of Art* for a discussion of music as a social practice with reference to the MacIntyre criteria: "By a 'practice' I am going to mean any coherent and complex form of socially established cooperative human activity through which goods internal to that form of activity are realized in the course of trying to achieve those standards of excellence which are appropriate to, and partially definitive of, that form of activity, with the result that human powers to achieve excellence, and human conceptions of the ends and goods involved, are systematically extended" (Berger, 2000, p. 111; MacIntyre, 2007, p. 187).

In *Art as Experience* (1934), Dewey presents a theory of art that exemplifies the idea of continuity and embeddedness by focussing no longer on the material 'work of art'³²⁴ but rather on the artistic process and more in particular the development of 'an experience'. According to Dewey, the work of art is what the product cause in experience; however, when it is being separated from the original conditions in experience and remitted to a separate realm, it becomes almost opaque in its significance.

[The task of philosophy of the fine arts] is to restore continuity between the refined and intensified forms of experience that are works of art and the everyday events, doings, and sufferings that are universally recognized to constitute experience.[...] In order to understand the meaning of artistic products, we have to forget them for a time, to turn aside from them and have recourse to the ordinary forces and conditions of experience that we do not usually regard as aesthetic. (Dewey, 1934/1980, pp. 3–4)

Dewey challenges the 'compartmental conception of fine art' (Dewey, 1934/1980, p. 8) which he relates to imperialism, nationalism, and capitalism and instead proposes to base aesthetic theory on the biological sensory exchange (interaction or transaction) between humans, whom Dewey calls 'the Live Creature', and environment.

Ultimately Dewey argues that the art of an artwork is not essentially in the art object but rather in the realisation of having 'an experience'. According to Dewey, normal experience, is full of "distraction and dispersion. What we observe and what we think, what we desire and what we get are at odds with each other" (Dewey, 1934, p. 35), but having 'an experience' is when material experience runs its course to fulfilment.

Then and then only is it integrated within and demarcated in the general stream of experience from other experiences. A piece of work is finished in a way that is satisfactory; a problem receives its solution; a game is played through; a situation, whether that of eating [...] Such an experience is a whole and carries with it its own individualizing quality and self-sufficiency. It is *an* experience. (Dewey, 1934, p. 35)

Art is thus related to a particular form of experience, resulting from a necessary relation between 'doing and undergoing': "to put one's hand in the fire that consumes it is not necessarily to have an experience. The action and its consequence must be joined in perception. This relationship is what gives meaning; to grasp it is the objective of all intelligence" (Dewey, 1934, p. 44).

In all the considerations that Dewey develops in relation to art production and reception the principle of continuity between higher forms of art and everyday experience is continuously employed and developed. It is a first and important step in enabling the use of a shared conceptual *vocabulary* between the fields of biology, culture and art production; it constitutes in very general terms a

³²⁴ Dewey still recognizes the individual art object as a site for the dialectical processes of experience, as the locus where the artist and the active observer encounter each other, their material and mental environments, and their culture at large.

'common ground' for artistic knowledge and other fields of expertise to meet in informational dialogue.

10.2.2 Art in terms of biologically guided, cultural archetypes

In *Consilience* (see 10.1.2.2), Wilson explores the relation between biology, culture and art and devotes a chapter, entitled 'on the arts and their interpretation', to the potential of consilient explanation in relation to the creative arts (Wilson, 1998, pp. 229–259). Wilson presents his enterprise as an alternative to postmodernist approaches which, in his view, lack a compass based on sound material knowledge. According to Wilson, it is only by sharing expertise in a consilient way that progress can be made in understanding the arts:

If the brain is ever to be charted, and an enduring theory of the arts created as part of the enterprise, it will be by stepwise and consilient contributions from the brain sciences, psychology, and evolutionary biology. And if during this process the creative mind is to be understood, it will need collaboration between scientists and humanities scholars. (Wilson, 1998, p. 236)

Wilson's point of departure is similar to Dewey's – although no reference to Dewey is present in the book : "the arts, like the sciences, start in the real world and then reach out to all possible worlds, and finally to all conceivable worlds" (Wilson, 1998, p. 240). Grounded in the 'real' world, Wilson proposes a three-part formula for something to become art: 1/ imitate something; 2/ give it form (geo-metrical); and 3/ intensify its features. By these three extremely reduced elements, art expresses the human condition by mood and feeling, calling into play all the senses, evoking both order and disorder.

According to Wilson, what the masters of the Western canon and those of other high cultures share is their intuitive grasp of inborn human nature, accurate enough to select commanding images from the mostly inferior thoughts that stream through the minds of all of us. These extraordinary artists select images from nature that are most emotionally and aesthetically potent. They achieve that by intuition, and with a sensibility that does not submit easily to formulas. However, while free-ranging in the selected details, artists generally remain faithful to the innate universals of aesthetics. Even when, as part of fantasy, they imagine worlds that cannot possibly exist, they still stay anchored to their human origins. Wilson postulates three evolutionary contexts in which the arts could have evolved.

Firstly, as a remedy against the solipsism of the self-conscious mind (see Mithen in Chapter 3):

The most distinctive qualities of the human species are extremely high intelligence, language, culture, and reliance on long term social contracts. In combination they gave early *Homo sapiens* a decisive edge over all competing animal species, but they also exacted a price we continue to pay, composed of the shocking recognition of the self, of the finiteness of personal existence, and of the chaos of the environment. (Wilson, 1998, p. 245)

According to Wilson, *Homo Sapiens* is the only species to suffer this kind of psychological exile and he considers culture and the arts as a necessary technology to overcome this element of deficit.

A second evolutionary reason for the arts to develop is the way in which they order an overwhelming world. All animals, while capable of some degree of specialized learning, are instinct driven, guided by simple cues from the environment that trigger complex behaviour patterns. The situational context that prompted the arts was the need to impose order on the confusion caused by intelligence. Because of the slowness of natural selection, which requires tens or hundreds of generations to substitute new genes for old, there was not enough time for human heredity to cope with the vastness of new contingent possibilities revealed by high intelligence. Algorithms could be built, but they were not numerous and precise enough to respond automatically and optimally to every possible event. The arts filled the gap. Early humans invented them in an attempt “to express and control through magic the abundance of the environment, the power of solidarity, and other forces in their lives that mattered most to survival and reproduction” (Wilson, 1998, p. 246).

Finally, and next to countering solipsism and creating order and meaning from the seeming chaos of daily existence, the arts also nourish our craving for the mystical originating out of the subconscious and out of our dreams of the unattainably distant places and times. Wilson considers the human attraction to mystery as “something still too amorphous, too poorly understood to be broken down into puzzles” (Wilson, 1998, p. 254). The fact that our minds travel so easily and eagerly from the familiar and tangible to the mystic realm, even in times of global information networks, indicates that the human spirit is drawn toward the unknown, that what has yet to be uncovered.

Given this evolutionary background, what can we know about the creative powers of the human mind itself? According to Wilson, the explanation of the material basis of the arts can only be found at the juncture of the sciences and the humanities. The primary premise is always that *Homo Sapiens* is a biological species born of natural selection in a biologically rich environment and the corollary attached to that premise is that the epigenetic rules affecting the human brain were shaped during genetic evolution by the needs of Palaeolithic people in their environment. The premise and corollary have consequences for conceptualizing culture:

Culture, rising from the productions of many minds that interlace and reinforce one another over many generations, expands like a growing organism into a universe of seemingly infinite possibility. But not all directions are equally likely. [...] The epigenetic rules of human nature bias innovation, learning, and choice. They are gravitational centres that pull the development of mind in certain directions and away from others. Arriving at the centres, artists, composers, and writers over the centuries have built archetypes, the themes most predictably expressed in original works of art. Although recognizable through their repeated occurrence, archetypes cannot be easily defined by a simple combination of generic traits. They are better understood with examples, collected into group that share the same prominent features. (Wilson, 1998, p. 243)

Given the impossibility of explaining works of art by identifying generic traits, interpretation of examples is indispensable and it is here that a consilience between science and the arts can flourish. According to Wilson, interpretation will be the more powerful when woven together from history, biography, personal confession, and science. However, the key to the exchange between them is not hybridization, not “some unpleasantly self-conscious form of scientific art or artistic science”, but rather “reinvigoration of interpretation with the knowledge of science and its proprietary sense of the future” (Wilson, 1998, p. 230). Gene-culture co-evolution is in Wilson’s framework the underlying process by which the brain evolved and the arts originated and which is most consistent with the joint findings of the brain sciences, psychology, and evolutionary biology.

Explaining the arts is one thing, the creative production is another and in Wilson’s view creation can never be locked in by any discipline of science. The reason is that:

The exclusive role of the arts is the transmission of the intricate details of human experience by artifice to intensify aesthetic and emotional response. Worlds of art communicate feeling directly from mind to mind, with no intent to explain why the impact occurs. In this defining quality, the arts are the antithesis of science. (Wilson, 1998, p. 238)

Notwithstanding their origin in the imagination of individuals, the production of art nevertheless and necessarily touches upon what is universally endowed by human evolution. Even the greatest works of art are indebted to the biologically evolved epigenetic rules that guide them: certain thoughts and behaviour are more effective than others in the emotional responses they cause and the frequency with which they intrude on phantasy and creative thought; via this biasing mechanism a cultural evolution is initiated toward the invention of archetypes, the widely recurring abstractions and core narratives that are dominant themes in the arts. The archetypes are the source from which the metaphors flow that are present in the arts but also of ordinary communication; they are the building blocks of creative thought.

Wilson’s conclusion: the arts are innately focused toward these archetypal forms and themes but are otherwise freely constructed. However, he explicitly adds: “the biological origin of the arts is a working hypothesis, dependent on the reality of the epigenetic rules and the archetypes they generate. It has been constructed in the spirit of the natural sciences, and as such is meant to be testable, vulnerable, and consilient with the rest of biology” (Wilson, 1998, p. 249).

10.2.3 Music as biocultural phenomenon

A third consilient-friendly approach is presented in a series of articles and book chapters by Cambridge University Professor of Music & Science Ian Cross where he develops a framework for understanding

music in bio-cultural terms (Cross, 2003a, 2003b, 2006). Cross is critically aware of the two ways in which music can be approached: on the one hand music can be considered from its knowable relationship to human biology, mind, and behaviour; on the other hand, music exists also in its diversity as *musics*, which are multiple and unknowable within a single unitary framework. In the latter view music seems to have lost much of its materiality grounded in human behaviour, it can only be approached through culturally situated acts of interpretation that unveil a multiplicity of musical ontologies, some or most of which may be mutually irreconcilable (Cross, 2003a, pp. 19–20).

In his contributions, Cross argues for the first option, the materialist perspective: *musics* are grounded in human behaviours, minds, embodied human brains, human biology, and ultimate in the processes of evolution. *Musics* are from that perspective culturally situated, minded human behaviours that stand in a structural relationship to human evolution. Of course, it might be the case that the cultural dynamics of music are distantly removed from the evolutionary processes that underlie human biology, but a clean and definitive dissociation between culture and biology – or between music and evolution – is, according to Cross, intellectually not defensible. Cross does not argue that *musics* are wholly reducible to an understanding of evolution, merely that the relation between *musics* and evolution is an element in need of exploration and specification. He sees evolution as “impacting on human mind and behaviour not by shaping or determining complex behaviours directly but by providing general constraints on how minds interact with their environments” (Cross, 2003a, p. 21); within this context “culture shapes and particularizes proto-musical behaviours and propensities into specific forms for specific functions, and those, can be so divergent that they do not appear to be mutually reducible” (Cross, 2006, p. 33). An exploration into the evolutionary origins of music then relates to the attributes that allow a gene, a behaviour, an organism, or a specific intra- or intergroup dynamic to be successful in survival and reproduction.

As a point of departure to find these general attributes, Cross considers four elements of which the embodied nature of music or the indivisibility of movement and sound, is a primary one (Cross, 2003a, p. 23). When looking and listening to *musics* beyond the boundaries of contemporary Western culture, one can observe that music always involves action; “to explore perception and cognition requires a reformulation of the dimensions of music and musicality, a re-definition of music in terms of both sound and movement and of the relationships between them” (Cross, 2003b, p. 107). A second, general to music seems to be that it always holds a social and interactive dimension, it connects people and can be seen as a mechanism for restructuring or strengthening social relation: “it appears that the human experience of music is most adequately conceived of as having a social and interactive dimension, (Cross, 2003b, p. 107). A third element in the spectrum of universal attributes is that music involves multiplicity of reference and meaning: a piece or performance is simultaneously capable of bearing many different meanings. Music is not only sonic, embodied and interactive, it is bound to its

contexts of occurrence in ways that enable it to derive meaning from, and interactively to confer meaning on, the experiential contexts in which it occurs, these meanings being variable and transposable (Cross, 2003b, p. 108). This heterogeneity of meaning can be observed when a member of one culture receives and interprets music from other cultures, but the phenomenon is also intra-culturally present. The meaning of a musical activity will necessarily depend at any given moment on that person's own history and narratives, and on the situational significances that culture's "shared system of meanings" confer on that activity. Music and protomusical activity exhibit thus a "transposable aboutness" (Cross, 2006, p. 33), a polysemic potential that underpins the social functionality of music and contributes, but not determines, music's meaning (Cross, 2006, p. 39). A final feature identified by Cross, is that music appears to have no obvious and direct survival value, no immediate and specifiable physical efficacy. Music can neither provide sustenance nor kill enemies, nor can it enjoin others—explicitly and unambiguously—to do so.

From these four attributes Cross infers that *musics* can be defined as "those temporally patterned human activities, individual and social, that involve the production and perception of sound and have no evident and immediate efficacy or fixed consensual reference" (Cross, 2006, p. 33). Taking into account the 'transposable aboutness' and the 'cognitive flexibility' that marks off humans from all other species, also a second working-definition is proposed: "*musics* are cultural particularizations of the human capacity to form multiply-intentional representations through integrating information across different functional domains of temporally extended or sequenced human experience and behaviour, generally expressed in sound" (Cross, 2006, p. 38).

Having identified these attributes, the question remains how they can be linked to an evolutionary perspective. Here, Cross takes recourse to infant predispositions which prime children to deal with certain types of information rapidly and expertly without being taught to do so (Cross, 2003a, p. 25). Children have a sort of intuitive biology, physics, and psychology at their disposal and Cross refers to early work by developmental psychologist Sandra Trehub and collaborators where it is demonstrated that six months infants are "rather capable listeners" and sensitive to melodic contour constancy even though the pitches might have changed (Trehub, Schellenberg, & Hill, 1997). Another point in case is the pioneering work of developmental psychologist Mechthild Papoušek (1996) which shows that infants display a range of 'proto-musical behaviours' in their interactions with their caregivers, using rhythm and pitch in a musical way. A third piece of evidence brought forward by Cross is developmental psychologist Colwyn Trevarthen's work on infant-caregiver interactions (Trevarthen, 1999) which indicate the early presence of musicality by the development of 'primary intersubjectivity' and the sharing of emotional states between caregiver and child³²⁵. Finally, Cross refers to his own

³²⁵ "Research on the dynamics of proto-conversations and musical games with infants elucidates the rhythmic

research and that of Steven Mithen's (Mithen, 1996) to suggest that proto-musical activities provide a mechanism for consequence-free exploration in acquiring cognitive flexibility as well as competence in social interaction. Proto-musical behaviours help in the integration of early-developing competences in discrete domains of cognition and behaviour. Thus it seems likely that "the emergence of proto-musical behaviours and their cultural actualization as music were crucial in precipitating the emergence of the cognitive and social flexibility that marks the appearance of *Homo sapiens sapiens*" (Cross, 2003a, p. 28).

In summary, the bio-cultural research-perspective that Cross advocates aims at explaining musical behaviour by figuring out the essential proto-musical behaviours or predispositions and to relate them to the cultural particularisers that lead to a concrete artistic manifestation.

10.2.4 Nature & nurture in musical sense-making

The relation between biology and culture is discussed by musicologist Mark Reybrouck in terms of a nature-nurture dependency rather than a dichotomy between the terms:

Listeners, in fact, are biological organisms, which are immersed in a culture. But even culture did not evolve in a vacuum. Both culture and music are born out of man's 'animal characteristics', which are rooted in the biology of perception and cognition, and this may be universal to a great extent. (Reybrouck, 2008, p. 403).

Reybrouck takes the commonalities at the level of acquired habits and learned responses as a basis for a conception of universals in music that underpin cultural variation and subjectivity. He thereby carefully steers between biological determinism, historical forces and cultural traditions by proposing a biocultural view that strikes a balance between genetic or biological constraints on the one hand – though there is no absolute agreement on what they are – and historical and cultural contingencies on the other.

As a central issue in thinking about the relation between nature and nurture, Reybrouck brings up the following question:

Is musical sense-making coded in our genetic programmes with reactions which rely on pre-wired and innate programmes or should we conceive of music as something which calls forth higher functions of the brain? And can we conceive of musical sense-making in terms of a dichotomy (innate/acquired) or should we think in terms of complementarity between distinct levels of processing? (Reybrouck, 2008, p. 399)

and prosodic foundations of sympathetic engagement in expressive exchanges. Developments in the first year prove the importance of the impulses of natural musicality in the emergence of cooperative awareness, and show how shared participation in the expressive phrases and emotional transformations of vocal games can facilitate not only imitation of speech but interest in all shared meanings or conventional uses of objects and actions" (Trevvarthen, 1999, p. 155).

The genetically programmed codes and hard-wired responses are typically fast and efficient but at the same time also very much restricted in their scope and functions.³²⁶ The number of primitive responses cannot increase indefinitely, thus animals became more and more dependent on processes of learning in order to increase their behavioural repertoire.

According to Reybrouck, musical sense-making, accordingly, is based on a dispositional machinery which is coded in our genetic programs and shaped by previous and current interactions with the sonic world (Reybrouck, 2008, p. 420). He follows Wilson in maintaining that it makes sense to conceive of biological, perceptual, and ecological constraints which act as 'biases', rather than to think in terms of 'causal relationships' between sounding stimuli and reactions to these stimuli.

It allows us, further, to consider the idiosyncrasies of the individual music user in his/her attempts to make sense out of the sounding flux, and to conceive of the process of sense-making in terms of epistemic autonomy. As such, there should be a dynamic tension between the 'nature' and the 'nurture' side of music processing, stressing the role of the musical 'experience proper'. (Reybrouck, 2008, p. 421)

In the same context of an interaction between nature and culture, musicologist Marc Leman takes natural and cultural constraints as a point of departure for a dialectal conversation. Natural constraints are the subject domain of the natural sciences which aim at describing and modelling the relationships between material entities; cultural constraints, on the other hand are about "the control of significations, attribution of meanings through habit or convention, ideals, norms, values, and worldviews" (Leman, 2008, pp. 55–56). Leman admits that cultural phenomena can often not be fully explained on the basis of a few natural constraints alone which necessitated the reintroduction of a socio-cultural level.

We cannot fully understand the impact of cultural constraints on the basis of cultural explanations alone, nor can we fully understand the impact of cultural constraints on the basis of natural explanations alone. It seems that both cultural and natural constraints are needed to understand musical phenomena. Certain phenomena are grounded in natural constraints but manifest themselves as goals or values. Thus, they have the status of cultural constraints and can exert strong influence on the development of new cultural phenomena. To understand this global resonance between natural and cultural constraints, it is strategically wise to have a look at what physics and biology can offer, and then reconsider the cultural explanation from that perspective. (Leman, 2008, p. 62)

³²⁶ For a biological grounding of these intuitions, reference could be made to dual process theories in psychology. They differentiate between fast, implicit, associative and intuitive processes, and explicit, controlled, verbalized, and conscious processing in human functioning (Kahneman, 2011).

10.2.5 *The role of origins in negotiating between sciences, literature and humanities*

A final example of an attempt to reconcile the sciences, arts and humanities is situated within the context of *the European Thematic Network devoted to Interfacing Sciences, Literature and Humanities* (Spinozzi & Zironi, 2010), the concept of 'origins' is proposed as the perfectly suited tool to host interdisciplinary dialogue.

If humanistic and scientific disciplines agree to explore trans-disciplinary routes, long-established definitions of art can be re-framed and, more specifically, innovative hypotheses about the origin of artistic expression can be developed. Furthermore, becoming acquainted with scientific approaches to the origins of art engenders a metacritical process, which prompts humanities scholars to ask themselves how their specific research methods can gain greater efficacy. (Spinozzi, 2010, p. 59)

Humanistic-scientific views on non-Western art have the potential to respond by complementing, rather than replacing, historically and philosophically oriented conceptions. Origins have been eluded by humanities scholars and getting acquainted with these neglected areas can potentially lead to the construction of a new cartography of the arts base on an understanding of art as an intrinsic, and shared, rather than a privileged, almost exclusive, human expression.

10.2.6 *Section-summary*

Taking our exploration into *academia* as a point of departure, we identified within the field of music research a line of thought (starting with Dewey) that resonates well with the tenets of bio-cultural consilience. It concerns a perspective to music that challenges a tradition in which art music is considered as an autonomous practice which is primarily concerned with producing musical works and is focused on idiosyncratic expression and creativity, or relegates music to the ineffable domain of metaphysics. Instead, biocultural approaches to music are considering music as a behaviour guided by a combination of phylogenetic predispositions, cultural particularisations, and personal choices. By shifting attention to music as action and interaction, the field of art music is no longer sealed off from the life-world (and thus from extra-disciplinary terrains) but becomes an integral part of it.

Within the context of these bio-cultural ways of thinking about art in general, and music in particular, there is a keen awareness of potential benefits and restrictions: strictly scientific or biological approaches will not be able to provide a complete picture of musical variability, given the inherent cultural situatedness of art; art studies in the humanities can benefit from setting up a dialogue with a bench-marking framework that is able to challenge tradition and idiosyncrasies and leads to new forms of criticism and hermeneutics.

10.3 A Bio-Culturally informed Performers' Practice [BCiPP]

The investigation above was needed to familiarise ourselves in a structural way with extra-disciplinary terrains and to see if a common ground for an informational encounter with musical practice could be identified. The crucial difference between intra-scholarly debates on integration and cooperation and our project of finding common ground between artistic practice and *academia* is that the priorities of artists are not primarily in explanations, understandings or finding general or particular truths in the traditional sense. Practitioners develop ideas primarily in function of action, directly or indirectly, and the information originating from extra-disciplinary domains is used to pragmatically review, challenge, inspire and invigorate personal theory.

This particular context takes us back to the drawing board that we set up in the previous chapter in relation to the role of theory in practical inquiry. Until now, we have referred to information that does originate in fields of knowledge other than musical practice itself as 'extra-disciplinary information' and employed the working-term 'Generally Informed Performer' or 'Generally Informed Performers' Practice' to refer to a performership that stands in an active and systematic relationship to these fields. Given the navigational explorations presented in this chapter, we are now able to be more punctual and systemic about this vast field of information and pass on to a more systematic and delineated approach. If our ambition is to extend a performer's information-base into more inclusive directions that go beyond historical and philosophical sources, then we could refer to such a perspective as a *Bio-Culturally informed Performers' Practice*. What are the essential element of such a performership?

We already discussed various epistemic categories that are of influence to a concrete practice situation: 'personal theory' (or '*Image*') relates to the 'beliefs' and 'habitus' of a performer and usually develops against the background of a shared 'performers practice' and its 'traditions'; 'experience', 'reflection' and 'learning' are potentially linked to (challenging) practice situations that normally build on 'habits', 'experimentation', 'imagination', and 'creativity' and are potentially informed by metatheory in a process of 'inquiry' (see Fig. 10.1). By introducing bio-cultural thinking in our scheme, the domain of metatheory can be more punctually indicated as the field of bio-cultural information. 'Bio' implies then information concerning systemic and generic elements about human functioning and is from an ecological perspective extendable to include the physical environment which stands in an inter- or transactional relation to that functioning. The notion 'cultural' relates to the particularised ways in which biologically pre-disposed humans configure life and society in diverse historical, regional, practical and personal contexts. The hyphen that connects leaves the possibility for a continuum of possible relations between the two fields and counters hierarchical interpretations.

To harmonize our model on the practice-side of things and make it resonant with a bio-cultural perspective and awareness, we should add a biological factor there³²⁷; if ‘predispositions’ are added as biological elements of a practice situation and the term ‘disposition’ is used as a complementary term in the field of personal theory, then our model covers for most of the concerns that we already raised.

What is still missing however is the relation of musical practice to extra-disciplinary domains other than scholarly fields of knowledge production. By that, reference is made to fields such as body-techniques (Feldenkrais, Alexander technique) and also to other artistic and non-artistic practices that do not directly adhere to a scholarly milieu (visual arts, professional practices, etc.). If we hold on to the mechanism of information as the connecting element this should not pose major obstacle to our bio-culturally informed project. These practices are cultural and produce information as disembodied knowledge which is accessible via a range of media.

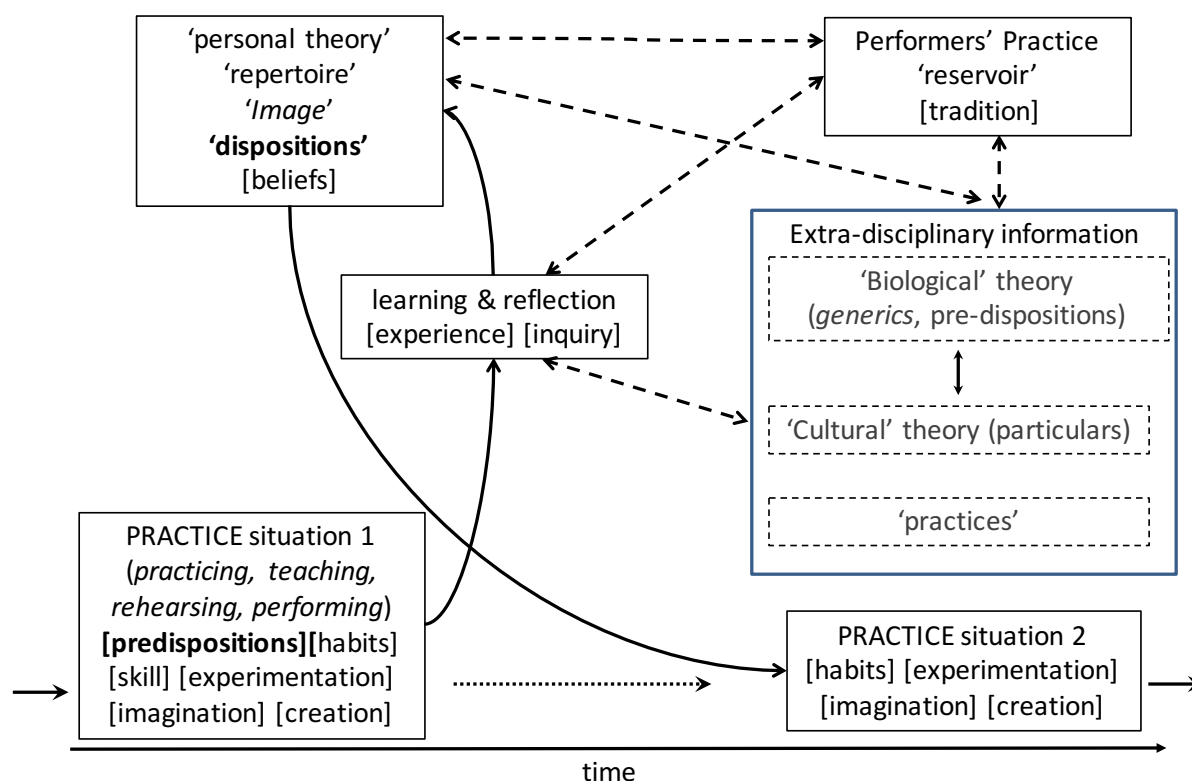


Figure 10.1. A bio-culturally informed action cycle.

The cycle of bio-culturally informed performership as presented in Fig. 10.1 takes off with a practice situation that is broadly defined and not limited to staged performances, it concerns a variety of concrete activities, of doings and sayings (such as practicing, thinking, teaching, rehearsing, reading,

³²⁷ It becomes apparent now that the learning-model that we developed in the previous chapter was humanities-laden with almost no reference to biological factors.

listening) and is grounded in more formal categories including predispositions (biological inclinations both on a generic and personal level), acquired habits and skills, experimentation, imagination, creation (as the actualisation of imagination).

These practice-driven actions continue (dotted line) until a situation is encountered where normal experience is disturbed, doubts are raised or hands-on experimentation does not lead to a solution. The practitioner is now involved in a process of learning, reflection and inquiry. This stage can develop in different forms: the experience itself can immediately affect personal theory (learning); reflection can be very punctual and brief, and lead to new insights (reflection-in-action); reflection can be directed to the action and lead to an explicit delineation and objectivation of the problem. In the latter case a process of information sets in (dashed lines); information can originate from the guild of peers, teachers, colleagues (performers' practice), from other practices (visual arts, professional practices, body techniques), or from extra-disciplinary terrains that provide information on the generic aspects and/or the cultural aspects (historical, other cultures) of a question. The information 'jumps together' and is pragmatically assessed and judged³²⁸ before it becomes part of a renewed personal theory or belief.

What we propose here is a new variant of consilience. Whewell saw consilience as the jumping together of apparently disparate facts lead to a coherent explanation and a higher form of understanding. Wilson extended the model to the relation between the sciences and the humanities, always with the intent 'to explain' things. What is put forward and introduced by this action-cycle is consilience between the science of phenomena (biology), their interpretations and situated manifestations (culture) and artistic practice (the sayings and doings of musicians). This type of consilience is not directed at 'explanation' but at invigorating and freeing the personal theories and beliefs that serve as background for artistic behaviour.

The informational model is a way out of a self-referential system governed by idiosyncratic sets of rules. *A Bio-Culturally Informed Performers' Practice* as a specification of an informed performership does not solve all the problems and challenges internally but rather acknowledges that it can learn from the experiences and inquiries of fellow-humans who look at things from a different perspective based different images of the world.

³²⁸ "Judgment may be identified as the settled outcome of inquiry. It is concerned with the concluding objects that emerge from inquiry in their status of being conclusive. Judgment in this sense is distinguished from propositions. The content of the latter is inter-mediate and representative and is carried by symbols; while judgment, as finally made, has direct existential import" (Dewey, 1938, p. 120).

A Bio-Culturally informed Performers' Practice [BCiPP]³²⁹ is an interconnected array of activities and understandings within the broader category of score-based performership that is underpinned by a shared and active interest in information on generics and particulars in musical action and interaction as a factor in creating a sonic environment from which musical experiences can evolve.

Definition 7: Bio-Culturally informed Performers' Practice [BCiPP].

³²⁹ When referring to the concept or when using the acronym, the 'i' of informed is not capitalized to symbolize its mediating role.

Chapter 11: In a state of overload

Opening the borders of musical practice to extra-disciplinary fields of information can be a powerful way to increase and challenge our cognitive capacity by suggesting new points of reference and of departure. Yet, “while opened borders may increase our ability to dream, they can also overwhelm us with a deluge of information and experience that we are unaccustomed to processing” (Gregory, 2005, p. 21). We already interposed ‘Image’ and ‘personal theory’ as mediating buffers and guiding instruments between the galaxy of information and concrete actions; in the previous chapter, another facilitative element of negotiation was added by proposing to situate music-making in a consilient, bio-cultural framework. But even with these filters in place, querying the information galaxy will still result in a bombardment of input which presents itself as a huge interpretative, integrative and selective challenge. Every unit of information is encircled by a certain context of discovery, critique, justification, interpretation and application; add to that cocktail the proliferation of specialized languages, sub-disciplines and research-niches and one can easily lose track in overambitious expectations, naïve conclusions and an incohesive and randomly selected knowledge-base. Informing practice requires, next to an awareness about the role and potential impact of information, also coordinated, systematic and pragmatic action.

In Chapter 4, where a generic perspective on information behaviour was presented, we came across the notion of ‘information systems’ which act as filters between an abundant galaxy of information and a limited human info-digestive capacity. In this Chapter 11, the contours of a discipline-specific information system for music performers will be presented. The requirements of such a system are multiple; what we have in mind at the outset of this endeavour is an information system that

1. does not limit itself to be merely being receptive to information (assimilation) but is also generative in directing inquiry to pragmatic and imaginative solutions both in terms of beliefs (accommodation)³³⁰ and changed situations;
2. operates within an action-oriented (and not work-focused) bio-cultural framework by identifying basic human (musical) capacities that have referents both in the personal theories of musicians as well as in *academia*, and that hold the potential to function as integrated attractors in a field of abundant information (Chapter 10);
3. is systematic, holistic, processual and intra-relational, facilitating the practice-specific interaction of information of previously unrelated facts (see the notion of ‘consilience’ – the ‘jumping together’ of isolated facts) (Chapter 10).

³³⁰ We refer to Piaget’s terminology here: in a process of adaption, ‘assimilation’ occurs when a new idea fits in with the already existing ideas while ‘accommodation’ implies that new information changes the already existing structures and ideas (see Chapter 4).

11.1 Generic perspectives: ontologies, topic modelling and boundary objects³³¹

The task of streamlining a potential information overload into a proficient information base is a daunting challenge that is, evidently and fortunately, not unique to the context of score-based performers. We review three generic frameworks that address the challenges intrinsic to an information society.

11.1.1 IT-based ontologies

The term ‘ontology’ has a longstanding pedigree in philosophy as a branch of metaphysics that concerns itself with ‘what exists’ (Blackburn, 1996). In the context of Artificial Intelligence, however, an ontology defines “a set of representational primitives with which to model a domain of knowledge or discourse. The representational primitives are typically classes (or sets), attributes (or properties), and relationships (or relations among class members)” (Gruber, 2009, p. 1963); an ontology is an “abstract, simplified view of the world that we wish to represent for some purpose” (Gruber, 1995, p. 908) that, once it is linked to a set of individual instances of classes, allows the instantiation of a systematic knowledge base. In fact, ontologies are no more than an explicit specification of the kind of conceptualizations that every knowledge system or agent of such a system is committed to, either explicitly or implicitly (see personal theory); the primary aim is to reach an agreement about a shared formal and explicit account of a domain of discourse and the concepts and relationships that are part of it. Since the stakeholders committed to a common ontology may use different representation languages and systems³³², the main challenge involved in such an operation is related to elements referred to as *translation*, *reusability*, *shareability*, *interoperability*, *portability*, and *genericity*; features that distinguish ‘ontologies’ from the more familiar ‘data models’ which are limited to representing “the structure and integrity of the data elements of the in principle single specific enterprise application(s) by which it will be used” (Spyns, Meersman, & Jarrar, 2002). The key-aspect of ontology-engineering then is concerned with making representational choices that capture the relevant distinctions of a domain at the highest, shareable level of abstraction while still being as clear as possible about the meanings of terms.

To make things more tangible, consider the example plotted in Fig. 11.1 which instantiates in a basic manner the main aspects of ontology-design.³³³ Within the ‘domain’ of ‘score-based performers’, three ‘classes’ are considered: ‘training institutions’, ‘repertoire’, and ‘instrumentalists’; the two latter classes could, for instance, be divided in the subclasses ‘Beethoven compositions’ and ‘pianists’

³³¹ With special thanks to senior ontology designer Mariana Casella dos Santos for the discussion on this topic and the verification of contents of the text.

³³² See for instance the use of parallel languages in the humanities (Bernstein, 1999).

³³³ The example is informed by Noy & McGuinness (2001).

respectively. The 'Beethoven piano concerti' are an instance of the subclass 'Beethoven compositions', 'Murray Perahia' is an 'instance' of the sub-class 'pianists', 'Mannes college' is an 'instance' of the class 'training institutions'. 'Attributes' (also called 'slots') describe properties of classes or instances: Murray Perahia 'recorded' all Beethoven piano-concerti and 'studied at' Mannes College. The pianist in this example is now described by two attributes: the attribute 'recorded repertoire' with the value 'Beethoven Concerti' and the attribute 'professional training in music' with the value 'Mannes College' but this can easily be extended to classes such as 'students', 'published books'.

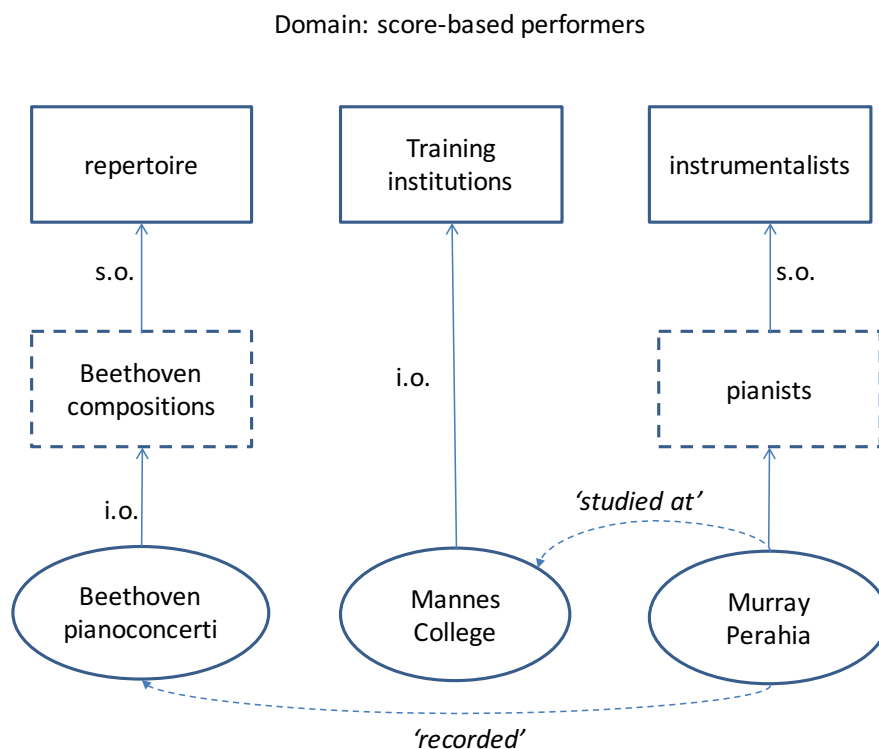


Figure 11.1. Ontology (example): some classes, instances, and relations implicated in the domain 'score-based performers'. Classes are indicated by a square frame, subclasses by a square frame with a dotted line, 'instances' are marked within elliptical nodes. 'i.o.' means 'instance of', 's.o.' means 'subclass of', the attributes or slots are presented in italics and by a dotted/curved line.

From this example, the inherent complexities become apparent related to ontology-engineering: How to determine and choose between a manageable quantity of classes and subclasses? Which labels to use for the various elements and relations? How to distinguish between subclasses and instances? Which slots to include? Uschold & Gruninger (1996, p. 107) propose three approaches in constructing class hierarchies and relational dependencies:

1. A top-down development process which starts with the definition of the most general concepts in the domain and subsequent specialization of the concepts.
2. A bottom-up development process which starts with the definition of the most specific classes, the leaves of the hierarchy, with subsequent grouping of these classes into more general

concepts.

3. A hybrid, middle-out approach which is a combination of the top-down and bottom-up approaches; that is, define the most fundamental terms in each work area before moving on to more abstract and more specific terms within a work area.

Ontology scientists Natalya Noy and Deborah McGuinness (Noy & McGuinness, 2001) further suggest three generic rules of thumb:

1. There is no one correct way to model a domain – there are always viable alternatives. The best solution almost always depends on the application that you have in mind and the extensions that you anticipate.
2. Ontology development is necessarily an iterative process.
3. Concepts in the ontology should be close to objects (physical or logical) and relationships in your domain of interest. These are most likely to be nouns (objects) or verbs (relationships) in sentences that describe your domain.

Once ontologies reach the status of an operational form, they can be used for different purposes: 1/ as a common vocabulary for communication among distributed agents; 2/ as a conceptual schema of a relational data-base; 3/ as backbone information for a user of a certain knowledge base; as a tool for answering competence questions; or 4/ in standardizing domain terminology (Mizoguchi & Ikeda, 1998). In a recent paper, choreographer and dancer Annabel Clarence outlines the project of creating an ontology for dancers.

The function of the ontology would be thesaural, allowing dance scholars and enthusiasts to quickly link multiplicitous synonyms as a springboard for more well-informed inquiry. The ontology would be able to encapsulate and document a singular dance event simultaneously from multiple social and cultural perspectives. The ability to represent [...] one event as both singular and as an array of elements is an aspect of scholarship that is as yet unrepresented in dance scholarship. Additionally, the ontology would allow for a quantitative analysis of dance patterns and correlations may lead to a specific and detailed understanding of unifying systems of dance. (Clarence, 2015, p. 90)

However – and probably due to the complexity of the area – the actual development of IT-based ontologies in the arts is yet to ignite.

11.1.2 Topic modelling

Topic models are a new class of text analysis methods which provide an automated, algorithm-driven, and bottom-up procedure for coding the content of a corpus of texts (usually very large corpora) into a set of substantively meaningful coding categories called ‘topics’ (Mohr & Bogdanov, 2013, p. 546). Rather than starting with basic categories of meaning (as in ontology-engineering), the topic modeller starts off by specifying the number of topics for the algorithm to find. The program then identifies that

specified number of topics and returns the probabilities of words being used in a topic, as well as an accounting of the distribution of those topics across the corpus of texts:

Each document is treated as if it were a so-called 'bag of words'. The goals of a topic model analysis are then to analyse these various word bags, to identify word co- occurrence patterns across the corpus of bags, and then to use these to produce a mapping of the distribution of words into the topics and of the topics into the bags. (Mohr & Bogdanov, 2013, p. 547)

The 'bag of words'-assumption which disregards the order of words within a text poses the main challenge for topic-modellers; discarding all the critical information that encircles these words can easily lead to a severely deficient analysis of meaning. Topic models are indeed weak representations of natural language semantics and the extracted topics are often difficult to interpret due to incoherence and lack of background context and any grounded semantics. The inherent consequence is that in topic modelling well-informed hermeneutic work is still required in order to read and to interpret the meanings that operate within a textual corpus. Within a context of facilitating these processes of interpretation, attempts have been made to link topic-modelling to ontologies which contribute to meaningfully labelling the topics (Allahyari & Kochut, 2015), or to use existing knowledge bases as background (Hu, Luo, Sachan, Xing, & Nie, 2016).

11.1.3 Trans-disciplinary boundary objects

Both ontologies and topic modelling systems are functional instruments primarily used for determining a conceptual or topical space within a particular domain of interest. The project of a bio-cultural informed performers practice, however, requires more than that. The inherent connection of practice with a broad array of extra-disciplinary fields necessitates trading zones which transcend domain boundaries. Unlike 'multi-disciplinarity' which draws on knowledge from different disciplines which each stay within their boundaries, or 'inter-disciplinarity' which analyses, synthesizes and harmonizes links between disciplines into a coordinated and coherent whole, the concept and practice of 'trans-disciplinarity' integrates the natural, social and health sciences and transcends their traditional boundaries (Choi & Pak, 2006, p. 359).

Science and Technology Policy Researcher Michael Gibbons and his colleagues (Gibbons, 1994; Nowotny, Scott, & Gibbons, 2003) consider the production of disciplinary-based knowledge (mode 1) outdated and limiting and therefore advocate a (new) mode of knowledge production (mode 2) which transgresses disciplinary boundaries and promote contextual, problem oriented research that occurs at the site of application.

[Mode 2 knowledge production] uses a range of theoretical perspectives and practical methodologies to solve problems. But unlike interdisciplinary or multidisciplinary knowledge production, transdisciplinary knowledge production is not necessarily derived from existing

disciplines, nor does it always contribute to the formation of new disciplines. The creative act lies just as much in the capacity to mobilize and manage these perspectives and methodologies (their external orchestration so to speak) as in the development of new theories or conceptualizations or the refinement of research methods. (Nowotny, Scott, & Gibbons, 2003, p. 186)

Gibbons realises that interaction between disciplinary communities is not a new thing but observes that advances in information and communication technologies have now made these interactions unconstrained, instantaneous and free-for-all leading to a situation in which research communities have open frontiers allowing for a new dialogical research game (Gibbons, 2008, p. 2).

Within that context, ‘boundary objects’ are defined as the common objects or purpose that bring researchers from a variety of disciplines, and other stakeholders together, it is an object of shared interest that transcends the boundaries of academic and practical disciplines and allows experts and others, with their respective social and cultural backgrounds, “to interact effectively in transforming an issue or problem into a set of common activities” (Gibbons, 2008, p. 2). More concretely, boundary objects:

- refer to concepts or ideas that refer to scientific objects that both inhabit several intersecting social worlds and satisfy the informational requirements of each of them;
- are plastic enough to adapt to local needs and the constraints of the several parties employing them, yet robust enough to maintain a common identity across sites;
- are weakly structured in common use and strongly structured in individual site use;
- have different meanings in different social worlds but have a structure common enough to more than one world to make them recognizable, a means of translation (Gibbons, 2008, p. 4–5).

Boundary objects are thus abstract or physical artefacts that exist in the liminal spaces between adjacent communities of people (Huvila, Anderson, Jansen, McKenzie, & Worrall, 2017). They are intersecting, plastic, adaptive, open (weakly structured), recognizable, and translatable and could well be the kind of building blocks needed for achieving a Bio-Culturally informed Performers’ Practice.

11.2 Identifying boundary objects in score-based performership

The generic perspectives brought up above indicate the urgency with which our society is concerned with finding new *modi operandi* for managing information overload and for maximizing the benefits that can be drawn from cooperation and the sharing of information. The dominant strategy is one of extending common sense, personal theories, and implicit understanding into more systematic and ICT-driven tools that allow a pragmatic and shareable engagement with a wide spectrum of information. Considering the top-down relational logic of ontologies, the probabilistic bottom-up approach in topic modelling, and the notion of ‘boundary objects’, we will, in the remainder of this chapter present the

contours of a proto-typical, conceptual information system for musical performers. It is called a *supra-disciplinary topical attractor model* of musical performership with a view to differentiate it from the IT-supported systems mentioned above.

By identifying and modelling basic human musical capacities that have referents both in the personal theories of musicians as well as in *academia* and hold the potential to function as integrated attractors in a field of abundant and chaotic information, a final operational step is proposed in the development of a framework for a *bio-culturally informed performership*. The methodology leading to the formulation of a first prototype of such a shared model of transdisciplinary boundary objects has been twofold: bottom-up and top-down.

11.2.1 Bottom-up strategy

Within the context of our enquiry, a bottom-up and discovery-led approach gave rise to three source-documents.

The first is a *personal, semi-structured database* (excel-format) consisting of over 7000 informational units (articles, review, monographs, podcasts, handbooks, dictionaries, encyclopaedia). Since 2005, such a personal database has been set up by the author and maintained responding in a very general and broad-spectrum way to practical and meta-practical questions from the piano-studio – practice-room, teaching-room, rehearsal-room, stage (see Appendix 13). Whereas the database started off as an annotated bibliographic tool, at around 3000 entries certain ‘topics’ emerged as attractors in a chaos of information³³⁴ and seemed to be able to cover a wide range of practice-related concerns (see Fig. 11.2).

³³⁴ The term ‘attractor’ already figured in our treatment of the Information Age. As it was also mentioned there, it is borrowed from dynamic systems and chaos theory but used here in a generic and non-technical way. The technical definition of an attractor is “an equilibrium state (or collection of states) to which a system evolves over time. When the system gets close enough to an attractor, it will remain close even if slightly perturbed. A system may have multiple attractors, each with its own region of attraction” (Clapham & Nicholson, 2014). and a top-down enquiry countered the former by analysing, comparing and looking for convergences between several models of performance employed in psychology, sociology, philosophy, neurology and artistic practice.

Disposition, belief, knowledge (tacit, explicit, procedural, etc.), practice, talent, nature-nurture, biology-culture, evolution, universals, origins, development, identity, motivation, attention, focus (regulatory), habit, emotion, anxiety, intention, expression, perception (listening, seeing, reading), Gestalt, sensation, stimulus, cognition, mind, brain, musical text, interpretation, imagination, improvisation, fantasy, creativity, gesture, motion, movement, behaviour, action, anatomy, bio-mechanics, bio-dynamics, technique, craft, performance, learning (implicit, situational, explicit, sensory-motor), education (formal-informal), experience, method, feedback, expertise, skill, memory, automaticity, flow, (sub)consciousness, body, embodiment, communication (coded, non-verbal), inter- and co-subjectivity, pleasure, interaction, resonance, entrainment, mimesis, metaphor, narrativity, plot, expectation, meaning, form, habitat, scene analysis, affordances, information, research art, music.

Figure 11.2. Topics emerging from the personal database of a pianist and teacher.

A second, more content-oriented element of a bottom-up strategy concerned the step-wise generation of a *personal encyclopaedia* (in word-format) which contains references to terms, people, opinion leaders, schools of thought, disciplinary fields, books, journals, quotations and audio-visual material.

Finally, a disciplinary compass has been created by means of sketching disciplinary knowledge maps that focus on the fields of philosophy, musicology and psychology with their subfield such as systematic musicology, behaviourist and cognitive psychology (see Appendix 14).

11.2.2 Top-down approach

Accompanying the three-way bottom-up strategy, a top-down approach was instantiated by means of analysing models of performance employed in psychology, sociology, philosophy, neurology and artistic practice. This second stream of enquiry was primarily directed at locating suitable labels as well as to apply a systematic and relation logic to the various topics. From our considerations in the previous chapter on a processual bio-cultural perspective on music, already two central aspects could be inferred: music implies next to action also an interactive dimension (see Cross in 10.2.3).

Below a brief excursus is presented into basic and more specific approaches to both domains, with a view to collect elements that can converge into the identification of trans-disciplinary boundary objects.

11.2.2.1 Action models

a) Classic models of human behaviour and cognition

Modelling human behaviour in terms of movement is a recurring theme in the epistemic history of humankind and develops into three influential models in the twentieth century.

Behaviourism refers to a psychological orientation which emphasises scientific and objective methods of investigation. Behaviourism's scientific perspective implies that theories need to be supported by empirical data obtained through careful and controlled observation and measurement of observable behaviour. Because of their latent existence internal events like consciousness, thinking and emotion are not part of the behaviourist target domain. The basic assumptions are summarized by psychologist John B. Watson in 1913:

The psychology which I should attempt to build up would take as a starting point, first, the observable fact that organisms, man and animal alike, do adjust themselves to their environment by means of hereditary and habit equipments. [...]; secondly, that certain stimuli lead the organisms to make the responses. (Watson, 1913, p. 167)

All behaviour, no matter how complex, can be reduced to a simple stimulus–response association which is then subjected to habit-formation via conditioning procedures.³³⁵

Under the influence of the outside conditions that form human nature, instincts and capacities grow into an almost countless multitude of habits of thought, feeling and action. On the basis of our many unlearned tendencies, we learn still more numerous acts and ideas. To original equipment is added the store of knowledge and skill we acquire. (Thorndike, 1905, p. 199)

Dissatisfied with the behaviourist approach in its simple emphasis on external behaviour rather than internal processes, cognitive psychology developed a research framework that focuses on the scientific study of the mind as an information processor. Unlike behaviourists, cognitive psychologists use experimental methods to build up cognitive models of the processing that goes on inside people's minds, including perception, attention, language, memory, thinking and consciousness.

Within the framework of cognitive theory, the introduction of feedback-loops constitutes a third model. Psychologist Jack A. Adams proposes the theory of closed-loops in the early seventies (Adams, 1971) and links it to two key neural components: a memory trace, which selects and initiates an

³³⁵ Classical conditioning (also known as Pavlovian conditioning) refers to a learning procedure in which a biologically stimulus (e.g. food) is paired with a previously neutral stimulus (e.g. a bell). Operant conditioning is a type of learning in which the potency of a behaviour is modified by the behaviour's consequences, such as reward or punishment. In this context Edward Thorndike formulated the law of effect and habit: "The line of least resistance is, other things being equal, that resulting in the greatest satisfaction to the animal; and the line of least resistance is, other things being equal, that oftenest traversed by the nervous impulse. We may call (1) the Law of Effect, and (2) the Law of Habit" (Thorndike, 1905, p. 166).

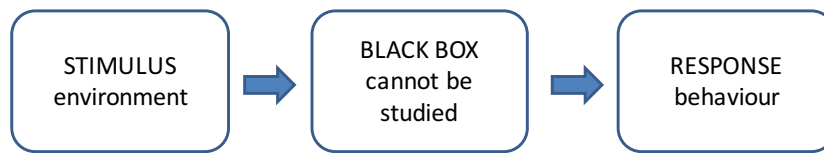
appropriate response; and a perceptual trace, which acts as a record of the movement made over many practices. During and after an attempt of the movement, feedback and knowledge of results enables the performer to compare the movement with the perceptual trace. The trace acts as a reference of correctness so that appropriate error adjustments can be made for subsequent attempts of the movement(see also: Schmidt & Lee, 2011, pp. 136, 438).

The essential components of the three models are represented in Fig. 11.3 and their impact on the scholarship related to musical performance is manifest in the generative performance model that music-psychologist Eric Clarke proposes by the end of the twentieth century (Clarke, 1993, p. 209, 1995, p. 112). Fig. 11.4 indicates how Clarke integrates the elements present in the classic models: information (notation or sound) is introduced to the system which parses the input into a structural representation which contains specific, punctual elements but also factors such as style³³⁶; from the structural model a motor program is activated which undergoes further expressive specification via an expressive motor program; finally, a timing-mechanism (clock) supplies information with regard to time and feeds back into the structural representation.

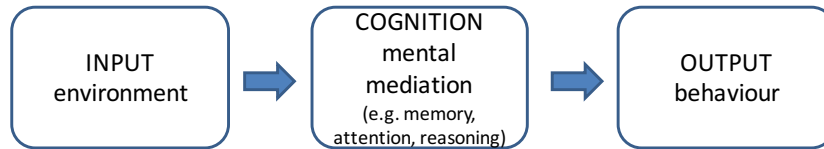
Models such as Clarke's do not pretend that all these structures have an actual place in the human brain, these models have the primary goal of offering a framework that can serve as a background for more punctual experiments and for understanding, predicting and possibly controlling certain behaviours.

³³⁶ In other publications, Clarke typically represents this structure as an inverted tree diagram, especially in the case where the input has been fully memorized (Clarke, 2001, p. 3).

A/ Behaviourist model (external behaviour)



B/ Cognitive model (internal behaviour)



C/ Closed-loop model for movement control and learning

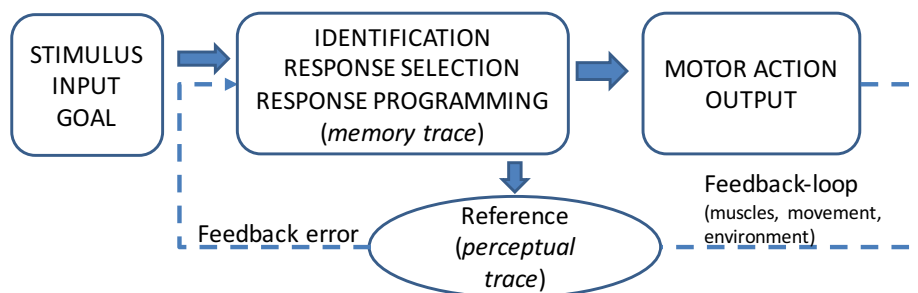


Figure 11.3. Summarizing 20th century models in motor behaviour and learning.

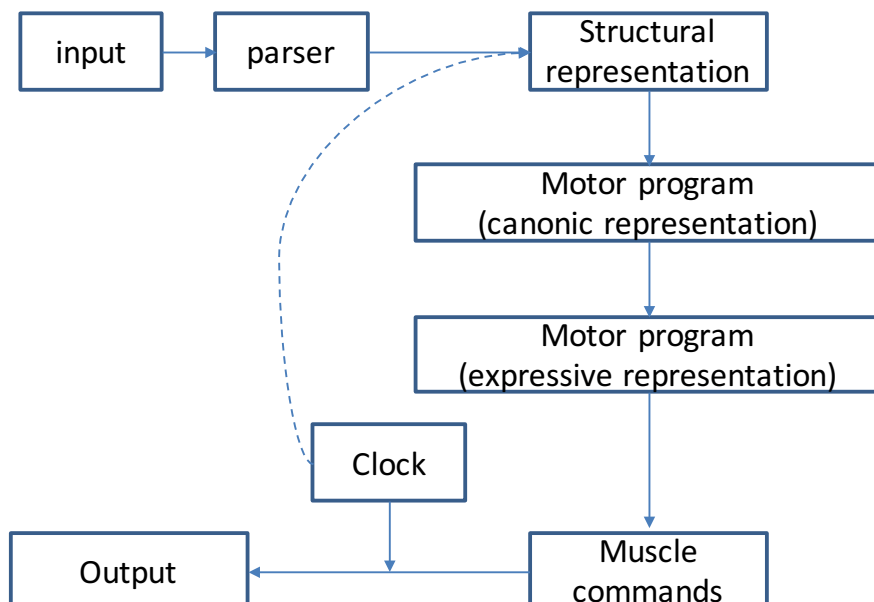


Figure 11.4. A generative musical performance model
(adapted from Clarke, 1993, p. 209, 1995, p. 112).

b) Emotions

The classic models plotted are very general in their field of application; a first ‘add-on’ that is pertinent in order to close the gap between the generality of classic behavioural models and the ecological reality of musical action is to stipulate the role of emotions.

On the Motion of Animals [Gr. Περὶ ζώων κινήσεως³³⁷; Lt. *De Motu Animalium*] is one of Aristotle's major texts on biology where he sets out the general principles of animal locomotion. In chapter 5 of the book, Aristotle inquires how the soul [ψυχή] moves the body, and what is the origin of movement in a living creature [Arist.De Motu.700b10]. Aristotle asserts that the living creature is moved by intellect [διάνοιαν], imagination [φαντασίαν], purpose [προαίρεσιν], wish/will [βούλησιν], and appetite [ἐπιθυμίαν]. According to Aristotle all these are reducible to mind [νοῦν] and desire [ὄρεξιν].

For both imagination and sensation [φαντασία καὶ ἡ αἰσθησις] are on common ground with mind, since all three are faculties of judgement [...]. Will [βούλησις], however, impulse [θυμὸς], and appetite [ἐπιθυμία], are all three forms of desire, while purpose belongs both to intellect and to desire. Therefore the object of desire or of intellect first initiates movement [...]. [Arist.De Motu.700b15-20]. (Aristotle, 1912)

The (implicit) model presented by Aristotle (see Fig. 11.5) is one in which purpose is generated either by the mind (imagination, sensation), or by desire.

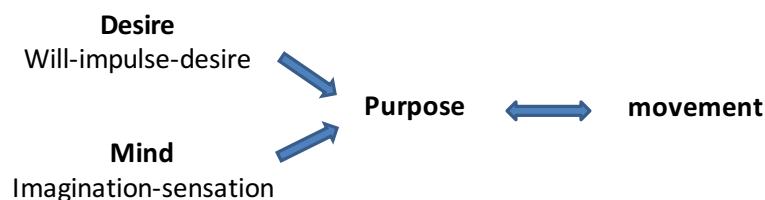


Figure 11.5. Aristotle's action model in *De Motu Animalium*.

Akin to Aristotle, but from a punctual neuro-physiological and -anatomical point of view, neurophysiologist Gert Holstege proposes the concept of a specific set of parallel motor pathways, governing somatic, autonomic, and endocrine motor responses. Holstege's parallelism is informed by pathologies where patients with lesions of voluntary motor control systems nevertheless maintain normal facial motor control during emotional display. To model such phenomena Holstege asserts an

³³⁷ For the text in Greek see https://el.wikisource.org/wiki/Περὶ_ζώων_κινήσεως.

emotional motor system next to a voluntary one. Each of these systems have direct and indirect (via interneurons³³⁸) access to the motor neurons³³⁹ that instigate movement.

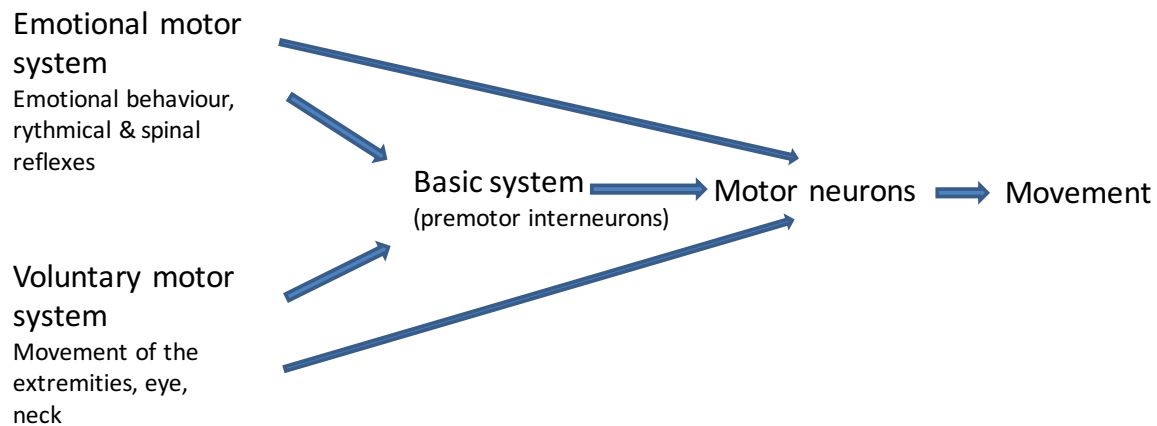


Figure 11.6. Holstege's model of a dual motor system (Holstege, 1992).

Both Aristotle's and Holstege's contribution offer a generic framework for experience-based observations such as the one's in *Freeing the Caged Bird: Developing Well-Coordinated, Injury-Preventive Piano Technique* (Lister-Sink, 1996) where unlocking the motor system from unwanted and acquired interferences is a crucial element.

c) Dual process theories – attention and automaticity

The idea of dual processing – by means of an emotional and voluntary motor system – can be further extended by postulating two archetypical processing modes that operate in forming judgements, solving problems, or making decisions and evolve around the factors attention and automaticity. The first system involves a quick and easy processing mode based on effort-conserving heuristics, the second concerns a slow and rule-based processing mode based on effort-consuming systematic reasoning. The first type of process evolved early in the course of human evolution, does not require working memory, is contextualized and often unconscious, and tends to involve automatic processing. The second type is an element of the 'new' mind, works decoupled and abstract, is invariably conscious and usually requires attention and working memory (Evans & Stanovich, 2013, p. 225).

³³⁸ "a neuron in the central nervous system that acts as a link between the different neurons in a reflex arc. It usually possesses numerous branching processes (dendrites) that make possible extensive and complex circuits and pathways within the brain and spinal cord" (Martin, 2015).

³³⁹ "one of the units (neurons) that goes to make up the nerve pathway between the brain and an effector organ, such as a skeletal muscle. An upper motor neuron has a cell body in the brain and an axon that extends into the spinal cord, where it ends in synapses. It is thus entirely within the central nervous system. A lower motor neuron, on the other hand, has a cell body in the spinal cord or brainstem and an axon that extends outwards in a cranial or spinal motor nerve to reach an effector" (Martin, 2015).

The foundations of dual process theory are seminally present in James' *Principles of Psychology* where he advances the idea two different kinds of thinking: associative and true reasoning.

There are two stages in reasoned thought, one where similarity merely operates to call up cognate thoughts, and another farther stage, where the bond of identity between the cognate thoughts is noticed; so minds of genius may be divided into two main sorts, those who notice the bond and those who merely obey it. The first are the abstract reasoners, properly so called, the men of science, and philosophers – the analysts, in a word; the latter are the poets, the critics – the artists, in a word, the men of intuitions. These judge rightly, classify cases, characterize them by the most striking analogic epithets, but go no further. (James, 1890, vol. 2, p.361)

Psychologist Jonathan Evans' dual process theory from 1984 also suggests a two-stage theory and draws a distinction between heuristic processes which select items of task information as 'relevant', and analytic processes which operate on the selected items to generate inferences or judgements (Evans, 1984). Psychologist Daniel Kahneman, more recently, further differentiates between effortless intuition and deliberate reasoning. Intuition (or system 1), like associative reasoning, is determined to be fast and automatic, usually with strong emotional bonds included in the reasoning process; it is a kind of reasoning based on formed habits and very difficult to change or manipulate. Reasoning (or system 2) is slower and much more volatile, being subject to conscious judgments and attitudes (Kahneman, 2003, 2011).

The framework of dual processes transcends the traditional behaviourist and cognitive models by inherently involving references to powerful categories such as intuition (Atkinson & Claxton, 2000), attention (Pashler, 2004), habits (James, 1890, bk. 1, chapter 4), consciousness (Bargh & Morsella, 2008) and learning.

In motor control and learning studies the duality of the two systems is overcome by assuming a three-stage model of skill acquisition. During the initial, cognitive stage of motor learning (also called the verbal-motor stage), the goal is to develop an overall understanding of the skill. The learner must determine what the objective of the skill is and begin to process environmental factors that will affect their ability to produce the skill. The teacher provides an optimal environment for learning and the learner mostly relies on visual input and trial and error to guide learning. During the associative stage (also known as the motor stage), the learner begins to demonstrate a more refined movement through practice and moves from the 'what to do' in the first stage to the 'how to do it'. Here, the focus is more on proprioception than on visual cues. The more practice, the more proprioceptive input the learner receives to aid learning. During the final autonomous stage of learning, the motor skill becomes mostly automatic; the performer has progressed to a level of learning which allows him/her to perform the skill in any environment with very little cognitive involvement compared to the first stage. It is also in

this stage that the single-channelled (Schmidt & Lee, 2011, p. 116) and therefore serial route of attention gives way to parallel processing (Schmidt & Lee, 2011, p. 58).

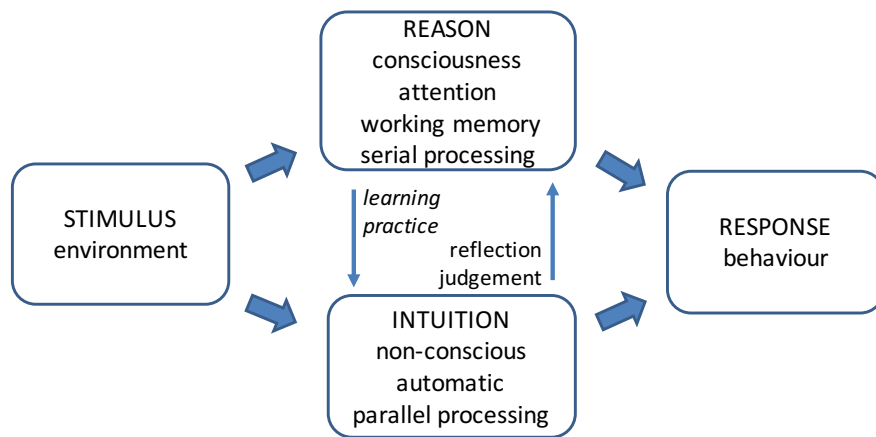


Figure 11.7. Dual process theory.

Dual process theories constitute a conceptual framework for practice-based insights such as present in for instance *The Inner Game of Music* (Green & Gallwey, 1987) where two ‘selves’ are postulated: *Self 1* is essentially verbal and conscious, the inner voice that interferes in natural behaviour, it contains our concepts about how things should be, our judgements and associations; *Self 2* is the reservoir of potential that contains our natural talents and abilities (Green & Gallwey, 1987, p. 28).

d) Attitudes, beliefs, and intentions

In the frameworks above, modelling starts invariably with a stimulus or more generally, an input component. In the *Theory of Planned Behaviour* psychologist Icek Ajzen aims at measuring behavioural dispositions that predict behaviour and which precede stimuli, intentions and particular circumstances.

By assessing attitudes or personality traits we attempt to unveil the hidden factors that, as a result of past events, have come to predispose an individual to act in certain ways. (Ajzen, 2005, p. 142)

According to Ajzen, actions are controlled by intentions, but some of these intentions never come to fruition or are revised to fit changing circumstances; the factors that induce people to change their intentions, or prevent successful execution of the behaviour constitute the central focus of Ajzen’s research (Ajzen, 1985, p. 11). Fig. 11.8 shows how volitional behaviour can be explained in terms of a limited number of concepts. At the initial level, behaviour is assumed to be determined by intention or the person's subjectively perceived likelihood that he or she will engage in a particular behaviour. At the next level – again according to the theory of planned behaviour – intentions (and the ensuing

behaviours) are a function of three basic determinants, one personal in nature, one reflecting social influence, and a third dealing with issues of control. The personal factor constitutes the individual's attitude toward the behaviour – positive or negative – The second determinant of intention is termed 'subjective norm'; it deals with perceived normative prescriptions and concerns the person's perception of social pressure to perform or not perform the behaviour under consideration. Finally, the third determinant of intentions is perceived behavioural control or the ability to perform the behaviour of interest (also known as self-efficacy). In Ajzen's model perceived behavioural control can influence behaviour indirectly, via intentions, or it can also be used to predict behaviour directly.

In a next backward-engineering phase, people's behavioural attitudes and intentions are assumed to follow from their beliefs about performing the behaviour. These beliefs need not be veridical; they may be inaccurate, biased, or even irrational (Ajzen, 2005, p. 126). However, once a set of beliefs is formed it provides the cognitive basis from which attitudes, subjective norms, and perceptions of control – and, ultimately, intentions and behaviours – are assumed to follow in a reasonable and consistent fashion.

Finally, a multitude of variables may be related to or influence the beliefs people hold. Different cultural and social environments lead to the acquisition of differential information about a variety of issues and forms the basis for their beliefs about the consequences of a behaviour, about the normative social expectations, and about the obstacles that may prevent them from performing a behaviour. Similarly, gender, age, and temporary moods can influence the way we perceive things and can therefore affect our behavioural, normative, and control beliefs and, as a distal result, guide our intentions and actions (Ajzen, 2005, p. 134).

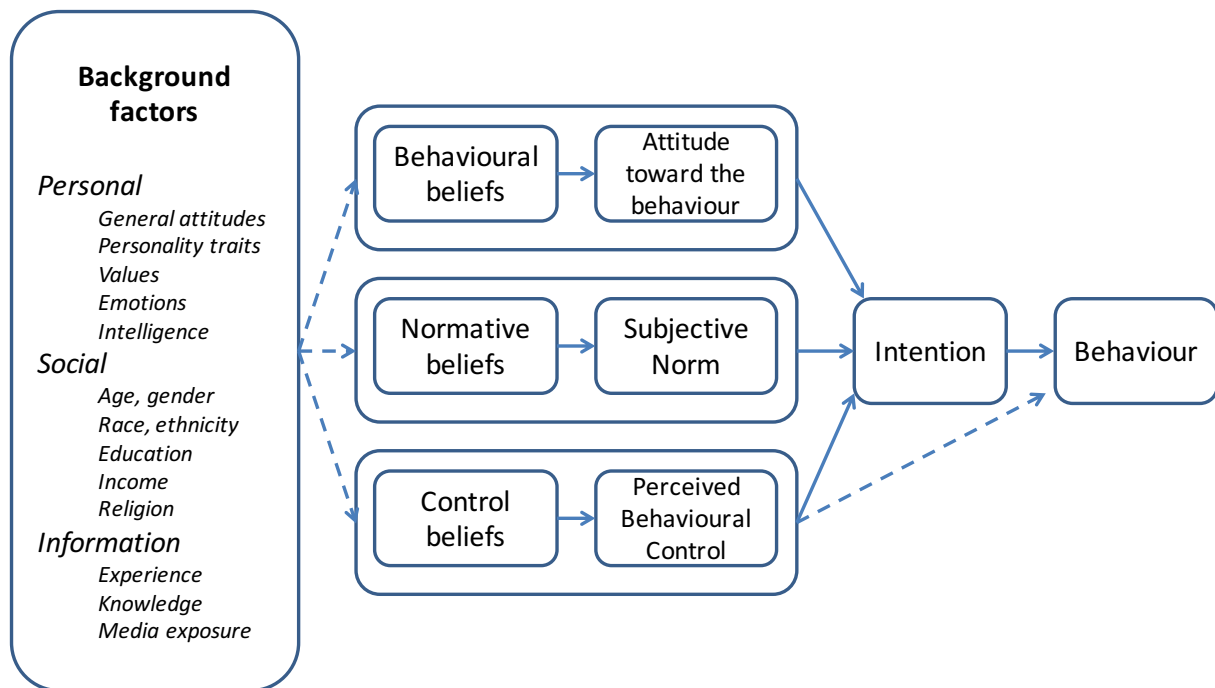


Figure 11.8. Ajzen's model of planned behaviour (Ajzen, 2005, p. 135).

Ajzen's extended behavioural model allows for the inclusion of background information and beliefs in modelling performance. These elements come close to the notion of *Image* that was at the centre of interest in PART I.

e) Relations between brain, body and environment

The unidirectional sequence of events (stimulus -> cognition -> movement), as asserted in the models above, is fundamentally challenged by empirical findings that indicate an intricate interdependency between environment, brain and body. The framework of *embodied cognition* is the most prominent cluster-term to represent the efforts to remodel the classical insights and add to their ecological validity.

From the classical standpoint, human action is seen as an "output" of a high-level, centralized system that is much like a serial processor and is heavily involved in forming an accurate internal model of the world. To function adaptively within unpredictable environments, such centralized systems require tremendous computational power in order to continually update their internal, amodal model of the world. This error-prone and time-consuming translational process is not required in embodied systems, for information is already residing either in the environment or in mental representations that maintain properties of the sensorimotor states that gave rise to them. (Morsella, 2009, p. 5)

Embodied cognition challenges the classical paradigm based on the dualism as it was put forth by Rene Descartes in the 17th century claiming that the mind is a nonphysical — and therefore, non-spatial — substance entirely different from the body. The viewpoint of embodied cognition covers a vast

semantic terrain (Wilson, 2002) but the most common definitions involve the claims that states of the body modify states of the mind (Wilson & Golonka, 2013, p. 1), that cognitive processes are deeply rooted in the body's interactions with the world and that unidirectional information-processing on the basis of representation of external states is an unsatisfactory model of human action. According to the logic of embodied cognition, behaviour emerges from the interaction between a nervous system in a body with particular capabilities on the one hand, and an environment that offers opportunities for behaviour and information about those opportunities on the other.

Embodied cognition has a relatively short history; its intellectual roots date back to early 20th century philosophers such as Heidegger, Merleau-Ponty and Dewey and it has only been studied empirically in the last few decades. In the field of cognitive linguistics, Lakoff and Johnson challenged Chomskyan information processing theory by asserting that semantics arise from the nature of the body and that humans really think metaphorically. Metaphor is considered to be a mostly latent but nevertheless fundamental mechanism of mind that provides more general understanding on the basis of physical and social experiences (Lakoff & Johnson, 1980, 1999).

In the domain of visual perception Gibson's account of vision critically addressed the problem of how to reconstruct a full-blown, three-dimensional world from the information specified in the two-dimensional image on the retina. Gibson asserts that vision does not begin with a static retinal array but with an organism actively moving through a visually rich environment. By his ecological approach to visual perception and by both emphasizing the role of the movement of a perceiver and the integration of that perceiver in a larger, visually rich environment, Gibson is at least a nascent proponent of embodied vision (Gibson, 1979/2015).

Biologist and philosopher Francisco J. Varela, psychologist Eleanor Rosch and philosopher Evan Thompson subsequently introduced the concept of *enaction* to present and develop a framework that places strong emphasis on the idea that the experienced world is portrayed and determined by mutual interactions between the physiology of the organism, its sensorimotor circuit and the environment (Varela, Thompson, & Rosch, 1991).

The idea that cognitive agents bring forth a world by means of the activity of their situated living bodies is also present in philosopher Alva Noë's *Action in Perception* (Noë, 2006) where he argues that the content of perception is not like the content of a picture; the world is not given to consciousness all at once but is gained gradually by active inquiry and exploration: "perceiving is a way of acting. Perception is not something that happens to us, or in us. It is something we do [...]. The central claim of what I call the enactive approach is that our ability to perceive not only depends on, but is constituted by, our possession of this sort of sensorimotor knowledge" (Noë, 2006, pp. 1–2).

From the perspective of decision making, neurologist Antonio Damasio advances in *Descartes' Error* (1994) the idea that when individuals face complex and conflicting choices, they may be unable to

decide using only cognitive processes, which may become overloaded, but rely on emotions and *somatic markers* to guide decision-making. Emotions, as defined by Damasio, are changes in both body and brain states in response to stimuli. Physiological changes (such as muscle tone, heart rate, endocrine activity, posture, facial expression, and so forth) occur in the body and are relayed to the brain where they are transformed into an emotion that tells the individual something about the stimulus that they have encountered. Over time, emotions and their corresponding bodily changes, become associated with particular situations and their past outcomes. When making subsequent decisions, these somatic markers and their evoked emotions are consciously or unconsciously associated with their past outcomes, and influence decision-making in favour of some behaviours instead of others.

Although not strictly pertaining to the tradition of embodied cognition Ronald Friedman et al. report in a 2000 article in the *Journal of Personality and Social Psychology* on the effects of approach and avoidance motor actions on the elements of creative insight (Friedman & Förster, 2000). The authors propose that the non-affective bodily feedback produced by arm flexion and extension informs individuals about the processing requirements of the situation, leading to the adoption of differential processing styles and thereby influencing creativity. More concretely, they found that arm flexion facilitated insight-related processes and that arm extension facilitated analytical reasoning; by this an inverse link was forged between movement and affect, attitude-, and motivation-formation. This sequential relation between body and mind goes back to the *James-Lange Theory of Emotions* which holds that emotions are perceptions of bodily states and reactions which are evoked by perception of exciting situations in the environment³⁴⁰, and to the *cognitive tuning model* (Schwarz, 1990; Schwarz & Bless, 1991) which essentially proposes that affective states function to inform individuals as to whether their current situations are safe or problematic and bring them in a state in which they will become more or less willing to take risks, adopting a relatively non-effortful, heuristic processing style. A final element to consider under the heading of brain-body-environment interactions concerns the relation between actions and the effects that they resort in the environment. Action-effect coupling and the *theory of event coding* (Hommel, 2015) is rooted in the ideomotor approaches such as proposed by James (1890), and embraces the idea that human cognition emerges from sensorimotor processing.

In contrast to behaviouristic or information-processing approaches, ideomotor theory considers humans as active agents that perform actions to reach particular goals. Accordingly, the theoretical analysis does not start with stimuli but with goals (intended action effects),

³⁴⁰ The *James-Lange Theory* is classically opposed to the *Cannon-Bard Theory* in which it is supposed that emotions give rise to physiological reactions such as fight-flight behaviours.

which are assumed to trigger the execution of movements suited to reach them. (Hommel, 2015, pp. 1–2)

Experiments have shown that the anticipation of forthcoming action effects can systematically affect response selection (Koch & Kunde, 2002; Kunde, 2001) and that repeated, contingent Action-Effect experiences result in lasting integrated representations of actions and effects (Elsner et al., 2002; Elsner & Hommel, 2001). At stage 1, associations between a motor pattern and its contingent effects are acquired, and repetition of these associations result in action-effect integrations which are bidirectional, that is, the activation of the motor representation will activate the associated representation of its effect, and vice versa. In stage 2, the representations can be employed for goal-directed behaviour: when a person intends to perform an action, there is a foregoing anticipation of the intended action effect, that is, the action goal.

What can be inferred from the elements resorting under the general framework of embodied cognition is that the sequence of events in human behaviour is not (always) unidirectional and stimulus-based, and that a case can be made for reciprocal influences between body-related elements (such as movement, motivation and emotion), cognitive processes and environmental effects. This perspective has gained currency in recent years, especially in circles of systematic musicology (Cox, 2016; Leman, 2008) and implies the inclusion of bidirectional arrows in modelling music performance.

From the overview above the following (boundary) topics and their relations can be inferred in relation to the treatment of action in *academia*:

- The elements that seem to be generically involved in action are: attitude, belief, motivation, emotion, input (environment, stimulus, image, effect), a processor (cognition, imagination), forms of output (behaviour, effect);
- The processes that are set out to connect these elements are linear/serial, parallel, body-first, effect-first, fast-slow, instinct-automatism-attention, learning.

11.2.2.2 Patterns of interaction

In Chapter 10 we noted that one of the strategies to arrive at an understanding of music as bio-cultural phenomenon is to identify proto-musical behaviours from on phylogenetic (evolutionary) and ontogenetic (developmental) perspective. In order to locate boundary objects in the field of musical interaction and communication we briefly discuss the central tenets and patterns present in these fields of inquiry.

a) Phylogenetic models

A powerful evolutionary framework that is proposed for explaining music in terms of interaction and communication is the *musilanguage*-model in which it is asserted that the structural features shared between music and language are the result of their emergence from a joint evolutionary precursor. In this context music and language are seen as “reciprocal specializations of a dual-natured referential emotive communicative precursor” (Brown, 1999, p. 271) whereby music is considered as a non-referential system of communication that emphasizes sound as emotive meaning and language emphasizes sound as referential meaning, telling us something about the world.³⁴¹ In *The Singing Neanderthals* (2005) Mithen explores the central characteristics of this protolanguage by reviewing selected aspects of monkey and ape communications. He comes to the following conclusions and characterizations:

- The vocalizations and gestures of protolanguage lack consistent meanings and are not elements to be connected via a grammatical system. They are composed of messages than words and are therefore holistic.³⁴²
- Unlike language which implies a referential capacity, proto-linguistic utterances of monkeys and apes are manipulative: “they are trying to generate some form of desired behaviour in another individual” (Mithen, 2005, p. 120).
- A third feature, only applicable to African apes is that their communication systems uses gesture as well as vocalization and is akin to human language multi-modal.
- Finally, some of the communication systems are essentially musical in nature: they make substantial use of melody, rhythm, synchronization and turn-taking.

With these common ingredients of ape communication systems as a point of departure, Mithen proceeds his inquiry by looking for evolutionary elements that contributed to the development of human language and music.

A first step in that direction is the extension and integration in *early hominids* (2 million years ago) of the differential aspects of protolanguage (holistic, manipulative, multi-modal, musical). The circumstances that facilitated such a process can be related to a new life-style in open landscapes and the necessity to create safety by living in larger groups. An increase in group size engenders the growth of social tensions and necessitates an extended emotional repertoire where emotions can be

³⁴¹ The evolutionary schism between language and emotion can also be considered to be an obstacle for GIPP. Music is usually viewed as the language of emotion whereas scholarly inquiry is related to the language of reason. We have shown in PART I that compatibility can be reached in delineating specific functions for each capacity.

³⁴² Mithen adheres to the view championed by linguist Alison Wray (Wray, 1998, 2000) that language only evolved when holistic utterance were segmented and produced words which could then be composed together to create statements with novel meanings (Mithen, 2005, p. 4). This particular view on language development has it opponents in compositional theories of language which maintain the proto-language consisted primarily of words to which, in a later stage, syntax was added (Bickerton, 2000).

expressed and induced in others. The emotional instrumentarium, consisting of facial expressions, body language, actions and vocalizations that communicate feelings, facilitate appropriate social interactions and trigger the emergence of a *Theory of Mind* (Mithen, 2005, p. 128). It is in this general context of getting acquainted with the inner world of group-members that also mirror neurons develop; these neurons fire both when an animal acts and when the animal observes the same action performed by someone else; hence it can be used for imitating actions and for understanding them, and to use this information to act appropriately (Rizzolatti & Arbib, 1998, p. 119): “the result was a communication system more complex than that found among non-human primates, but one quite different from human language” (Mithen, 2005, p. 138).

The second element of protolanguage-development is to be situated in *Homo Ergaster* (1.8 million years ago) and the raise of bipedalism. The changes in human mobility had a fundamental impact on the evolution of human musical abilities in terms of the synchronization to an external perceived rhythm (entrainment), emotional resonance, dance, or in short, the automatic movement of the body to music.

Since this [musical] experience may often begin as a rhythmical stirring of the body, it may be possible for a performer to recapture the right feeling by finding the right movement [...]to feel with the body is probably as close as anyone can ever get to resonating with another person. (Blacking, 2000, pp. 110–111)

A third element arises with the dispersal of Early Humans in northern directions. Entering unfamiliar landscapes lays pressure on the need for cooperation and the transmission of vital information to others about new types of animals and plants and new constellations of life-support resources (water, firewood). In the *Origins of the Modern Mind* (Donald, 1991), cognitive neuroscientist Merlin Donald proposes that within this pre-historical context, a system of *mimesis* developed that served as an instrument for communicating information about the environment. Whereas in the preceding culture, which Donald calls ‘episodic culture’, hominids could only react and point to the ‘here and now’, *mimesis* allows for representation and reflection. At the basis of this capacity for mimesis or action-metaphor is easy and independent access to voluntary motor memories; without this feature, even simple operations like self-cued rehearsal and refinement of one's own skill are impossible, because the cognitive system remains primarily reactive, designed to react to real-world situations as they occur.

Mimetic action is basically a talent for using the whole body as a communication device, for translating event perceptions into action. Its underlying modelling principle is perceptual metaphor; thus, it might also be called action-metaphor. It is the most basic human thought-skill, and remains fundamentally independent of our truly linguistic modes of representation. Mimesis is based in a memory system that can rehearse and refine movement voluntarily and

systematically, guided by a perceptual model of the body in its surrounding environment, and it can store and retrieve the products of that rehearsal. (Donald, 1993, p. 740)

A fourth and final transitional element, that ultimately leads to the separation between music and language is the development of symbolic behaviour by the *Homo Sapiens* some 200,000 years ago. Mithen links the invention of symbols to the emergence of cognitive fluidity – the capacity to integrate previously separate functional domains (see Chapter 4) – and creativity. Donald situates the capacity for lexical invention in a gradual move from a *mimetic* into a *mythic culture* where stories constitute the collective memory and where the dualism between language and music is effectuated.³⁴³

Summarizing this evolutionary story that predates the separation between language leads to the identification of seven elements that can be attributed to musilanguage: holistic, manipulative, multi-modal, musical, expressive, entraining, mimetic.

b) Ontogenetic models

Looking into the ontogenetic development of interactive capacities, we encounter a field of expertise that focuses on the equivalent of proto-language in the development of early-stage intersubjectivity and communication in terms of *motherese* or Infant Directed Speech [IDS]. Based on systematic observation (using a spectrograph) and punctual analysis, psychologist Anne Fernald notes that:

By the time infants develop the prerequisite cognitive skills for interpreting speech sounds as symbols, they have had a long experience responding to the mother's vocalizations as meaningful in other ways. The characteristic melodies of mothers' speech are used to elicit and maintain the infant's attention, to modulate arousal, to communicate emotions, and to facilitate speech segmentation, with a developmental progression from the more general attentional and affective functions in the early months to linguistic functions toward the end of the first year. (Fernald, 1992, p. 279)

The sequence of functions of IDS as presented by Fernald resembles those that we discussed from a phylogenetic perspective. For new-born and very young infants IDS has a non-representational character and is used in a context of attention and affect regulation: rising contours engage attention; bell-shaped contours maintain the infant's attention; and, intense sounds elicit an orienting response. With slightly older infants the functional domain of IDS shifts to the modulation of emotion and arousal: low pitched, falling contours have a soothing effect and rising contours increase the level of arousal. IDS gradually then develops into an instrument that communicates and expresses speaker's feelings and intentions. In all previous interactions the infant simply reacted positively to pleasurable

³⁴³ This view on the development of music and language into separate functional fields can also be linked to the issues that we addressed in PART I with regard to the opposition between the realms of information and imagination: Information tells us in a discursive way something about the world whereas music is about communicating states of mind.

sounds and negatively to unpleasant sounds; the focus was on the intrinsic acoustic properties of the IDS. Now, the melodies and rhythms help the child appreciate the mother's feelings and intentions (Theory of Mind). In a final phase, specific patterns of intonation and pauses facilitate the acquisition of language itself.

A similar sequence of developments is found in psychologist Philippe Rochat's approach to early (social) cognition³⁴⁴ (Rochat, 1999). Rochat describes three developmental periods which focus on two key transitions by 2 and 9 months of age (see Fig. 11.9 for a summary). At birth and during the first 6 weeks of life (the new-born period), infants show an essentially innate sensitivity to social stimuli and display social attunement; new-borns tap into fundamental environmental resources, and are especially sensitive to people who provide food, care, and the comfort they need to survive. At this initial stage of development, there is no evidence of an explicit awareness of self and others but there is an implicit attunement to others, responding to others in a differentiated way. Here the stance toward people and things in the environment is *attentional*. By the second month a first revolution takes place when infants manifest the first signs of shared experience or *primary intersubjectivity*. This manifestation of reciprocity within a dyadic context (mother/father-child) coincides with the emergence of a novel sense of self as intentional agent in the environment which in turn allows for a *contemplative stance*.

Six-month-old infants interact dyadically with objects, grasping and manipulating them, and they interact dyadically with other people, expressing emotions back and forth in a turn-taking sequence. (Tomasello, 1999, p. 62)

By the end of the first year (9-month revolution) a new differentiation between the self and others develops when the infant starts to monitor others in relation to others and by this breaks out of a dyadic context in favour of a triadic one:

Infants start to manifest a sense shared attention to the physical world, coordinating their own perspective and attentional focus on things with the perspective and attentional focus of others. Gestural communication, in particular pointing, joint attention, gaze following, and social referencing are all indexes of secondary intersubjectivity emerging by 9 months. (Rochat, 1999, p. 24)

This inclusion of others' perspective in dealing with them and the world changes the realm of communication fundamentally: from the attunement of feelings, affects, emotions during dyadic, face-to-face interaction, the possibility presents itself of learning through teaching and cooperation on things outside the dyadic relationship. "Infants' awareness that they can attend jointly, and that

³⁴⁴ "Social cognition can be construed as the process by which individuals develop the ability to monitor, control, and predict the behaviour of others" (Rochat, 1999, p. 4).

others' facial expression and communicative efforts can inform them about the environment, makes teaching and learning with others possible" (Rochat, 1999, p. 25).

Age	Intersubjectivity Level	Social-Cognitive Stance
0 to 1 month	Sensorimotor attunement	Attentional
2 to 7 months	Primary intersubjectivity: smiling, affective attunement, social expectations	Contemplative
8 to 12 months	Secondary intersubjectivity: joint engagement, social referencing, attention following, gestural communication	Intentional

Figure 11.9. The ontogenetic development of communication within the first year of life.

Rochat's overview implicitly and explicitly refers to concepts that are central in the vocabulary related to the developmental psychology: attunement, intersubjectivity, joint attention and shared intentionality.

In *The Interpersonal World of the Infant*, psychiatrist Daniel Stern introduces the term 'affect attunement' to refer to "the performance of behaviours that express the quality of feeling of a shared affect state without imitating the exact behavioural expression of the inner state" (Stern, 1985, p. 142). Stern considers attunement in the context of affects – whereas Rochat relates attunement to a sensorimotor interaction – and thus situates it later in the process of child development (secondary revolution – 9 months). Stern observes that whereas in the first months of life the mother-child interaction is based on unimodal imitative processes (with elements of variations and improvisation), this imitation-like behaviour is extended at the age of nine months; around that time, there is no faithful rendering of the infant's overt behaviour anymore, but rather some form of cross-modal matching that does not refer to the other person's behaviour *per se*, but rather some aspect of the behaviour that reflects the person's feeling state (Rochat, 1999, pp. 141–142). Examples of the phenomenon of affective attunement include the vocal matching of the parent of physical effort such as stretching for a toy, an explosive and intense 'YES' when the child is successful in a task.

Stern considers affect attunement as a particular form of 'intersubjectivity', a term articulated by Trevarthen to capture the ways in which neonatal selves coordinate the rhythms of their movements and senses in relation to other persons' movements, purposes and feelings.

All voluntary actions are performed in such a way that their effects can be anticipated by the actor and then adjusted within the perceived situation to meet the criteria set in advance. Interpersonal communication is controlled by feedback of information, as is all voluntary behaviour. But there is an essential difference between a person doing things in relation to

the physical world and the control of communication between persons. Two persons can *share* control, each can predict what the other will know and do. Physical objects cannot predict intentions and they have no social relationships. For infants to share mental control with other persons they must have two skills. First, they must be able to exhibit to others at least the rudiments of individual consciousness and intentionality. This attribute of acting agents I call *subjectivity*. In order to communicate, infants must also be able to adapt or fit this subjective control to the subjectivity of others: they must also demonstrate *intersubjectivity*. By subjectivity I mean the ability to *show* by coordinated acts that purpose are being consciously regulated. Subjectivity implies that infants master the difficulties of relating objects and situations to themselves and predict consequence, not merely in hidden cognitive processes but in manifest, intelligible actions. (Trevvarthen, 1979, p. 322)

According to Trevvarthen these powers of innate intersubjective sympathy that an infant can show shortly after birth is the primary motivator of cultural intelligence.³⁴⁵

The final pair of concepts ‘joint attention’ and ‘shared intentionality’ have been most extensively articulated by evolutionary anthropologist Michael Tomasello who uses them as quasi-synonyms referring to overt and covert elements of the same phenomenon respectively. According to Tomasello, also chimpanzees know what others see: they follow the gaze of others to external locations and then check back with the other to see if there is anything interesting to observe; young children, however, go beyond this initial gaze following stage:

From before the first birthday, human infants do not just follow the gaze of others to external targets, and do not just want to know what the other sees, they also attempt to share attention with others. Importantly, joint attention is not just two people experiencing the same thing at the same time, but rather it is two people experiencing the same thing at the same time and knowing together that they are doing this. This is truly intersubjective sharing, and it is critical because it creates a shared space of common psychological ground that enables everything from collaborative activities with shared goals to human-style cooperative communication. (Tomasello & Carpenter, 2007, pp. 121–122)

According to Tomasello, the emergence of shared intentionality during human evolution did not create totally new cognitive skills but it took existing skills of, for example, gaze following, manipulative communication, group action, and social learning, and transformed them into their collectively based counterparts of joint attention, cooperative communication, collaborative action, and instructed learning – cornerstones of cultural living (Tomasello & Carpenter, 2007, p. 124). Shared intentionality is a small psychological difference that made a huge difference in human evolution in the way that humans conducted their lives. The unique motivation to share psychological states with others resulted in species-unique forms of cultural cognition and evolution, “enabling everything from the creation and use of linguistic symbols to the construction of social norms and individual beliefs to the establishment of social institutions” (Tomasello, Carpenter, Call, Behne, & Moll, 2005, p. 675).

³⁴⁵ For more perspectives on the phenomenon of intersubjectivity see Zlatev (2008).

The link between music and the foregoing insights in relation to early social cognition has been explicitly forged in work by psychiatrist Mechthild and developmental psychologist Hanuš Papoušek, Colwyn Trevarthen and psycho-acoustician and psychologist Stephen Malloch. The Papoušeks describe the intra-modal, vocal interactions between mother and infant in great detail and in terms of leading, followings, highlighting, elaborations and turn taking; they consider these communications as the precursors of the musical arts (Papoušek & Papoušek, 1981). Malloch introduced the term 'communicative musicality' to establish a semantic link between IDS and musicality. The point of departure to the edited volume dedicated to this phenomenon (Malloch & Trevarthen, 2009a) is that communicative musicality is vital for companionable parent/infant communication and can be formulated in terms of pulse, quality and narrative:

'Pulse' is the regular succession of discrete behavioural events through time, vocal or gestural [...] 'quality' refers to the modulated contours of expression moving through time. [...] Pulse and quality combine to form 'narratives' of expression and intention. The 'musical' narratives allow adult and infant, and adult and adult, to share a sense of sympathy and situated meaning in a shared sense of passing time. (Malloch & Trevarthen, 2009b, p. 4)

With the inclusion of musical terms such as pulse, melody and narrative a trans-disciplinary link is forged between the fields of developmental psychology and musical practice.

From the overview above the following topics and their relations can be inferred and summarized in relation to the treatment of interaction in *academia*, from both a phylogenetic and an ontogenetic perspective:

- Intersubjective manipulation (alarm signals, mood regulation, attention modulation).
- Attunement (resonance, sharing states of vitality).
- Rhythmical synchronization via entrainment.
- The expression of feelings via emotion which allows for a Theory of Mind.
- Joint attention and shared intentionality (a look outward to elements of the surrounding and perceivable environment, breaking with dyadic intersubjectivity).
- Action-metaphor as a mimetic instrument allowing to present environmental elements that are as such not within perceptual reach.
- Forms of (proto-)narration allowing for the representation of environmental elements that are as such not within perceptual reach.

11.3 Designing a topical attractor model for score-based performers

The bottom-up and top-down elements presented above constitute a background from which a general model can be abstracted in terms of performers' informational interests. The model that is proposed hereafter is not primarily a scientific one; it does not aim at controlling, describing and predicting certain behaviours in an experimental setting; its first target is to create clusters of extra-disciplinary information that relate either proximally or distally to the interests of musicians. Inferring such a basic model from a bi-perspectival approach that represents a multitude of information and ways of systematic ordering crucial factors necessarily implies an imaginative leap that cannot be fully accounted for and depends to a critical extent on the personal knowledge and assessment of the modeller (see 11.1.1, the determination of classes and sub-classes in ontology design). The process that in our view captures this leap at best is the emergence of attractors in a chaotic field. Within dynamic systems and chaos theory the technical definition of an attractor is "an equilibrium state (or collection of states) to which a system evolves over time. When the system gets close enough to an attractor, it will remain close even if slightly perturbed. A system may have multiple attractors, each with its own region of attraction" (Clapham & Nicholson, 2014). In the process of arriving at a model as presented in Fig.11.10 such an organic process of attraction has been facilitated with modelling efforts that originate from extra-disciplinary terrains, with the aim of creating and anticipating convergence and transdisciplinary consilience from a biocultural and practical perspective. The result is not a model that predicts phenomena *per se* but rather one that represents a territory of central topics³⁴⁶, is pragmatic in its field of application and open to revision and extension.

As a point of departure and at the most general level of context, the field of playing and performing music is considered as concerned with the intentional and directed creation of a sonic environment which allows for having an experience. Music is considered as being involved with the creation of a possible world, an environment that affords³⁴⁷ experience and intersubjective resonance: "I should emphasize that [the concrete tools of piano playing] serve to achieve the most important goal: *the ability to create an illusion*" (Berman, 2000, p. 13). Experience does not represent external reality but relates to the subjective qualification of one's situated position. The choice for this open view on music making is informed by John Dewey's approach in *Art as Experience* (Dewey, 1934) and emphasizes

³⁴⁶ The map is not the territory however.

³⁴⁷ Affordance is borrowed from ecological psychology; it is "an environmental resource allowing or stimulating an organism to interact with the environment in a particular way. Thus a surface affords a person the opportunity to sit or to lay something down without its falling and an ice cream affords the opportunity to eat." (Matsumoto, 2009). In *The Senses Considered as Perceptual Systems* (1966), Gibson coins the term 'affordance' and defines it succinctly as "what things furnish, for good or ill" (Gibson, 1966/1968, p. 285). Affordances are the possibilities/opportunities for action in a particular animal-environment setting; they are what an arrangement of environmental elements means to an animal in terms of action ("Is the ball catch-able?"; "is the tree clime-able"; "can I pass through this opening?").

music as doing and undergoing rather than as a thing – the representation of a score; Music as having and creating experience is a notion that has strong references in musical practice and scholarship (Ratner, 1983; Reybrouck & Maeder, 2015, Chapter 3; Blacking, 1969; Bowman, 1998, Chapter 6; Hodges & Sebald, 2011).

Within this general context, a topical attractor model is developed where action, interaction and (re-) action operate as the main-attractors in a chaotic field of information (see Fig. 11.10). They represent the basic human capacities that enable musical experience and are situated at the top of an inverted tree-model that harbours various levels of sub-attractors and prolongations. A first line of sub-attractors related to ‘action’ consists of ‘disposition’, ‘imagination’, ‘movement’ and ‘effect’ and the attractor ‘interaction’ is in a first instance further developed in terms of ‘affect regulation’, ‘entrainment’, ‘diegesis’, and ‘mimesis’. In its secondary level of attraction, the model can be read as follows (clockwise starting with disposition – bottom left).

- A performer acts within the context of a certain *disposition* (physical, mood, emotional, attitudes, belief-system, situation).
- An experience-affording sonic environment is *imagined*. In score-based performance, this is done in resonance with the image a composer has codified into a score (see Fig. 11.11 for an extended model, including compository action). The absence of a ‘score’ in the primary model relates to the bio-cultural perspective that we adopt and the focus of our information-base on creating an experience rather than on performing particular works.³⁴⁸
- *Movement* is generated and results in a visual and aural *effect*.
- The elements that belong to ‘ACTION’ are not sequentially ordered (see 11.2.2.1.e on embodied cognition).
- The *effect* is actively (via *movement*) sensed by a listener, (potentially) stimulates *imagination*, and (can) result in an altered *disposition* (mood).
- The link between ‘performer’ and ‘listener’³⁴⁹ is enabled via non-mutually exclusive, interactive procedures that allow the intersubjective creation of experience: 1/ *affect regulation* ‘touches’ the listener directly; 2/ *entrainment* allows for rhythmic coupling; 3/ *expression* enables inferences regarding a particular state of mind; 4/ *shared intentionality* reaches beyond dyadic communication and implies a shared focus on environmental aspects; 5/ *mimesis* refers to elements beyond the immediate environment via bodily presentation; and 6/ *diegesis* attracts the story-affiliated elements that re-present an event.

In the remainder of this chapter, the choice for these attractors is accounted for by describing their transdisciplinary playing fields.

³⁴⁸ “To music is to take part, in any capacity, in a musical performance, whether by performing, by listening, by rehearsing or practicing, by providing material for performance (what is called composing), or by dancing” (Small, 1998, p. 9).

³⁴⁹ We use the term ‘listener’, although ‘watching’ is as much part of the process.

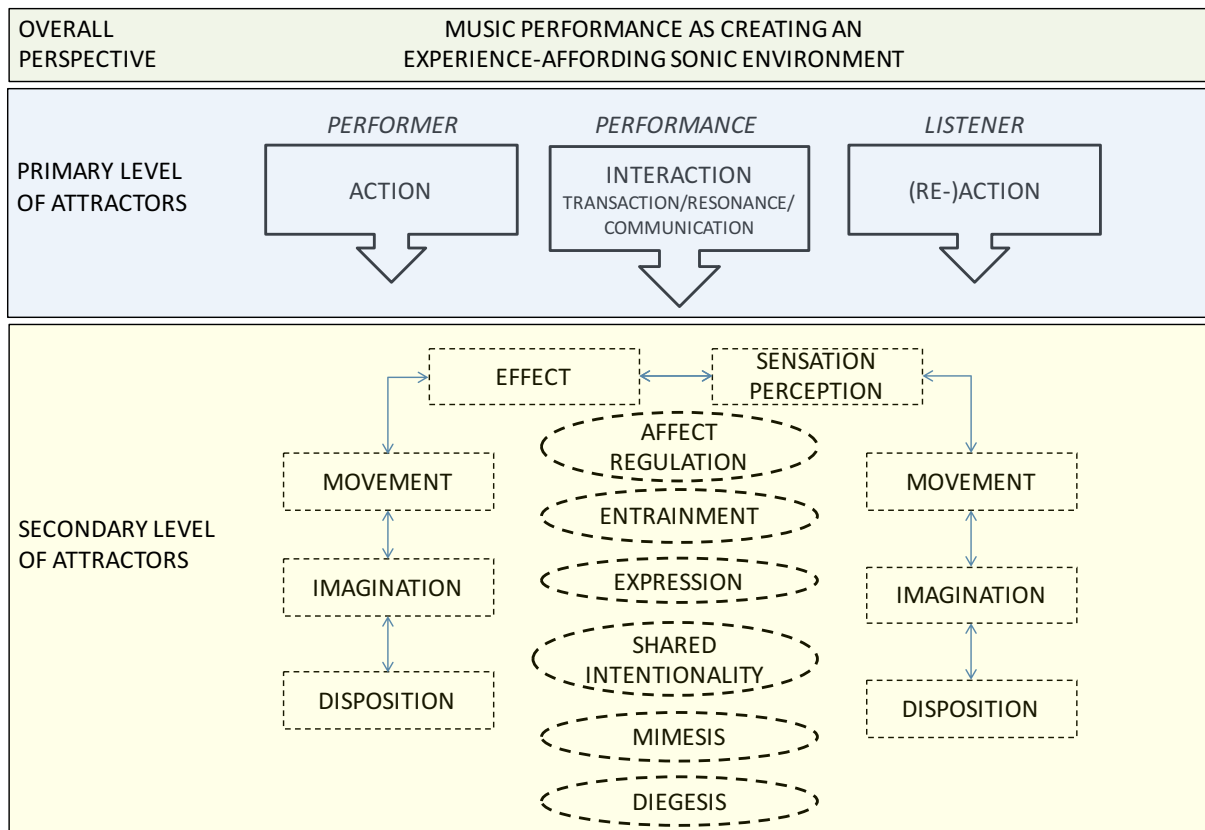


Figure 11.10. A topical attractor model for musical performance [primary model].

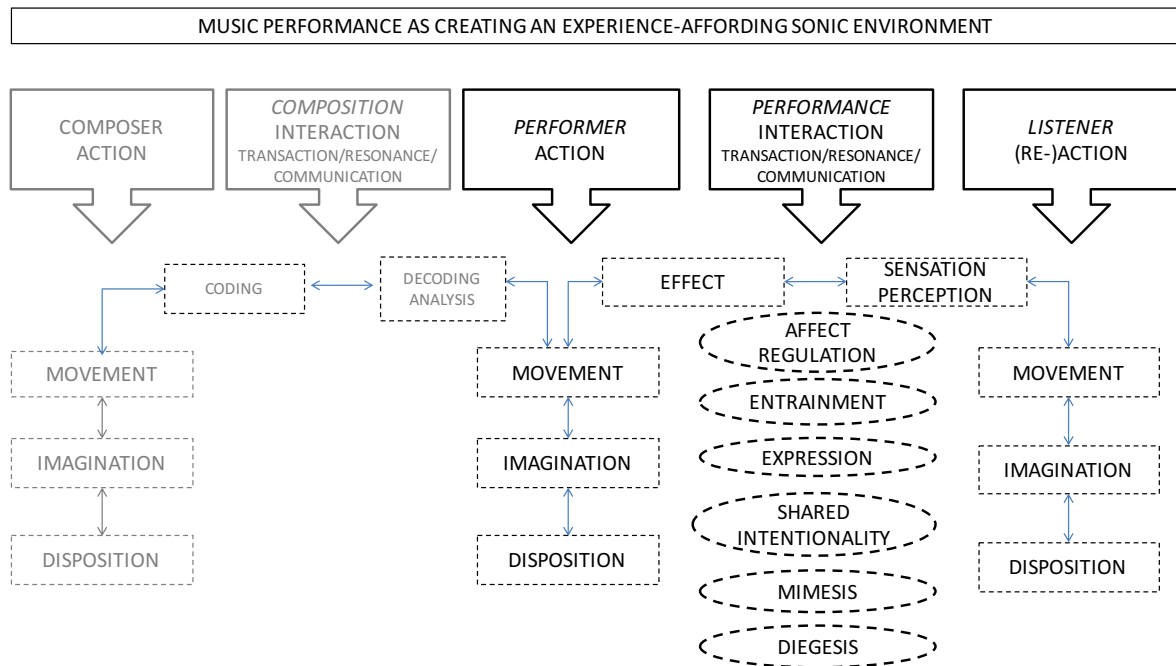


Figure 11.11. A topical attractor model for musical performance [extended version including the composer's action].

11.3.1 Primary attractors: action & interaction

In Chapter 10 we already considered the pro's for taking music's action-side as a point of departure in crossing disciplinary borders, it allows for a bio-cultural discourse in music based on human capacities rather than cultural artefacts and enables the accommodation of a wide range of musical perspectives. 'Action' is a concept that is eminently present in the field of systematic musicology, philosophy and psychology and it is especially in the latter discipline that it has been presented as a unifying concept. In *The Psychology of Action* (Gollwitzer & Bargh, 1996), the authors take the schism that separates cognitive psychologists from social psychologists interested in motivation as a point of departure for establishing a superordinate goal.³⁵⁰ In their view, a comprehensive psychology of action qualifies as such a superordinate goal since explaining when and how actions are initiated, sustained, disrupted, and resumed requires a multitude of theoretical perspectives. Central issues of a psychology of action then are: where do action goals come from? When and how do people prepare their actions? How do people control their ongoing goal pursuits (effortful or automatic)? How do goals affect people's interactions? (Gollwitzer & Bargh, 1996, p. x). In *The Handbook of Human Action*, neuroscientist and handbook-editor Ezequiel Morsella describes the extensive field covered by human action and the research questions that support it; these questions relate to how action are mentally represented, neurally encoded, controlled, acquired, activated and selected and socially embedded (Morsella, 2009, p. 3).

Next to 'action', 'Interaction' is the primary attractor used for the elements that allow for sharing or inducing an experience. Interaction is not limited here to its strictly technical and mechanical meaning but functions as a cluster-term for different forms of communication (Hauser, 1996; Hauser, 2010). Worthy alternatives and co-determinants of interaction are John Dewey's notion of 'transaction' and the term 'resonance' which has gained currency in musical epistemology in recent years. In *Knowing and the Known* Dewey distinguishes between: 1/ self-action as the pre-scientific concepts which situated the cause of action within humans, animals, and things; 2/ interaction as a Newtonian context where elements are balanced in a system of action and reaction; and 3/ transaction as system of descriptions that deals with multiple aspects and phases of action, without any attribution to ultimate, final, or independent entities, essences, or realities. In a transactional procedure seeing together prevails on composing separate elements. Systematic musicologist Marc Leman uses the term 'behavioural resonance'³⁵¹ to refer to a type of involvement with music which is direct in the sense

³⁵⁰ For the relation between the motor behaviour paradigm and the one that focuses on action see Aune, Pedersen, & Ingvaldsen (2008).

³⁵¹ In physics, resonance refers to "the condition in which an object or system is subject to an oscillating signal having a frequency at or close to that of a natural vibration of the object or system" (Joaquin, 2013, p. 57). It is a

that it is “a matter of corporeal immersion in sound energy, which is a direct way of feeling musical reality. It is less concerned with cognitive reflection, evaluation, interpretation, and description” (Leman, 2008, p. 4). According to Leman, behavioural resonance is “something personal, experienced only by the subject. It does not require great skills to have direct involvement with musical reality, but if they are desired, great skills can be developed” (Leman, 2008, p. 4)³⁵².

11.3.2 Secondary attractors

The next layer of the inverted-tree-like topical attractor model consist of prolongations³⁵³ that specify the primary topical attractors and consist of secondary, sub-attractors and their connections. Within the field of ‘action’ four secondary topics (boundary objects) are identified which accommodate the bottom-up and top-down elements that we encountered in the previous sections.

11.3.2.1 Sub-attractors related to action

a) Disposition

Disposition is a term that is generally understood as a “natural tendency or bent of the mind” [OED.6], a “physical aptitude, tendency, or inclination (to something, or to do something)” [OED.9a], or a “physical condition or state; state of bodily health” [OED.10a]. We encountered the term in 10.1.2.2 where a differentiation was proposed between disposition as the collective for (culturally) acquired action tendencies, and pre-disposition as referring to tendencies that are given by nature. In our model the ‘disposition’ attracts biological and acquired elements that determine an embodied and situated state of mind. This implies the following aspects: 1/ emotion, feeling, affect³⁵⁴; 2/ motivation³⁵⁵; 3/ belief, attitude³⁵⁶; 4/ habit³⁵⁷; 5/ identity³⁵⁸; 6/ image³⁵⁹ (personal theory, philosophy); 7/ knowledge

tendency of one system to match the resonance frequency of another resonance system, as a result of forced vibration (see for instance resonance between tuning forks). Linguist John W. Du Bois (Du Bois, 2010) analogizes the resonance principle to the interaction between and among interlocutors.

³⁵² 2017 saw the publication of *The Routledge Companion to Embodied Music Interaction* (Leman, Lesaffre, & Maes, 2017); because of the recent date of publication (2017), it was not possible to include references to the articles published in this volume.

³⁵³ The term ‘prolongation’ is borrowed from Schenkerian analysis where it designates a next level elaboration or composing-out of a basic (harmonic) *Ur-Linie* or structure (Schenker, 1935).

³⁵⁴ Emotions as action tendencies (Frijda, 1986, pp. 69–93).

³⁵⁵ See for instance Deci & Ryan (2008); Ryan (2012); Sorrentino & Higgins (1986).

³⁵⁶ “If you want to change the way you play, you have to change the way you think about your playing” (Winspur & Wynn Parry, 1998, p. 18). See also *Emotions and Beliefs: How Feelings Influence Thoughts* (Frijda, Manstead, & Bem, 2000).

³⁵⁷ See for instance Aarts & Dijksterhuis (2000).

³⁵⁸ See for instance MacDonald, Hargreaves, & Miell (2002, 2016).

³⁵⁹ See Boulding (1961).

(implicit, explicit, tacit); 8/ physical disposition³⁶⁰; 9/ consciousness³⁶¹; 10/ attention; and 11/ the instrument.

b) Imagination

Imagination is an attractor that has been extensively discussed in PART I. The term ‘cognition’ could also have qualified as a secondary topic but given the quintessential role of imagination in the arts, the choice has been made to present ‘imagination’ as a pivotal attractor in this domain. Imagination attracts fields of interest such as: 1/ creativity as the overt manifestation of imagination; 2/ intention; 3/ memory³⁶²; 4/ information processing; and 5/ inspiration as fragments of the environment (both coded and analogue) that feed the imagination.

The absence of ‘a score’ in the representation of secondary topics is related to the bio-cultural view on music performance that we developed in Chapter 10 and the aspiration to sail away from a stimulus-response model. The model can be extended to include this particular aspect (see Fig 11.11).

c) Movement

The domain of ‘movement’ attracts scholarship related to motor control and learning and practice-led insights in relation to instrumental technique. It entails essential categories such as tone production, behaviour, automaticity, skill acquisition, the neurophysiology of movement and bio-mechanics (Mulder, 2002). An important topic within this field concerns the study of gesture. Gesture is an element that is in close connection and overlap with the domain of interaction; it is to be situated at the intersection of observable (and thus communicating) actions and images in the mind.

Musical gesture is biologically and culturally grounded in communicative human movement. Gesture draws upon the close interaction (and intermodality) of a range of human perceptual and motor systems to synthesize the energetic shaping of motion through time into significant events with unique expressive force. The biological and cultural motivations of musical gesture are further negotiated within the conventions of a musical style, whose elements include both the discrete (pitch, rhythm, meter) and the analog (dynamics, articulation, temporal pacing). Musical gestures are emergent gestalts that convey affective motion, emotion, and agency by fusing otherwise separate elements into continuities of shape and force. (Robert Hatten cited in Jensenius, Wanderley, Godøy, & Leman, 2010, p. 18)

It has been suggested that gestures consist of three general movement types: sound-producing, whose direct action consequence is sound generation; sound-facilitating, which support sound-producing

³⁶⁰ This category includes anatomy as an academic field but also applied approaches (Feldenkrais, Alexander-method).

³⁶¹ See for instance David & Eric Clarke (2011).

³⁶² See Snyder (2000).

motor movements but themselves do not generate sound directly; and ancillary, referred to by the authors as non-technical or concurrent movements, which are not involved with sound production or sound facilitation (Jensenius et al. 2010, p. 24).

d) Effect

The effect of musical instrument directed movement, sound, is intimately linked to the foregoing topics: movement, gesture and sound are intrinsically connected and in the context of action-effect coupling we have already noted that effect can be the initiator of a musical action. In our model 'effect' attracts information that relates to the properties of sound (physics, psychoacoustics) and its more distally anticipated effects on listeners' imagination and disposition.

e) Sensation/Perception

The domain of sensation relates primarily to the first stages of aural, visual or tactile connection, to *aesthesis* or sensational knowledge (Hahn, 2007). Sensations are uninterpreted sensory impressions created by the detection of environmental stimuli, whereas perception refers to the set of processes whereby we make sense of these sensations. Perception enables us to literally navigate through the world, avoiding danger, making decisions, and preparing for action.³⁶³

Within this domain two schools of psychology can be discerned: cognitive psychologists operate from a point of view where defective and unreliable input reaches the senses (the eye, the ear or the skin) and assume a representational and evaluative process to fix the input and add meaningful interpretations to it so that an inference can be made about what caused that input in the first place. Within the context of ecological perception, it is argued that the intermediary steps are not needed and that the input is already richly structured by the environment and the animal's own activities, allowing a direct perception mode based on attunement to information. Ecological psychology asserts that perception is not based upon discrete sensations, as commonly believed, but upon the 'pickup' of 'stimulus information', or simply 'information'.

The boundaries between sensation, perception, imagination, effect, movement and sensation are permeable; this domain will attract the informational elements that have the act of listening and observing in general (either as audience or in a feedback-scenario) as a focal point of interest.

³⁶³ For the evolution from sensation into perception and consciousness see Humphrey (Humphrey, 2006).

11.3.2.2 Sub-attractors related to interaction

The basic question for a performer operating in a biocultural framework is: how does one create an environment or a condition that affords a musical experience? The choice of secondary attractors in the domain of interaction is informed by the phylo- and ontogenetic considerations in 11.2.2.2. and follows the sequence of strategies and instruments that can be used in order to convey or share an experience. The list develops from three dyadic approaches (affect regulation, entrainment, expression) into three triadic ways of inducing an experience (shared intentionality, *mimesis*, *diegesis*).

Before presenting the sub-attractors, a note on terminology is necessary as far as differentiation between affect, emotion, mood, and feelings is concerned.

Affect is generally considered as an encompassing term which refers to a pre-personal and universal way in which the body prepares itself for action in a given circumstance (Deleuze & Guattari, 1987). Within the category of affect and within a musical context, at least four affective phenomena can be distinguished (Davidson, Scherer, & Goldsmith, 2003, p. viii):

- *Emotion* relates to a relatively brief episode of coordinated physiological changes that facilitate a response to an external or internal event of significance for the organism; emotions are the projection/display of a feeling – either genuine or feigned – which expresses our internal state or fulfils social expectations; emotion is often intertwined with mood, temperament, personality, disposition, and motivation. In the 20th century, psychologist Paul Ekman (Ekman, Friesen, & Ellsworth, 1972) identified six basic emotions on the basis of facial expressions (anger, disgust, fear, happiness, sadness, and surprise) and psychologist Robert Plutchik eight (Plutchik, 1980), which he grouped into four pairs of polar opposites (joy-sadness, anger-fear, trust-distrust, surprise-anticipation).
- *Feelings* are the subjective representation of emotions; feelings are personal and biographical; they are based on sensation which have been checked against previous experiences.
- *Mood* typically refers to a diffuse affective state that is often of lower intensity than emotion, but considerably longer in duration; moods are not usually associated with the patterned expressive signs that typically accompany emotion and sometimes occur without apparent cause.
- *Temperament* refers to particular affective dispositions that are apparent early in life, and thus may be determined by genetic factors.

The differentiation within the field of affect and the permeable boundaries that surface when emotion is used in a performative and musical context will be further assessed in Chapter 13. For now, and in the context of this attractor model it suffices to take into account that ‘affect’ is used to refer to a broad realm of affective phenomena, that ‘emotion’ refers to observable affective behaviour and that ‘feeling’ is the most latent and personal element of behaviour.

a) Affect regulation and attunement

A first mode of causing another person to have an experience is via manipulation and attunement in the context of affect regulation. If one person gives another one a push then a particular state of mind is instantiated in the receiver which is not necessarily convergent with the one of the receiver. In affect attunement the regulation is more connected to a process of imitation and sharing. The topic of 'affect regulation' attracts the proto-elements of musicking such as pulse, melodic contour, dynamics, repetition, variation, and proto-narrational elements (Malloch & Trevarthen, 2009b).

b) (Rhythmic) Entrainment

A particular mode of intersubjective regulation is the one that is caused via entrainment. Dynamical or complex systems theory describes and models the behaviour of interacting systems comprising autonomous agents and has proved a powerful tool in explaining how, through processes of self-organisation, the behaviour of a dynamical system amount to more than the sum of its parts (Clayton, 2013, p. 16). Entrainment, broadly defined, is a phenomenon in which two or more independent rhythmic processes synchronize with each other in such a way that they adjust towards and eventually 'lock in' to a common phase and/or periodicity (Clayton, Sager, & Will, 2004, p. 2-4). In *Keeping Together in Time: Dance and Drill in Human History*, historian William H. McNeill addresses the biological and cultural evolution of this kind of muscular bounding and assumes that rhythmic stimuli may restore a simulacrum of foetal emotions to consciousness.

It has occurred to me that rhythmic input from muscles and voice, after gradually suffusing through the entire nervous system, may provoke echoes of the foetal condition when a major and perhaps principal external stimulus to the developing brain was the mother's heartbeat. If so, one might suppose that adults when dancing or merely marching together might arouse something like the state of consciousness they left behind in infancy. (McNeill, 1995, p. 7)

In musical terms entrainment is closely related to rhythm, meter and groove but can also include non-cyclical engagements between bodies such as in the context of syncopation (Witek, Clarke, Wallentin, Kringelbach, & Vuust, 2014). In the latter case, the boundary between the domain of affect regulation and entrainment is pragmatic.

c) Expression

A third way of intersubjective interaction is via emotion or the expression of feeling. Expression and emotion are boundary topics with branches in a variety of academic disciplines and in musical practice. In *The Language of Music* (Cooke, 1959), musicologist Deryck Cooke attempts to identify the specific

emotions expressed by tonal tensions within a piece of music and how such emotions are moderated by volume, rhythm, tempo and pitch. More recently, 'emotion' and 'expression' have developed into key research topics in the field of the psychology of music (Juslin & Sloboda, 2001, 2010; Juslin, 2013). In score-based performance, the question presents itself with regard to whose emotion is expressed: is it the composer's, the performer's, the emotion of a *persona* (in which case it would be a matter of mimesis), or a universal affect (as it is implied in Mattheson's vision on Baroque Music)?

These questions indicate the permeability of the sub-attractor boundaries and will be more elaborately discussed in Chapter 13. However, within the context of this attractor-model which aims at attracting information rather than settling age-old problems of artistic expression, we consider this category as the homestead of research that inquires into the topics emotion, feeling and expression.

d) Shared intentionality, joined attention

Shared intentionality or shared attention offers the opportunity to get out of a direct and dyadic intersubjective context and to refer to shared intentional objects situated in a present environment (Tomasello & Carpenter, 2007). In the context of musical performance, the performer acts as a guide who points out the various places of interest within a composition via micro-timing, dynamics or an implicit listening-attitude. The metaphor of a performer as a guide is frequently used in musical practice.³⁶⁴ In scholarly literature, joint attention is generally related to visual elements and is achieved when one individual alerts another to an object by means of eye-gazing, pointing or other verbal or non-verbal indications (Moore & Dunham, 1995). Creating a situation of joint-attention to a sonic environment by means of shared and intentional listening is an element that has received only limited attention (Cochrane, 2009), but the mechanics that have been inferred from the visual field are amenable to be transferred to a sound-situation in which the intentional listening of one person (the performer) is contagious vis-à-vis an audience.

e) Mimesis

Mimesis [μίμησις] and diegesis [διήγησις] have been contrasted since Plato's and Aristotle's times: mimesis shows by means of enactment and conveys an extra-contextual experience by using the body as a representational canvas; diegesis is the telling of the story by a narrator. The objects of mimesis and diegesis can be human actions (see Aristotle in the *Poetica*), affects (Mattheson, 1739), events, *persona*³⁶⁵ (Levinson, 2006, p. 93), a plot (Seaton, 2014), fauna, flora or habitats in a more general

³⁶⁴ In a recent interview, on the occasion of his 70th birthday, Philippe Herreweghe stated for example: "Conducting is leading people into a city that you are supposed to be more familiar with than the musicians themselves. With time, you know more cities and you become a better city-guide" (Herreweghe, 2017).

³⁶⁵ 'persona' is a term used by philosopher Jerrold Levinson to account for expressivity in music: "a passage of

sense. In *The Language of Music* (1959), Cooke maintains that there are three ways in which music can represent physical objects.

First, by direct imitation of something which emotes a sound of definite pitch, such as a cuckoo, a shepherd's pipe, or a hunting horn. [...] The second way is by approximate imitation of something which emits a sound of indefinite pitch, such as a thunderstorm, a rippling brook, or rustling branches. [...] The third way in which music can represent physical objects is by the suggestion of symbolization of a purely visual thing, such as lightning, clouds or mountains, using sounds which have an effect on the ear similar to that which the appearance of the object has on the eye. (Cooke, 1959, pp. 3–4)

With regard to the latter, most distal category, Cooke refers to the first of Debussy's *Trois Nocturnes* which is entitled *Nuages* and observes that, although we are persuaded into interpreting the shifting patterns of sound in terms of the visual imagination, we should have been uncertain what the composer intended to represent if Debussy had not given the *Nocturne* its title. Here, we hit upon the functional role of mimesis. Taking into account music's free-floating intentionality and aboutness, mimesis is not a tool to represent objects, events, or habitats but rather a means to present the feelings and experience that go along with particular elements of an environment.

Closely orbiting the notion of mimesis are 'action-metaphor' and Deleuze's notion of '*devenir*':

To become [*devenir*] is not to progress or regress along a series. Above all, becoming does not occur in the imagination, even when the imagination reaches the highest cosmic or dynamic level, as in Jung or Bachelard. Becomings-animal are neither dreams nor phantasies. They are perfectly real. (Deleuze & Guattari, 1980/1987, p. 238)

f) Diegesis

In instrumental music, diegesis relates to the elements of narrative that characterize temporal development. Elements of 'telling a story' and representing a succession of events imply: 1/ starting at a given moment; 2/ being manifest for a certain amount of time; 3/ ending; 4/ moving forward; 5/ expectations; and 6/ unexpected events (Meelberg, 2006, p. 39, see also Bal, 1990, 1985/1997).

music P is expressive of an emotion E if and only if P, in context, is readily heard, by a listener experienced in the genre in question, as an expression of E. Since expressing requires an expresser, this means that in so hearing the music the listener is in effect committed to hearing an agent in the music—what we can call the music's persona—or to at least imagining such an agent in a backgrounded manner. But this agent or persona, it must be stressed, is almost entirely indefinite, a sort of minimal person, characterized only by the emotion we hear it to be expressing and the musical gesture through which it does so. It is important to keep that in mind when entertaining skepticism as to whether understanding listeners normally hear or imagine personae when they apprehend expressiveness in music" (Levinson, 2006, p. 93).

Structural and form-related elements in a composition do not always have to refer to a diegetic process, they can also be of a mimetic nature by implying and presenting the developmental elements of an event. In his study on narratology in music, Meelberg illustrates this distinctive possibility as the difference between ‘presentation’ and ‘representation’: narrative comes into play if a succession of events is represented via a medium such as a video and a report; the succession of events as such is a presentative mode of temporal unfolding and does not fit the category of diegesis. Thus, the most of drama is not narrative, it is a transformation from one state to another, but it is not a representation. Rather, it is a presentation, or a demonstration. Lyric poetry, on the other hand, can qualify for the label of diegesis because of its (mostly) representative character (Meelberg, 2006, pp. 39–40).

11.4 Chapter summary

In this chapter, we addressed the challenge of streamlining the information overload that surrounds musical performers. Based on established concepts in ontology-design and topic-modelling, a prototype of a topical attractor model was proposed as a pragmatic instrument that attracts intra- and extra-disciplinary information into topical boundary-objects. Identifying and determining fields of trans-disciplinary interest is an open-ended work-in-progress that is in need of constant dialogue with its stakeholders. Therefore, any model that is presented will always be of a proto-typical nature. The inconclusive character of modelling however does not prevent us from reaching an agreement on certain basic areas of convergence and the establishment of a vocabulary that allows for intra- and extra-practical communication. The process of topical delineation is reminiscent of the pioneering years of ‘new’ disciplines such as psychology where a research programme was constructed on the basis of establishing a limited number of topics. Consulting James’ *Principles of Psychology* (James, 1890) for example teaches us that more than a century later the discipline is still concerned with the topics coined by seminal authors such as James. It is evidently not pretended here that the topical approach presented above comes anywhere near to James’ seminal effort, rather it is an invitation to dialogue in bio-cultural terms on certain trans-disciplinary common interests and to permit the gradual accumulation of a practice-based and extra-disciplinary information base for musicians.

In PART IV, it will be shown how such a practice-based but open information system is not limited to collecting information but also allows for the generation of dialogical connections between various topical fields and units of information.

PART IV: Bio-culturally informed performership in action – two case-studies from the piano-studio

In the preceding PARTS, a conceptual, contextual and practical framework for an informed performership has been proposed and, following the deliberations and considerations in each of these domains, the case has been made for a *Bio-Culturally informed Performers' Practice* [BCiPP]. BCiPP aims at actively exploring information from extra-disciplinary fields (science, humanities, para-academic inquiry), assessing its potential impact on personal and practice theories, and at stimulating trans-disciplinary and bio-cultural dialogue on topical attractors. From this perspective, informational units that live an isolated and fragmented life in *academia* are amenable to re-contextualisation within a practical agenda and to finding a destination in the field of pedagogical reproduction.³⁶⁶

In PART IV, two operational examples are presented which provide indications on how such a transformation of information into practice-relevant instruments and insights is achieved. The two case-studies are not in-depth enquiries – this would require a fully separate study; they are presented from the perspective of an informed performer, not the one of an Artistic Information Researcher (see Chapter 8). Their function is to illustrate how the foregoing meta-practical considerations can work in concrete circumstances and in relation to practical challenges and problems.

The first case-study pertains to the attractor-field of *action* and examines how practical insights about the basic stroke(s) in piano-playing can be informed by a selected cluster of Information Units [IUs]; in the final chapter, the domain of *interaction* is explored by creating a tool for performative analysis in terms of embodied vitality.

In accordance with the learning model developed in Chapter 9, in each study the practice situation will first be briefly sketched, followed by presenting relevant IUs from the bio-cultural galaxy of information which are then re-contextualised and developed into a pragmatic and reproductive tool (see Fig. IV.1 for an overview of the *modus operandi* in PART IV).

³⁶⁶ The terms 'reproduction' and 'recontextualisation' are borrowed from Basil Bernstein who distinguishes between a field of production where new knowledge is constructed, a field of reproduction where pedagogic practice in schools occurs, and a field in between, called the recontextualising field which is concerned with appropriating discourses from the field of production and transforming them into pedagogic discourse. According to Bernstein, recontextualisation entails de-location or the selective appropriation of a discourse or part of a discourse from the field of production, and relocation in which the original discourse undergoes a transformation according to the play of interests in the contextualising field (Bernstein, 1996, pp. 113–114).

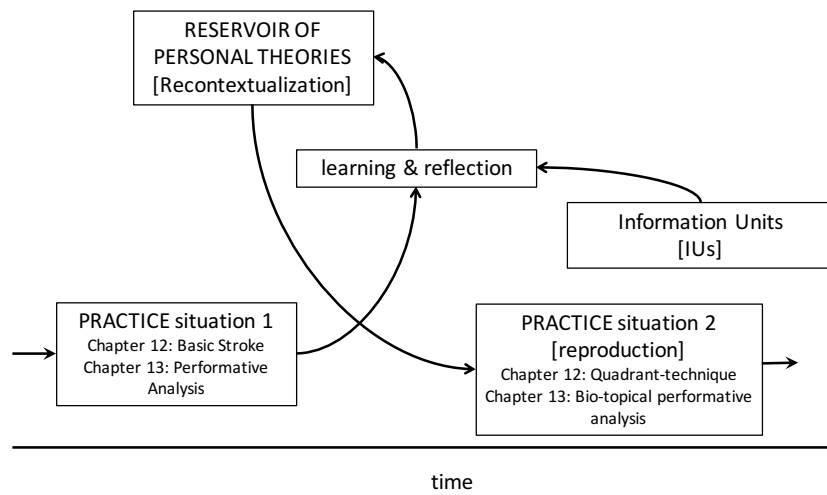


Figure IV.1. Overview of the modus operandi in BCiPP in terms of Bernstein's pedagogic device (Bernstein, 1996).

Chapter 12: The basic stroke(s) in piano playing

The basic stroke in piano playing is an elementary factor in the development of a pianist's repertoire of instrument-directed and sound-producing movements; it logically involves: 1/ a moment of rest or stand-by; 2/ a phase in which the instrument is approached; 3/ a sound-generating key-stroke; and 4/ a moment of release³⁶⁷. Different schools of piano playing formulate (implicitly or explicitly) an answer to the question of how to generate the sound of a single and sustained note on a piano in an effective way. Akin to e.g. the forehand stroke in tennis, the basic stroke in piano playing is mainly a didactical tool introduced in the first piano-lessons, to create awareness in terms of muscle-coordination in the arm and hand, and remains an element of development and perfection even in the careers of top-players. The focus of attention among pianists addressing the issue will generally be on the position and involvement of the fingers, knuckles, wrist, elbow and shoulder, and on the use of muscle-power and/or gravitational forces. Most likely, the confrontation of ideas will give rise to a pre-Socratic, unresolved debate, ruled by idiosyncratic opinions, cherished beliefs, personal judgements, and powerful traditions. Notwithstanding these variances, there may still arise a zone of convergence around some basic principles of instrument-directed tone-production which would be seen in most generic piano method books to require:

- A balanced and supportive upper body
- Relaxed shoulders (certainly no elevation)
- Horizontal alignment from elbow, over the wrist to the knuckles³⁶⁸
- Freedom in the wrist
- Curved shape of the fingers³⁶⁹

More detailed, extended and systematic accounts of single tone production as well as proposals regarding the supporting instrument-directed movements can be found in dedicated SIPP-publications (see 2.2) and their offspring (Bernstein, 1991; Fink, 1992; Brouwer, 2006). However, and as already indicated in Chapter 2, these references are hardly representative for the practical knowledge that

³⁶⁷ Piano pedagogue Barbara Lister-Sink mentions four phases involved in the basic stroke: 1/ easy, efficient lift of the forearm; 2/ free fall of the forearm; 3/ optimal bone alignment and muscle contraction on the moment of impact; and 4/ instantaneous release (Lister-Sink, 1996). Lister-Sink's approach is strongly tied to the weight-school of piano-playing; in order to allow for the inclusion of other approaches, we will hold on to the four phases as mentioned in the main text.

³⁶⁸ "The wrist should be positioned to form a more or less straight line between the elbow and the knuckles. Holding it too low will interrupt the flow of muscular continuity from the shoulder to the fingertips. Holding it too high brings fingers too close to the surface of the keys, interfering with articulation" (Berman, 2000, p. 30).

³⁶⁹ "The correct shape of the pianist's hand is the one that is also the physiologically innate one, with naturally curved fingers" (Berman, 2000, p. 29).

pianists hold with regard to technical accomplishment and tone production. Therefore, and with a view to provide a more explicit *Image* of practice-based understandings and personal theories in this area, we briefly revisit the four *Main Stream Performance*-sources that we discussed in Chapter 2 for more systematic indications in the field of piano-technique and the role of the basic stroke therein.

12.1 A reservoir of basic, personal theories

In *The Art of Piano Playing* (1973), Heinrich Neuhaus brings the technical elements F (force), m (mass), v (velocity), and h (height) to the table in approaching the physical possibilities of instrumental technique (Neuhaus, 1973, p. 58) – although he admits to preferring the use of metaphors when speaking of the locomotor system to his pupils (Neuhaus, 1973, p. 93). The overall framework sketched by Neuhaus is one in which two primary functions are attributed to the fingers: they are “independent living mechanisms” (Neuhaus, 1973, p. 93) which are connected to the weight of the whole hand and arm as required from the dynamical context; simultaneously, and in cases where a considerate volume of sound is required, the fingers are transformed from being independently active units to strong supports: “they become pillars, or rather arches under the dome of the hand, a dome which in principle can bear the full weight of our body” (Neuhaus, 1973, p. 94). From this double use of fingers, Neuhaus infers eight essential elements of piano technique:

1. The playing of one note³⁷⁰ – the basic stroke or “the amoeba of the piano-playing kingdom” (Neuhaus, 1973, p. 115);
2. Playing two, three, four or five notes;
3. Scales (position-switch of the hand);
4. Arpeggio (broken chord);
5. Double notes (two notes simultaneously);
6. Chords (more than two notes simultaneously);
7. Jumps and leaps;
8. Polyphony.

In *On Piano Playing* (1981), György Sándor promotes the idea that piano playing is not so much a matter of muscular strength and endurance but of proper activation of a complex set of muscles of which some are small and weak, made for precision work, and others are strong and powerful: “we must learn the kind of coordination that enables us to put to use the necessary equipment and to play

³⁷⁰ “On the piano it is possible to play a single note in so many different ways that this in itself is already an interesting technical problem” (Neuhaus, 1973, p. 115).

without any trace of fatigue, no matter how demanding and difficult the passages we must perform” (Sándor, 1981, pp. 16–17). Next to coordinated muscular energy, Sándor attaches great value to the force of gravity and maintains that muscular and gravitational force in all their combinations account for all the sources of energy available to activate the entire playing equipment. Within his focus on coordination, Sándor assumes an interactive distributive continuum of energies: “total relaxation is non-existent in piano playing. Even when we rely purely on the force of gravity, we must use the necessary muscular equipment to lift and place the arm and hand in their proper positions” (Sándor, 1981, p. 7).³⁷¹

Taking these generic points of view as a point of departure, Sándor subsequently postulates five basic-strokes: 1/ a single note stroke via free fall; 2/ five-fingers, scales, and arpeggios; 3/ rotation; 4/ staccato (octaves); and 5/ thrust. According to Sándor, “these fundamental patterns offer a solution for most, if not all, technical problems in piano playing when they are applied individually or in combination with one another” (Sándor, 1981, p. 115). Sándor claims that these basic technical patterns are recognizable from the indications within the written score but that they are also determined by a performer’s individual anatomy, reflexes, temperament, tactile sensibilities, weight and size, and thus allowing for an unlimited variety of shadings, gradations and combinations.

Boris Berman advocates in *Notes from the Pianist’s Bench* (2000) a technique that combines well-articulated action by the fingers with the flexibility and fluidity provided for by the wrist. The role of the bigger joints is to give body to the sound and providing brief moments of relaxation by substituting effort with weight (Berman, 2000, p. 25). This leads Berman to formulate two basic principles of piano technique:

The “economy principle” requires the pianist to be economical in his movements, not to use a bigger part of his body – finger, hand, forearm, arm – when a smaller one will suffice; the “extension principle” requires us to regard each of the various segments of our piano-playing anatomy (finger, hand, forearm, arm) as the continuation of the adjacent parts, with each individual unit always ready to support and share the work with the others. (Berman, 2000, p. 28)

Berman further distinguishes between three fundamental physical actions in piano playing: 1/ the independent use of well-articulated fingers; 2/ rotation movements of wrist or forearm, as well as thrust initiated by these body parts; and 3/ using the weight of the forearm and upper arm as the source of the pianist’s physical activity (Berman, 2000, pp. 24–25).

³⁷¹ See also Sándor (1981, p. 115).

Finally, Alan Fraser's *The Craft of Piano Playing* (2003) focusses on stabilizing and activating hand structure allowing for the freeing of the wrist and all of the more central parts of the mechanism (lower arm, upper arm, shoulder, spine, pelvis) to accommodate and follow the movement of the hand in a supportive way (Fraser, 2003, p. 26). According to Fraser, functional hand structure is obtained by skeletal alignment (Fraser, 2003, p. 20) and optimization of the intrinsic hand musculature³⁷². In the second edition of *The Craft of Piano Playing* (Fraser, 2011) the author is more punctual in this regard and attaches special attention to the (intrinsic) lumbrical muscles³⁷³ and their function in maintaining the hand's arch (Fraser, 2011, pp. 11, 157, 303, 311).

These brief explorations into MSP-references on basic points of view with regard to piano-technique and tone-production add to the zone of convergence the following three elements: 1/ the issue concerning the coordinated trade-off between muscular action and gravitational force via relaxation is at the centre of the debate but varies and is inconclusive in its basic principles, functional details and contributory elements (finger, wrist, arm, shoulder); 2/ there is an urge for reducing instrumental technique to basic components that are then particularised in not one but rather a variety of basic strokes; and 3/ the quest for universality is complemented by a situated approach closely tied to the requirements of a particular score.

From the perspective of BCiPP, the question imposes itself whether and how the process of tone-production in terms of instrument-directed strokes can be further informed by expertise originating from extra-disciplinary fields and how this information can (consiliently) 'jump together' (*con salire*) into a more grounded understanding that allows for further dialogical and accumulative development.

12.2 Bringing extra-disciplinary units of information to the table

As a first step in a process of informing instrument-directed tone production in piano-playing, seven Information Units [IUs] are concisely presented in their original disciplinary context. They are rendered as punctual 'information' – without too much detail and background – and selected from the personal information-base as presented in 11.2.1 (see also Appendix 13). Some of the units are revisited here in a more specific context and with a view to a practical recontextualization in 12.3.

³⁷² The muscles that move the hand are divided into two groups, the extrinsic and intrinsic muscles. The former are the powerful flexor and extensor muscles of the forearm. These muscles originate outside the hand – the region of the elbow – and insert within the hand. The small muscles are located within the structure of the hand itself and originate and insert within the hand are referred to as intrinsic muscles. These can be further divided into four groups, the thenar, hypothenar, interossei (dorsal and palmar) and lumbrical muscles (Behnke, 2012, pp. 86–93).

³⁷³ The four lumbrical muscles are found deep within the hand and assist with the flexion of the knuckle joints and the extension of the finger joints.

12.2.1 IU 1: skilful action as the coordination of degrees of freedom – neurophysiology

In “some emergent problems of the regulation of motor acts” (1957/1984), Soviet neurophysiologist Nikolai Bernstein (1896-1966) formulates the notion of ‘degrees of freedom’ as a pivotal element in the realm of motor control.

The first clear biomechanical distinction between the motor apparatus in man and the higher animals and any artificial self-controlling devices, as I have repeatedly emphasized, lies in the enormous number of degrees of freedom which it can attain, both in respect to the kinematics of the multiple linkages of its freely jointed kinematic chains, and to the elasticity due to the resilience of their connections – the muscles. (Bernstein, 1957/1984, p. 354)

In Bernstein’s view, “the co-ordination of a movement is the process of mastering redundant degrees of freedom of the moving organ, in other words its conversion to a controllable system” (Bernstein, 1984, p. 355). Within the context of coordination, Bernstein is one of the first to understand movement as a closed circle of feedback-interaction between the nervous system and the sensory environment and by that he anticipates what is now generally known as *neuro- or brain-plasticity*. Bernstein’s notion of coordination as gradually mastering redundant degrees of freedom is still very influential in current research. In a 2009 article in *Neuroscience* medical scientist and pianist Shinichi Fuyura and colleagues take Bernstein’s seminal insights as a point of departure to document the results of an experimental set-up designed to measure a skill-level-dependent interaction between gravity and muscular force when striking piano keys³⁷⁴; they conclude that “a balance shift from muscular force dependency to gravity dependency for the generation of a target joint torque occurs with long-term piano training” (Furuya, Osu, & Kinoshita, 2009, p. 822).

12.2.2 IU 2: the role of lumbrical muscles – systematic musicology

In an article on the temporal control and hand movement efficiency in skilled music performance (Goebel & Palmer, 2013), musicologists Werner Goebel and Caroline Palmer document the finger movements of highly skilled pianists as they perform a five-finger melody at successively faster tempi.³⁷⁵ From the analysis, they conclude that the metacarpophalangeal joints (knuckles) contribute most to the downward fingertip motion while the proximal and distal interphalangeal joints (the two finger joints) slightly extend. This latter observation is an element that relates to SIPP-author Ortmann’s distinction between a flat- and a curved-finger stroke (1929, pp. 217–250). According to

³⁷⁴ The study included seven active, award winning expert pianists (three males and four females) with more than 15 years of classical piano training by different instructors, and seven novice piano players (three males and four females) with less than 1 year of piano training (Furuya, Osu, & Kinoshita, 2009, p. 823).

³⁷⁵ They did so by tracking the movements of finger joints, the hand and the forearm of twelve pianists via a three-dimensional motion-capture system.

Ortmann, the flat-finger stroke features a straight finger that is moved exclusively by the knuckle, while the other finger joints remain immobile; it enables fast finger speeds but lower forces according to the lever principle. The curved-finger stroke features flexed finger joints and allows for more forceful playing. Goebel and Palmer link pianists' finger movement patterns in fast five-finger melodies to a predominant use of the lumbrical (intrinsic) muscles of the hand rather than an extensive use of extrinsic finger muscles. Because of their anatomical trajectory, contraction of the four lumbricals makes the knuckle-joint bend/flex while slightly extending/flattening the fingers (see Fig. 12.1). The authors suggest that “to achieve sufficient finger independence, pianists may avoid extensive use of the extrinsic muscles that are known to exhibit strong biomechanical coupling by generating movements from the lumbrical muscles that are known to be fairly independent”, though they immediately add: “more research is necessary to conclusively determine the use of intrinsic and extrinsic muscles in piano performance” (Goebel & Palmer, 2013, pp. 9–10). Fig. 12.1 indicates the difference (from a theoretical perspective) between knuckle-flexion via the *Lumbricals* (left column) and knuckle-flexion via the extrinsic hand musculature (right column).

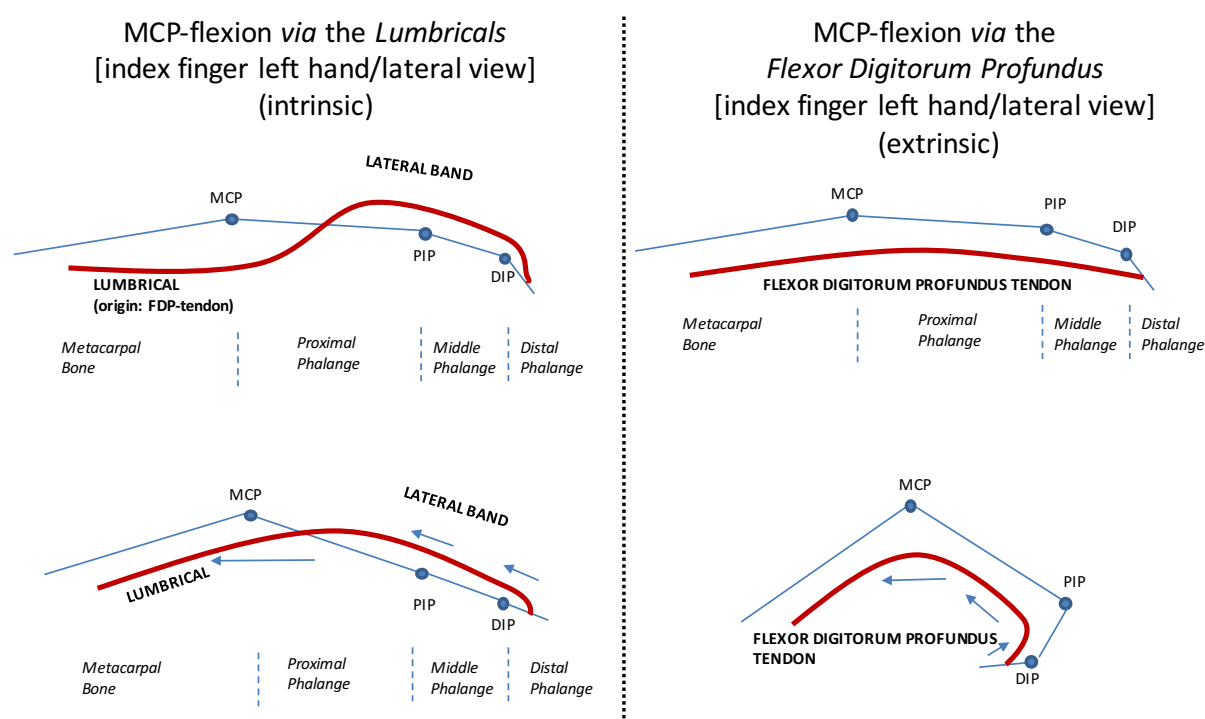


Figure 12.1. MCP-flexion via the lumbricals (left column) or the flexors extrinsic to the hand (right column).³⁷⁶

³⁷⁶ The *Lumbricals* show variable origins and insertions (Lawton, 2013); what is considered to be the most common situation is represented in 12.1. A special thanks to Walter Heynderickx (MD) and Carsten Schoellner (MD) for verifying these anatomical renderings produced by the author.

12.2.3 IU 3: dorsiflexion of the hand³⁷⁷ – ergonomics/biomechanics

In his doctoral dissertation, music educator Gustavo Daniel Cardinal seeks cooperation with the Indiana University Ergonomics Laboratory to analyse wrist flexion and extension in piano performance (Cardinal, 2010). By means of computer analysis of motion (digitally tracked markers placed on the hand and forearm), Cardinal obtains quantitative data of wrist flexion and extension of the right-hand performance in six short musical tasks. The participants in this study are 32 college-level pianists with no concurrent performance-related medical problems and selected to form four different groups according to gender and hand span. The following elements can be induced:

- The measurement of wrist angle in rest position exhibits degrees of dorsiflexion ranging from approximately 2° to 15° (main knuckles higher than the forearm).
- The curvature of the hand in this position evidences a wide variety of arrangements with no particular hand shape patterns (Cardinal, 2010, p. 215).
- The motion analysis indicates that wrist flexion/extension motion varies with the musical task performed.
- Except for large hand stretches (e.g., octaves), all other tasks (e.g., passage work, a scale, trills, trill-like figures) are performed mostly in degrees of dorsiflexion (a relatively 'low wrist').
- Wrist motions are also influenced by the pianist's gender. In general, males play with a somewhat higher wrist than females, although this is not the case for the octave and chord tasks.³⁷⁸ As intervals require more hand stretch, higher wrist positions are observed.

Following the results of the experiments, Cardinal advocates a reformulation of the function of the wrist:

The prescriptive literature on piano technique conceptualizes the function of the wrist mostly as a connective structure that transmits weight and movement. This role is important for piano playing. However, the most fundamental role of the wrist is balancing the length-tension relationship of the flexor and extensor muscles. Acknowledging this important function implies that the motion of the fingers is directly affected by the position of the wrist, and that the use of the wrist (particularly F/E), cannot be representatively described in general terms (as often observed in piano pedagogy, e.g., 'the wrist should be flexible'). (Cardinal, 2010, p. 219)

Cardinal further contends that a flat or elevated wrist may not be the most efficient position for musical tasks and that the level of dorsiflexion found in the position of rest could be considered a better model position than that displaying a flat or elevated wrist.

³⁷⁷ With dorsiflexion is meant the backward bending of the hand resulting in a 'low' wrist.

³⁷⁸ Cardinal refers here to research that indicates that females and males negotiate differently between fine motor skills and larger hand/arm movements. Archaeologists Geoff Sanders and Marta Perez could indeed conclude from experiments that "women performed better when movement was restricted to the distal muscles of the wrist and fingers (hand task) while men were better when using the proximal muscles of the upper arm and shoulder (arm task)" and they relate these findings to the hunter-gatherer hypothesis suggesting that gender differences in task performance have arisen through a process of natural selection that favoured the development of brain and body structures supporting the cognitive and motor skills required for hunting in men and for gathering in women (Sanders & Perez, 2007).

12.2.4 IU 4: Chopin as teacher – historical musicology

In the musicological study³⁷⁹ *Chopin: Pianist and Teacher* (2004), Jean-Jacques Eigeldinger approaches Frédéric Chopin's pianistic and stylistic practices by collecting and analysing a variety of information sources such as Chopin's memoranda, correspondence, the fragmentary versions for a *Sketch for a Method* [*Projet de methode*], the annotated scores of pupils and associates, and the statements of Chopin's own students in diaries, letters and reminiscences. Chopin's interest in *Bel canto* as a model for pianistic declamation and fullness of tone is of interest because of its close link with an element of piano technique and tone production: the use of the wrist.

True to his principle of imitating great singers in one's playing, Chopin drew from the instrument the secret of how to express breathing. At every point where a singer would take a breath the accomplished pianist [...] should take care to raise the wrist so as to let it fall again on the singing note with the greatest suppleness imaginable. (Eigeldinger, 2004, p. 45)

Chopin considers the wrist as the equivalent of respiration in the voice and in annotated scores of Chopin students, strokes across the staff are found which appear to have been marked with the score on the music stand. These strokes indicate breaks of various kinds depending on the musical context. Sometimes it means lifting the hand before a change of pattern or a new motive (Eigeldinger, 2004, p. 112).

12.2.5 IU 5: a two-stage model for the acquisition of voluntary action control – psychology of action

The coupling of action and effect already surfaced in discussing the relations between the components in the topical attractor model (Chapter 11). In a 2001 article in the *Journal of Experimental Psychology: Human Perception and Performance*, experimental psychologists Birgit Elsner and Bernhard Hommel propose and experimentally support a two-stage model for the acquisition of motor control based on the ideomotor³⁸⁰ principle of action-effect coupling (Elsner & Hommel, 2001).

Stage 1 of this model is concerned with the acquisition of contingencies between movements and effects. As an illustration, Elsner & Hommel present the case of a new-born infant confronted with a

³⁷⁹ Although Frédéric Chopin (1810-1849) is assumed to pertain to the intra-practical sphere of information, musicologist Jean-Jacques Eigeldinger indicates in his study on the pedagogical insights of Chopin the specific contribution that musicology can make to the field of performance: "The authentically minded interpreter who wishes to do justice to master-pieces of the past faces a multitude of complex problems. Musicology, established now for a century as a positive science, has seen its objectives broaden and diversify. Performance practice, without being altogether a new sphere, is now a field in which musicology is proving itself to the greatest effect" (Eigeldinger, 2004, p. 1).

³⁸⁰ In psychology, ideomotor theory refers to a framework for action planning which suggests that actions are represented by their perceivable effects. Thus, any activation of the effect image, externally or internally, will trigger the corresponding action.

world full of action opportunities and unable to perform voluntary actions since it has no knowledge of their effects. To acquire this element, new-borns first generate a random motor pattern that leads to a specific, perceivable change in the relationship between the infant and its environment. This change leads to a pattern of activation in the cognitive system (in terms of perception) that, given the temporal overlap of the activation of the motor and the sensory pattern, results in the integration of the corresponding codes. The learning in Stage 1 is automatic and implies that activating one pattern on a later occasion will lead to activating the other one as well.

Stage 2 of the model connects to the selection of goal-directed actions and the recruitment of appropriate movements that are functional in reaching the goal. According to Elsner and Hommel, movements are recruited by activating the perceptual codes that represent the desired goal:

Given that past co-occurrences of movements and their consequences have led to associations between the underlying motor patterns and the codes of their perceivable effects activating such an effect code will tend to activate its associated motor pattern to a certain degree. This activation allows the effect-oriented selection of motor patterns. Although this selection may be controlled by additional intentional processes, the spreading of activation from the effect to the response codes happens automatically, that is, independent of the agent's intentions. Thus, movements are selected by anticipating (i.e., activating the codes of) their consequences. (Elsner & Hommel, 2001, p. 238)

The authors maintain that the two-stage model has implications that go beyond the first few months in life. In a follow-up article (Elsner et al., 2002) specific reference is made to playing a musical instrument and the differential role of ideomotor and sensorimotor learning in the process. By sensorimotor mapping, people learn associations between cueing stimuli and subsequent actions, whereas by ideomotor learning, associations are acquired between actions and subsequent sensory events: “when playing the piano, both types of learning may be present, but sensorimotor mapping would associate the finger movement to the sight of the note, whereas ideomotor learning would associate the finger movement to the hearing of the tone” (Elsner et al., 2002, p. 364).

12.2.6 IU 6: studies in approach-avoidance behaviour – social psychology

In Chapter 11 (11.2.2.1) we already reported on an article in the *Journal of Personality and Social Psychology* where social psychologists Ronald Friedman and Jens Förster conclude that arm flexion facilitates insight-related creative processes and that arm extension facilitates analytical reasoning (Friedman & Förster, 2000). The experimental tasks that they administer measure the three central elements of creative insight proposed by psychologists Jonathan Schooler and Joseph Melcher (Schooler & Melcher, 1995). The first of these elements involves overcoming fixation on misleading interpretations and strategies rendered overaccessible by the context of the problem. The second element entails breaking away from inappropriate initial assumptions and strategies by re-encoding

components of the problem into a novel global representation. The final element of creative insight according to Schooler and Melcher entails memory search for novel responses and strategies.

Of particular interest in the context of instrument-directed technique is the experimental method that the inquirers employ. To induce either positive or negative hedonic states they rely on non-affective bodily feed-back generated by pressing upward on a table (arm flexor contraction) or pressing downward on a table (arm extensor contraction). This procedure has been introduced by social neuroscientist John T. Cacioppo and colleagues who found supportive evidence to the fact that arm flexion gives rise to bodily feedback associated with approaching positive stimuli, whereas arm extension gives rise to bodily feedback associated with avoiding negative stimuli (Cacioppo, Priester, & Berntson, 1993). This hypothesis is based on the learning-theoretical notion that, over the course of a lifetime, arm flexion (where the motor action is directed toward the self) is repeatedly associated with acquiring or consuming desired objects (i.e. approach motivation), whereas arm extension (where the motor action is directed away from the self) is repeatedly associated with rejecting undesired objects (i.e. avoidance motivation).

12.2.7 IU 7: the sight of sound – psychology

In a 1995 contribution to *Music and the Mind Machine* (Steinberg, 1995), psychologist Jane Davidson reflects on a series of experiments where the *point-light technique*³⁸¹ is adopted to assess the visual information contained in music performances (Davidson, 1993). In these studies, the performers are asked to perform the same piece of music in different expressive manners: projected – as in public performance, deadpan and exaggerated. The observers are subsequently presented with these manners in three modes: the visual point-light stimuli alone, the sound alone, and the combined visual and sound stimuli. From the results, it can be inferred that there is sufficient perceptual information contained in visual information of kinematics alone to permit the identification of performance manners. Furthermore, vision seems to be the only mode to significantly differentiate between projected and exaggerated manners, suggesting that vision most strongly conveys the differences between the three performance manners. From an ensuing exploratory investigation Davidson infers the suggestion that “for the non-musician, visual stimulus mode may be the main source of information about the expressive intention of the performer” (Davidson, 1995, p. 110).

³⁸¹ In the point-light procedure, test-persons are dressed in black clothing with reflective tape attached to their major joints; they are consequently videotaped while a spotlight shines on them. After recording the movement, on-screen adjustments are made so that only the moving dots against a black background are visible, thus isolating pure movement (Johansson, 1973).

12.3 Recontextualisation of IUs in piano technique

The seven IUs presented above originate from a variety of disciplinary fields and generally do not cross-refer to each other. They constitute pieces of information, freestanding elements of a jigsaw-puzzle, of which some do and other do not imply an immediate link with playing a musical instrument. From the perspective of BCiPP, the question arises how these elements of information can be interrelated ('jump together') and how they can have an impact³⁸² on the reservoir of personal theories that are present in the practice of piano-playing.

IU1 – Bernstein's notion of coordinating degrees of freedom and the gradual and experience-related shift from using muscular force to depending on gravitational force – seems to be of a confirmational type, especially with regard to the skill-dependent trade-off between muscle force and gravity which is a prominent topic in MSP-texts. However, by employing a scientific apparatus (statistics, measurements, representative sample of participants) the study goes beyond personal experience (see Section 3.3: the third form of life of information) and adds extra authority to a principle of piano-technique that has already been suggested in several practical and experience-based contexts. Since there is no absolute agreement on the matter among pianists, this IU could easily be used to overthrow or marginalise deviating perspectives in a process of deterministic scientification and simplification (see Chapter 6). A conclusion that Nikolai Bernstein and mathematician Tatyana Popova drew in the 1930s from their seminal experiments related to rhythmic octave strike on the piano³⁸³ is illustrative of such an eliminative influence based on scientific experiments. It indicates that such information must be handled cautiously and that a contextualisation of the facts into a broader context of practical *Images* is a *conditio sine qua non*. In their article, they develop the following logical induction:

During slow and medium tempi, both the hand and the forearm move under the action of their own active muscle impulses. At medium tempi, a sequence of such impulses merges into a single continuous chain, while during slow tempi, individual impulses leading to strikes are separated by more or less prolonged periods of inactivity. [...] Since the mechanism of fast piano playing movements differs so dramatically and deeply from the mechanism of slow movements, it becomes very clear that studying complex passages at slow tempi, or drilling difficult parts, is unjustified. (Bernstein & Popova, 1930; reprinted in Kay, Turvey, & Meijer, 2003, p. 38)

From a scientific perspective, Bernstein and Popova's conclusion about the absurdity of practicing slowly has meanwhile been technically countered by insights such as Adam's closed-loop model (see 11.2.2.1); there it is asserted that learning by error detection and correction is only possibly in slow

³⁸² See 4.3.2.3 on information use (e.g. enlightenment, problem understanding, instrumental, factual, confirmational, projective, motivational) (Taylor, 1991, p. 230).

³⁸³ They did so by using a new device for movement recording, a kymocyclograph.

movements and by means of many repetitions which eventually transform closed-loop processes into a quasi-automatic open-loop process. Also from a pragmatic perspective, practising slowly has been found to be helpful in a context on increasing and perfecting audio-motor integration (Kutik, 2016), an aspect which Bernstein, who focuses on movement alone, does not seem to take into account. Furuya's experiment-based observations with regard to the relation between level of expertise and the use of gravity implies a higher standard of ecological validity but also here questions arise. For instance, studying seven "award winning expert pianists" may well be a sample that holds enough representative guaranties for an exploratory scientific experiment, but the dedicated practitioner will need more detail and visual and auditory reference to assess the value of the research-outcome in relation to her/his *Image*.

How then can IU1 be qualified in terms of information impact? The main contribution of Bernstein's stipulation of skilled movement as a coordination of degrees of freedom to musicians is that it offers a new vocabulary (freedom and coordination as potential boundary topics) and a systematic and principled perspective on a developmental and physical aspect of performance: defining technique in terms of freedom and coordination, and adding to that a trajectory in which muscular force gives way to gravitational force opens a dialogical field where a variety of perspectives can meet and where agenda's can be set for further enquiry and assessment.

A similar agenda-setting-role can be attributed to IU2. The function of the intrinsic hand musculature in piano playing has only just entered the concerns of pianists (Fraser, 2011) and also recent studies in biomechanics and anatomy confirm a (temporary) state of inconclusiveness about their functional roles: "the unique properties of the *Lumbricals* indicate that they are probably [own emphasis] important in fast, alternating movements, such as typing and playing instruments" (Palti & Vigler, 2012, p. 15). The situated differentiation between flat and bent fingers and the use of intrinsic and extrinsic hand musculature impacts on a central element from the zone of convergence, the one that recommends curved fingers as a standard position. Making a reference to Ortmann's research is likely to instil some confidence in the tentative conclusions by Goebel & Palmer but being in a state of vagueness, the matter would certainly benefit from future collaborative research and discussion before it can really impact on the minds and hands of pianists. On the agenda with regard to potential contributions of intrinsic hand musculature to piano-playing, the role of the 5 interosseous muscles in abduction (spreading of the fingers) and adduction is also a terrain to be explored.

The author of IU3 – dorsiflexion of the wrist – sketches the context of his doctoral research by explicitly stating that the inquiry is an evaluative tool to asses often contrasting pedagogical information and practices concerning wrist position and motion (Cardinal, 2010, p. 221). The impact of the information

may be confrontational to practitioners who consider it a universal law to maintain a horizontal alignment from elbow to the knuckles in piano playing. Cardinal's differential analysis in terms of hand span and gender opens a perspective of individual assessment rather than a unifying dogma. By envisaging an extension of the sample-domain in the direction of younger and older participants, the author hopes to extend insights into the role of skeletal and muscular development in wrist extension and flexion (Cardinal, 2010, p. 232), an element that would certainly impact on the didactical implications. What could make this domain of study even more relevant is to investigate aspects such as the potential differentiation between wrist dorsiflexion in the right and left hand, the relation of dorsiflexion to the use of the lumbrical muscles³⁸⁴ [IU2], and the role of repertoire in wrist position. An example of a pronounced dorsiflexion for instance can be found in Mitsuko Uchida's rendition of Bach's *Sarabande* from the French suite nr. 5 in G major BWV 816 (hhaayyddnn, 2015) whereas this physical disposition seems to be less pronounced in Uchida playing Mozart (Vincenzo V, 2012) or Schumann (Berliner Philharmoniker, 2009). Next to Uchida also another female pianist with extraordinary technical skills, Martha Argerich, often adopt such a pronounced low wrist position. This prompts (research) questions such as: is this a conscious or learned strategy³⁸⁵; can the differential use of extrinsic and intrinsic muscles be experimentally measured?

The indications collected by Eigeldinger on Chopin's piano technique [IU4] present a cultural element in the consilient and dialogical field related to instrument-directed tone production and add to the information cluster the factor repertoire. Raising the wrist as a musical gesture in piano playing is usually connected to 19th century piano music although some pianists will apply it transhistorically. The raising of the wrist, as a consequence of elevating the arm, can be naturally and logically linked to inhaling via chest expansion and slight collar bone and shoulder elevation which cause the arm to lift. Such considerations which link specific instrument-directed movements to elementary bodily activities are only implicitly present in accounts such as Chopin's and are barely traceable in scholarly literature.³⁸⁶ Also here, a bio-cultural perspective would allow for a deepened understanding and dialogical integration.

Research and scholarship related to ideomotor theories of action-effect coupling [IU5] explicates in a clear way implicit and vague everyday intuitions and experiences and brings them within the structural purview of a limited set of principles through integration and subsumption. By reminding the

³⁸⁴ The lumbrical muscles are only mentioned in an anatomical overview (Cardinal, 2010, p. 33).

³⁸⁵ Both pianists studied with Maria Curcio (1918-2009) who advocated a rather low wrist position in her teaching (Ashley, 1993).

³⁸⁶ Alexandra Pierce's *Deepening Musical Performance through Movement* is a notable exception (Pierce, 2007).

importance of audio-motor integration in approaching technical matters and the role of imagination in action-effect coupling, this IU has didactic implications that reach beyond the basic stroke. The 'silent piano'-technique is illustrative for this wider field of application; it has been developed in the piano-studio against the theoretical background of action-effect coupling and is a didactical tool that aims at conveying elements of microtiming to students by analogue and non-verbal means. In silent-piano sessions, the teacher plays on an acoustic instrument while the student plays on a keyboard or digital instrument in silent mode. While playing, the student does not get the audio-feedback from his own actions but from the sounds produced by the teacher. As would be predicted from an action-effect coupling perspective, students gradually attune their actions to the sound, and when playing on the acoustic instrument afterwards, they have – to a differing extent – acquired the sound image of their teacher especially in terms of instrument-directed action.

By transgressing the borders between imagination, movement and effect, IU5 allows for systemic integration of separate elements of instrumental technique into an embodied whole.

By inversely linking approach-avoidance motivation to muscular states, IU6 adds a new element to the spectrum that has not (yet) found its way into piano-pedagogy and is also absent in music-oriented disciplinary handbooks (Lehmann, 2007; Parncutt & McPherson, 2002). Translating the *modus operandi* used by Friedman and Förster to the situation of pianists leads to the trivial inference that piano-playing could be prone to inducing avoidance behaviour and limited creativity because of the downward force that is inherently exerted on the keyboard. This is a very primitive deduction that should be weighed against other aspects such as the expertise-related trade-off between muscular and gravitational energy from which it could then be inferred that a certain level of expertise does not only impact on coordination but also on the capacity of creative insight (see IU1). IU6 has certainly the potential to extend pianists' perspective of technique but also calls for further differentiation. In the scientific approach for instance, a duality is assumed by the authors between approach and avoidance motivation without providing a 'neutral' middle-ground. In the context of piano playing, the question imposes itself whether either of these two types of archetypical motivation is adequate. Considering it as one of the roles of the performer to embody varied states of mind implied in a composition, should performers not aim for a neutral state, an empty canvas that frees the voluntary motor system from emotional high-jacking (see 11.2.2.c)?

Finally, the linkage between vision and sound [IU7] allows via the notion of gesture for a link between the topical domains of 'action' and 'interaction'. In IU4, a relation between a wrist-gesture and breathing was suggested in Chopin-repertoire, but the repertory of interactive gestures is certainly ready to be extended. In publications such as pianist Seymour Bernstein's *20 Lessons in Keyboard*

Choreography (Bernstein, 1991) such a link is explicitly forged but also from scientific theories such as the motor theory of speech perception³⁸⁷ (Liberman & Mattingly, 1985) and from evolutionary accounts of language (Corballis, 2009) valuable inferences can be made. Considering linguistic communication primarily as a gestural system, evolved from the so-called mirror system in the primate brain, resonates well with the framework of communicative musicality (Malloch & Trevarthen, 2009a) and lifts the issue of basic strokes beyond a strictly technical concern to the domain of communication and expression.

IU	Domain	Key terms	Impact on piano technique
1	<i>Neurophysiology</i>	Three streams (gesture, groove,	Confirmation, new vocabulary, systematic framework, agenda-setting
2	<i>Systematic musicology</i>	Intrinsic hand musculature (<i>Lumbricals</i>)	New element to be assessed, agenda-setting
3	<i>Ergonomics Biomechanics</i>	Wrist extension/flexion – dorsiflexion	Confrontation
4	<i>Historical musicology</i>	Chopin’s ‘breathing’ wrist	Particularisation and differentiation in terms of repertoire
5	<i>Psychology of action</i>	Action-effect coupling	Systemic integration
6	<i>Social psychology</i>	Influence of arm flexion/extension on creative insight	New element in need of differentiation and assessment
7	<i>Psychology</i>	Visual perception of sound	Opening the domain of interaction

Figure 12.2. IUs impacting on practical understandings regarding the basic stroke in piano playing.

12.4 Reproduction: the Quadrant-technique

In Fig. 12.2, the various elements presented in Section 12.2 and discussed in Section 12.3 are summarized. A common feature to all IUs in relation to action is that they open a dialogical field which invites further assessment and inquiry in terms of differentiation and interrelation. Transdisciplinary dialogue is one way to proceed in that direction, intra-practical and pragmatic evaluation in the piano-studio is another which does not exclude the former strategy. From the perspective of Basil Bernstein’s *pedagogical device*, a reproductive tool can be considered as embodying the state of knowledge with regard to a particular field in such a way that it allows for didactic conveyance, pragmatic refinement, particularisation and potentially also validation.

³⁸⁷ “The first claim of the motor theory, as revised, is that the objects of speech perception are the intended phonetic gestures of the speaker, represented in the brain as invariant motor commands that call for movements of the articulators through certain linguistically significant configurations” (Liberman & Mattingly, 1985, p. 2).

In this section, such a reproductive tool is presented under the label of the Quadrant-technique.

12.4.1 The Quadrant-technique: basic tenets

The *Quadrant-technique* is a four-stage reproduction model used in coaching pianists and creating instrument-directed upper-limb awareness at various levels of proficiency; the term ‘quadrant’ refers to the fact that the basic strokes in piano-playing circumscribe a quadrant of the circle that could be drawn if the shoulder would make a full-circle rotation (see Fig. 12.3). The technique is based on four primary foundations: 1/ personal experience; 2/ a reservoir of intra-practical insights (see 12.1); 3/ the extra-disciplinary IUs that we have discussed in 12.2; and 4/ the general context of the topical attractor model presented in Chapter 11 which allows for the situated interconnection of the IUs.

The tool is schematically represented by Fig. 12.3-6 and closes the circle from extra-disciplinary output to intra-disciplinary impact.

Within the context of the Quadrant-technique, phase 1 [Fig. 12.4] is the *zero-position* which is characterized by relaxation of the muscles of the shoulder girdle and upper-limb. In this position pianists can gain awareness on: 1/ the intrinsic shape of the hand (slightly curved fingers); 2/ the slight, naturally induced dorsiflexion of the wrist [IU3]; 3/ the rest-position of radius and ulna (the two bones forming the lower arm); and 4/ the rest-position of the shoulder girdle.

Phase 2 [Fig. 12.5], called the *breathing position* [IU4] is an active phase in which the arm is lifted via a rotational movement in the *gleno-humeral joint*³⁸⁸. During the lift-phase the lower arm ‘falls’ into a pronated position³⁸⁹ which induces a slight abduction and endo-rotation of the *humerus*. Once the arm has reached its highest position, one should become aware of the anti-gravitational forces developed in the shoulder- and elbow-zone.

Phase 3 [Fig. 12.6] brings the hand in a sound-producing position. The crucial element here is to effectuate an action-effect link between muscular relaxation in the shoulder and sound production. Pianists may relate muscular tension, as an active and intentional component of piano-playing, to sound-production and end up with a playing apparatus that is for the most part based on muscular energy. It is a Copernican turn to realize that the most comfortable position of the hand is not the *breathing position* but the play position where the keyboard supports to a certain extent the weight of the arm and where sound is produced by means of relaxation. In Phase 3 a skeletal alignment is envisaged between the joints of the fingers, the knuckles and the wrist which results in a ‘grand arch’

³⁸⁸ The articulation between the glenoid cavity of the scapula (shoulder blade) and the head of the humerus (upper arm bone).

³⁸⁹ ‘Pronation’ is the act of turning the palm downward via rotation of the forearm; ‘supination’ is the action of turning the hand so that the palm is up.

which connects fingertips to the elbow via the wrist. In the context of instrumental didactics, this position is referred to as the 'digital position': the *digitus* (fingertip) carries a large portion of the weight (see 12.1 and Neuhaus' notion of the fingers as pillars) and such a playing position is adequate in passages that require the production of a 'big' sound.

In phase 4 [Fig. 12.7], the playing position evolves into a resting position by relaxing the flexors that connect the lower arm to the hand [*flexor carpe radialis* and *ulnaris*]; by relaxing these flexors the wrist is lowered and the weight of the arm is re-distributed from the tip of the finger in the direction of the the carpal bones or the heel of the hand; here, the 'grand arch' transforms into a 'hand arch'. This position is also referred to as the 'carpal position'; because of the redistribution of weight from the *digitus* to the *carpal bones*; this position allows for the fingers to move lightly and freely (see 12.1 and Neuhaus' notion of the fingers as 'independent living mechanisms').

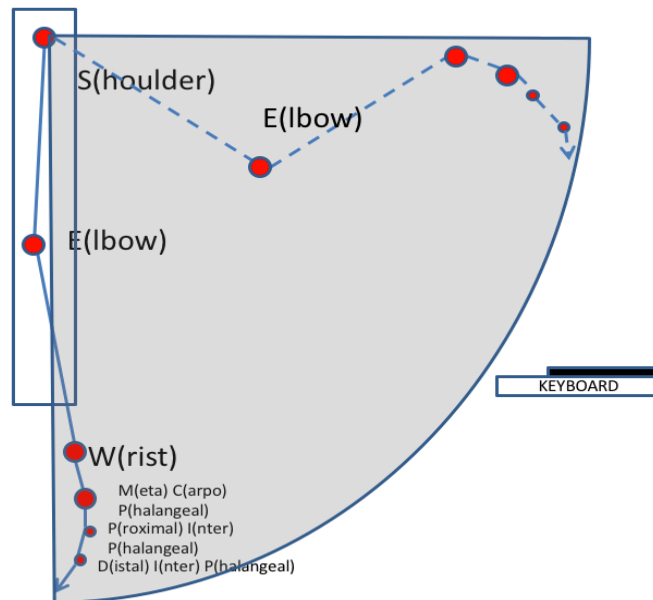


Figure 12.3. The Quadrant of piano-directed movement.

Quadrant-technique: zero-position

- rest position
- relaxation of shoulder muscles/biceps & triceps/pronators & supinator
- naturally curved fingers

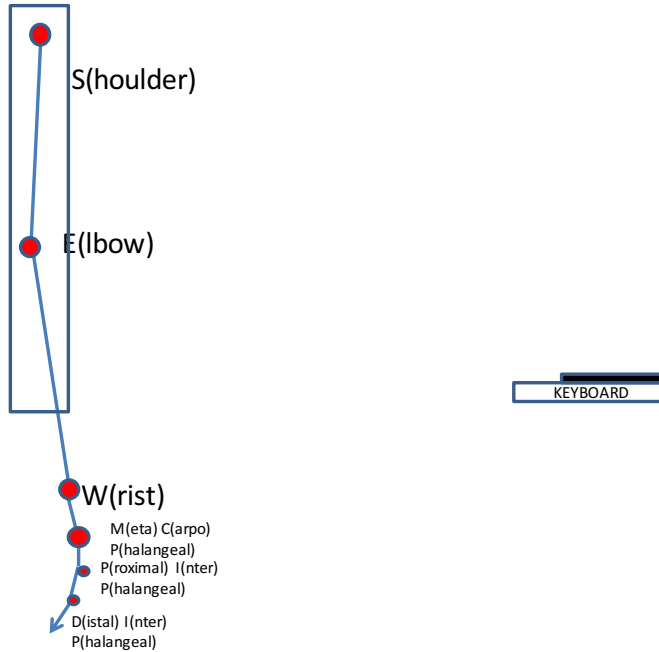


Figure 12.4. Quadrant-technique: zero-position.

Quadrant-technique : breathing position

- suspension-‘stiffness’ in shoulder and elbow
- gravity-induced pronation
- slight abduction + endorotation shoulder
- relaxation in wrist (extensors & flexors), MCP and fingers
- no support from the keyboard (no contact)

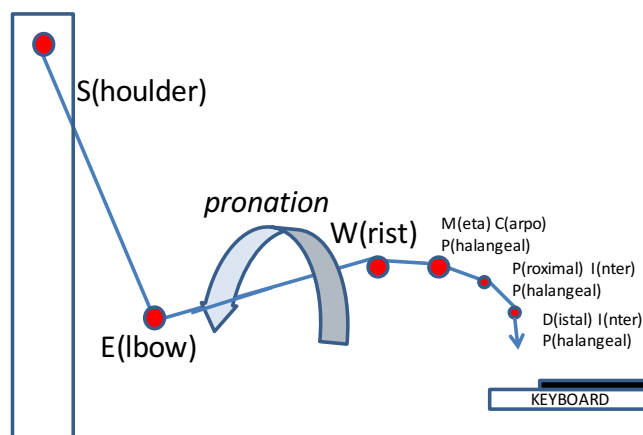


Figure 12.5. Quadrant-technique: breathing position.

Quadrant-technique : play & listening position I

- rotational relaxation of shoulder and elbow (biceps)
- coupling of relaxation with the effect of a sounding instrument
- temporary 'stiffness' in W (grand arch)
- skeletal alignment in MCP/PIP/DIP
- support from the keyboard + lumbrical support in MCP

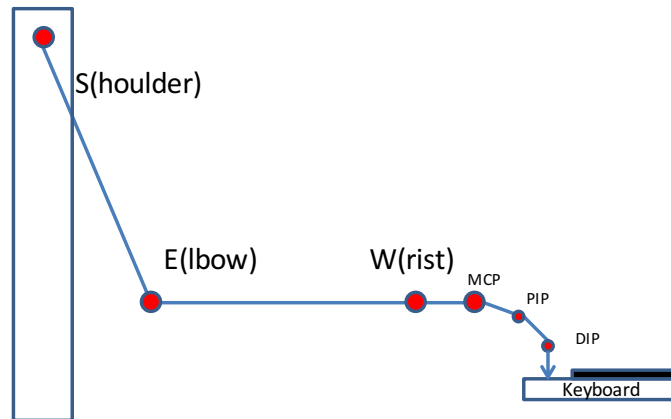


Figure 12.6. Quadrant-technique: play & listening position (also called 'digital position').

Quadrant-technique : rest-position

- relaxed shoulder and elbow (slight abduction + endorotation)
- (semi)-relaxed wrist (flexor carpi radialis/ulnaris)-> re-distributing the gravitational impact -> hand-arch
- support and skeletal alignment in MCP/PIP/DIP
- support from the keyboard

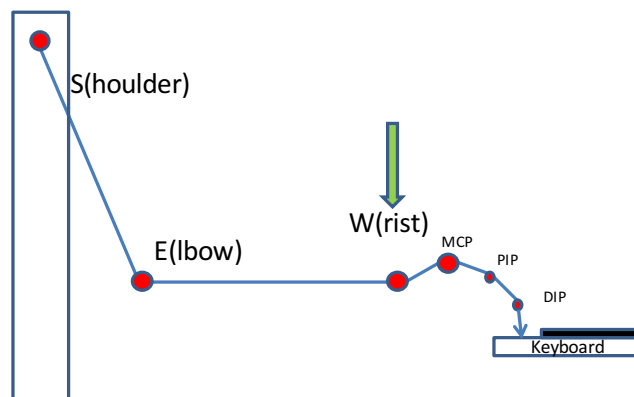


Figure 12.7. Quadrant-technique: rest-position (also called 'carpal position').

12.4.2 Four basic strokes within the quadrant

The four positions described above give rise to a catalogue of four essential or basic strokes: 1/ The first is a down-stroke and follows the sequence of events as illustrated above: it evolves from a zero-, over a breathing- into a play-, listening and rest-position; 2/ the up-stroke moves upwards from a rest-position into the breathing position and embodies staccato-playing; 3/ the third essential stroke involves the playing of two connected notes and combines the down- and up-stroke into a *Seufzer*; and 4/ the fourth essential stroke relates to phrasing more than two notes, it is initiated from the zero-position to evolve in the breathing position where the tension is gently released into a rest-position to softly play the first note of a series of legato-connected notes. By the end of the series the hand is brought back into the breathing position to close the phrase.

Together these four strokes resonate with the practical situations that a pianist encounters in an early stage of study and in combination with a process of deep learning, they allow for basic instrument-directed proficiency and coordination. However, more advanced levels of piano playing would require extensions to this basic framework. A rotational technique *à la* Matthay (Matthay, 1903) where sound is produced or supported either by pronation or supination is one specific add-on, delicate finger-strokes combined with a suspended position of the arm [breathing position] and producing fragile sounds and sound-clouds are another extension. On a more systematic level, additions to the Quadrant-technique involve primarily a differentiation in pivotal points.

12.4.3 Fulcrum-based extensions of the Quadrant-technique

The four strokes as proposed in 12.4.2 have the gleno-humeral joint (shoulder joint) as their principal fulcrum (pivotal point). This choice is informed by Bernstein's notion of *degrees of freedom* from which it can be inferred that in order to arrive at a functional coordination of these degrees maximal involvement of the joints is mandatory. Taking a fulcrum such as the metacarpophalangeal joint (knuckle) as a primary reference and starting point would allow for the stiffening and immobilization of the other degrees of freedom.

This choice for four shoulder-centred strokes as the primary point of departure in piano-technique invites in a further stage fulcrum-led extension. A down- or an up-stroke can just as well be elbow-, wrist-, knuckle- or even phalangeal-based and the choice for one of these fulcrums is mostly related to the gestural and sound-effect that is adequate in a particular repertoire. Music from the classical period for instance, precedes the Chopin-related idea of a *Bel canto* inspired breathing wrist, therefore, phrasing and sound-production will in most cases be more elegant if the articulation is generated by the wrist, thereby only generating minimal movement in shoulder and elbow. The adequateness of a

wrist-articulation in this case is related to the breathing-volume needed for the phrase as well as to the way in which the dampers reach the strings after key release.

In a 2010 documentary, Barthold Kuijken addresses the central importance of breathing in music performance and states that “one has to learn to inhale what one is about to play, also in the emotion not only in technical terms”³⁹⁰ (Soetewey & T’Seyen, 2010). Translating this principle to a keyboard reality and taking into account the evolution of phrasing in Western Art Music, one logically arrives at differentiated levels and modes of breathing via the keystroke.

Next to the sheer breathing-volume also the anticipation of sound differs according to the choice of fulcrum: in the case of a shoulder-centred stroke the sound is embedded in a long preparatory trajectory while a wrist-induced stroke is more agile and surprising in its intersubjective effect. This technical and musical differentiation is also evident from the historical evolution of piano-technique which evolved from a harpsichord-related finger-technique to a *Schwung*-technique by the end of the nineteenth century (Kloppenburg, 1951, 1992; Kochevitsky, 1967).

As far as key-release is concerned: when the key is released with a passive wrist, there is an upward movement already before the strings are damped, the gesture prepares and accompanies the actual sound event; releasing the key without wrist anticipation leads to the perception of simultaneity between vision and sound, and to a more punctual phrasing.

12.5 Field of application

A reproductive tool such as the Quadrant-technique offers an embodied and pragmatic point of departure for technical and musical development, assessment, extension, dialogue and critique. While its nature is inherently inconclusive, open ended and flexible, it can be used as a valuable frame of reference in first initiations to the piano. It establishes bodily awareness, in a context of re-education or as a reflective and generative framework in interpretative matters such as phrasing and sound impact. The Quadrant technique presents a systemic frame of reference that facilitates traditional modes of technical exploration; by explicitly providing the bio-cultural information that leads to its configuration, students and colleagues are stimulated to reflect, to adjust and to add a method to deep learning.

The integration of extra-disciplinary information and personal, practical theories into a model such as the Quadrant technique is facilitated by mediation of a systematic information system such as the topical attractor model presented in Chapter 11. The Quadrant technique illustrates that having an information model in the background of personal inquiry does not only allow for the attraction of

³⁹⁰ “Je moet leren inademen wat je gaat spelen, ook in de emotie, niet alleen maar techniek” (Soetewey & T’Seyen, 2010).

information, it also functions as a first zone of assessment, an area where Information Units can dialogue and spring together with other information or practical experiences.

Chapter 13: Feeling the score – towards an *Interactional* and *Bio-topical Performative Analysis*

In Western Art Music, the preservation of music across centuries is accomplished mainly through notation. The score is a skeleton of musical thought which is revived into an experience affording sonic (and visual) environment by means of a performer. Bringing a notated structure to life is a central concern in musical practice and involves an act of embodied realisation and varying degrees of creative assessment and interpretation. Such performative mediation leads to microstructural adaptations or (re-)constructions in terms of parameters such as rhythmic grouping, melodic grouping, metric accents, tempo, dynamics, timing, duration and articulation, and engages various levels of conscious, intuitive or habitual involvement.

On the intentional level and in systematic terms, the primary distinction between *performative* and *hermeneutic* or *critical interpretation* has already been introduced in Chapter 2: critical interpretation “ascribes, explains, and relates, aiming to provide an account of a work’s import and functioning, both local and global” (Levinson, 1993, p. 34), whereas performative interpretation is “a considered way of playing a piece of music involving highly specific determinations of all the defining features of the piece as given by the score and its associated conventions of reading” (Levinson, 1993, p. 36).

A tool that is generally called into support of either of these two interpretative modes is *musical analysis*; in this chapter, the focus is on exploring the possibility of devising an experience- and practice-proof apparatus for creative performative musical analysis as viewed from the tenets of a *Bio-Culturally informed Performers’ Practice* (see 10.3). The most characteristic element of such an approach is that an analytical focus on interactive and transactional affordances occasions a shift where no longer the score, but the body, as the primary cause of the musical environment and as an amplifier of a coded sonic environment, becomes the prime intentional object of analysis.

To arrive at such an analytical framework, firstly, the state of the field will be assessed, followed by a punctual presentation of seven selected Information Units that pertain to the BCiPP attractor-domain of ‘interaction’. The recontextualisation of these IUs in the field of performance and a proposal for reproducing them via a practical tool precede the chapter-close which presents an *Interactional* and *Bio-topical Performative Analysis* and rendition of Chopin’s Mazurka op.67 nr.4.

13.1 A reservoir of analytical tools

Performative analysis of some kind is an intricate part of every musician’s personal theory. Musicians in the early stages of study, having no advanced theoretical understanding of music, rely on visual, motor and aural memory when assimilating new pieces but also establish primitive and practical proto-

conceptual landmarks in larger-scale compositions; these structural elements relate to a personal assessment of the affective development of the composition, the main structural sections, the visual presentation of the score, or more punctual technical elements such as particular hand positions or tessiture-related aspects (highest note, lowest note). Next to individual strategies, the communication between teacher and student soon starts to involve elements of proto-analysis when a particular piece is discussed in terms of its expressive potential. Often, these communications imply a personal set of habitually encountered affective states (e.g. dreamy, happy, sad), events (e.g. wedding, royal crowning, funeral) or imaginative metaphors which refer to environmental factors (e.g. fountains, rivers, woods).

From a functional perspective, these primitive types of performative musical analysis are not only instrumental in learning and memorizing new pieces, or in developing *style*-awareness via comparative analysis, they also provide guidance during the act of performance; they allow for the prevention of choking and facilitate an attention-management that focuses on what is going on in the music (external focus) rather than on internal thoughts (self-monitoring – internal focus) (Beilock & Carr, 2001; Green & Gallwey, 1987). However, and next to these practical roles, the ultimate ambition of analysis would be its contribution to performative imagination and creativity: analysis should provide an opportunity to approach the score from an unexpected angle and to challenge habitual inferences and intuitions, and lead them into novel configurations. This functionality is akin to the role of experimentation in physics: via the instruments of science natural phenomena transform into scientific phenomena which can then be further studied and related.

This latter functionality opens possibilities for a link with the field of music theory, aesthetics and critical analysis which is a vast and differentiated terrain but converges around the central aim of discovering (or imposing) and classifying structure and intrinsic relations in a musical work. Within that general field of enquiry, each form of analysis develops specialised tools that target specific musical parameters (pitch, melody, rhythm, harmony) or large scale developments within a composition (form, narrative, motives, themes) (Cook, 1987, p. 9).

The relation between analysis and performance is a long-standing issue of debate and the positions range from perspectives that advocate *analytically informed performances* over *performatively informed analyses* to perspectives that shun analysis in the context of performance altogether (Hatten, 2010). The first variant is a rather prescriptive approach that entails a conception of the work as ideal object that must be precisely manifested in all its structure by a subservient performer who merely realizes its designs in sound. Music theorist Wallace Berry advocates this one-sided perspective in his 1989 textbook, *Musical Structure and Performance* (Berry, 1989). The programme of *performatively informed analyses* considers the score as a *text* or a *script* as opposed to an analytically fixed *work*. Within this context, new gestural syntheses may be discovered that engage the performer's best

instincts for phrasing as well as the analyst's hierarchical analysis of compositional units or segments. Examples of such negotiations can be found in the cooperating venture between music theorist Daphne Leong and flutist Elizabeth McNutt (Leong & McNutt, 2005) and in the performance based mappings that pianist Alessandro Cervino presents in his doctoral dissertation *Mapping the Performer's Creative Space: an exploration in and through piano playing* (Cervino, 2012). The third and most critical voice in the debate on the relation between analysis and performance is most clearly represented by musicologist Carolyn Abbate and music educator Christopher Small. Abbate has criticized hermeneutic and even performative approaches as being all too *gnostic* in their pursuit of hidden and metaphysical meanings.³⁹¹ In place of these studied and symbolic abstractions that aim at making the opaque transparent, she notes that actual performance foregrounds elements of a more *drastic* and physical nature involving a category of knowledge that flows from actions or experiences and not from verbally mediated reasoning (Abbate, 2004). Music is not something to be said, but to be played (Jankélévitch, 1961/2003, p. xvi). In the same vein Small has argued against the focus in the Western classical tradition on musical works and the relegation of performance to a subordinate status which, according to Small, has had an impoverishing effect on musical experience. He concludes quite provocatively that "performance does not exist in order to present musical works, but rather musical works exist in order to give performers something to perform" (Small, 1998, p. 8). With this statement, Small adheres to a bio-cultural approach to music where a performer is considered to be the first cause of creating an environment and where the specific situation of Western Art Music with its differential roles attributed to performer and composer are considered to be but a cultural particularisation of a dyadic and interactional relation between art-maker and the art-experiencer. Such a perspective, however, does not erase the reality of score-based performance where a coded script is an essential element of the particular situation; an element that needs to be adequately approached in function of a musical experience.

Within all these orientations a persistent challenge presents itself with regard to the relevance of systematic analytical work to performance. Attempts to close the gap between performance and analysis include Heinrich Schenker's thinking where music is considered as a class of human experience with as its most fundamental layer a sense of directed motion towards an ending-point. By analytically stripping away inessentials such as surface form and claiming access to primary elements of experience, Schenker comes close to a *modus operandi* akin to the process of phenomenological reduction (Cook, 1987, p. 67). Likewise related to this urge for general and experience-based principles are the psychological approaches to analysis that arise most prominently in the second half of the twentieth century (Cook, 1987, pp. 67–115). In *Emotion and Meaning in Music* (Meyer, 1956),

³⁹¹ The opposition between drastic and gnostic is borrowed from Jankélévitch (1961/2003).

composer and philosopher Leonard Meyer combines *Gestalt Theory*³⁹² and pragmatic, consequentialist theories to come to an understanding of emotion and meaning in music as resulting from the frustration of expectations. This leads Meyer to analyse compositions in terms of listener expectations at any given point in a piece of music, and comparing these to the actual realisation. His work goes on to influence theorists both in and outside music, as well as providing a basis for cognitive psychology research into music and our responses to it (Narmour, 1977, 1990; Huron, 2006).

Adopting a macro-perspective on analytical efforts in score-based music performance, at least four intentional objects can be discerned that have enjoyed extra-disciplinary interest and enquiry in terms of analysis.

1. The *score* as a descriptive (how should it sound?), prescriptive (what should a performer do?) and expressive (what was the composer's intention/idea?) symbol has been the main focus of analytical attention. This domain is largely covered by a sub-field of musicology: music theory.
2. The *listener's receptive experience* pertains to the domain of aesthetics, music psychology, and music criticism.
3. The *performer's gestures* both from a receptive and a generative point of view are an object of analysis mainly in the field of psychology (Davidson 1993, 1995, 2001).
4. The *sound of music* as an expressive actualisation of the score has been a more recent focus of attention and comparative analysis in music psychology and in projects such as *AHRC Research Centre for the History and Analysis of Recorded Music [CHARM]* and the *AHRC Research Centre for Musical Performance as Creative Practice [CMPCP]*.

It is safe to say that, although efforts have been made to stimulate a rapprochement between systematic analytical theory and performers' concerns³⁹³, the outcome of these initiatives has not resulted (yet) in a self-evident exchange of ideas between the fields of systematic musical analysis in musical practice. Schenkerian analysis and psychology-based analytical approaches have barely reached performance curricula (certainly not in the European context) and most musicians' analytical repertoire still consists of proto-analytical tools (deep-learning, keen observation, intuition, metaphor)

³⁹² *Gestalt Psychology* is a school of thought in psychology originating in the early 20th century that focused on perception and emphasized the organization of experience into wholes that were more than the sums of their parts.

³⁹³ Institutional initiatives such as the *Orpheus Academies for Music and Theory* and its subsequent publications (Agsteribbe & Dejang, 1999; Beelaert, Dejang, & Snyers, 2007; Crispin, 2009, 2012; Moelants, 2010, 2014; Brooks, 2014) as well as a publications such as *Beethoven's Tempest Sonata (first movement): five annotated analyses for performers and scholars* (Bergé, D'Hoe, Caplin, & Beethoven, 2012) all attest to an awareness of this challenge and an appreciation of the potential that lies in an informative relation between analytical theory and practice.

complemented with essential music-theoretical understandings about form (e.g. sonata-form, lied), chord-progressions and counterpoint.

The project of devising a bio-culturally informed tool for musical analysis can be situated within the context of filling the gap between abstract analysis and performative functionality. Within the framework of BCiPP, analysis is considered as a tool for facilitating and opening possibilities with regard to the interactional potential that a composition holds as an intentionally created sonic environment. In the topical attractor-model presented in Chapter 11, five categories were proposed that ‘attract’ information about experience-enabling elements. In this chapter, these categories – perception, affect regulation/attunement, expression, joint attention/shared intentionality, *mimesis* and *diegesis* – will be further explored for their generative potential in function of an interaction- and experience-based device for performative analysis.

13.2 Introducing Information Units from the domain of musical interaction

The volume of extra-disciplinary information that is available to feed the domain of performative analysis is considerable. Below, seven units of information have been selected from a more extended database (see Appendix 13) on the basis of their potential informational impact. They are punctually and informationally presented in their own *jus*, namely from the perspective of their source-domains. A discussion of the IUs in function of a recontextualization in the context of performative analysis is provided afterwards, in section 13.3.

13.2.1 IU 1: *Expressive culture and the two-stream hypothesis – cognitive science*

In *Beethoven's Anvil: Music in Mind and Culture* (Benzon, 2008), cognitive scientist and jazz musician William Benzon regards music as embodying two simultaneous streams: one stream is the cyclic, repetitive and groove stream, the other the evolving, phrasing and gestural stream which is underpinned the biologically given patterns by which we express and communicate emotion (see also Clynes, 1995, pp. 279–280; Clynes, 1977).

In a series of publications (Benzon, 1993, 2008; Benzon & Hays, 2006) that aim at identifying the characteristics of expressive culture³⁹⁴, Benzon maintains that these fundamental streams are differentially represented in three ranks of cultures; in this specific context of expressive cultures, Benzon adds a third stream which relates to the architectonics of music via harmony.

³⁹⁴ Just as cultural evolution has given humans ever more sophisticated conceptual tools to reason with, so it has given us ever more elaborate and coherent expressive tools that engage with feeling of ourselves and the world (Benzon, 1993, pp. 273–274). Unlike *cognitive culture* that advances through inventing ever more sophisticated conceptual tools for abstraction, the works of *expressive culture* are always embedded in some medium that is manipulated and continuously developed in order to elaborate and control our inner experience (Benzon, 1993, pp. 275–276).

Rank 1 cultures dominated a period that stretches from the emergence of human language and society 100,000 years ago up to the development of writing.³⁹⁵ According to Benzon, musical elaboration in Rank 1 music focuses on rhythm and the groove stream, with rhythmic complexity developed by manipulating the phasing of repetitive patterns. Melodic devices remain relatively simple; harmony plays no structural role in Rank 1 music.

Rank 2 cultures are represented by the ancient high civilizations with writing systems, walled cities and permanent agriculture; Rank 2 music includes the Near and Far East and medieval Europe. With Rank 2, the control of melody becomes differentiated from the control of rhythm. Melodic pitches are now intrinsic to the music itself and no longer dependent on pre-existing and dispositional vocal mechanisms. With the emergence of melodic elaboration, creation of musical meaning by creating expectations becomes possible. With Rank 2, two aspects of musical material are independently manipulated and developed as channels of control: rhythm and melody. Harmonic structure still has no structural significance.

The Renaissance sees the birth of Rank 3 culture, which continues through the Industrial Revolution and currently dominates the Western world. This world gives us classical music characterized by detailed notation. From melodic elaboration in Rank 2, we now move to harmonic elaboration. Harmony as the simultaneous sounding of two or more different tones exists to a certain extent at all ranks, however, the manipulation of these simultaneous occurrences is not organized into a constitutive principle. That only happens in the post-Renaissance Western world. The musical material is now subject to three independent sources of structure.

Rank 4 culture starts in the arts and sciences with the beginning of the 20th century and is, according to the authors, a work in progress and not yet amenable to an analysis in macro-historical terms.

13.2.2 IU 2: Four orientations in critical theory – literary criticism

In *The Mirror and the Lamp: Romantic Theory and the Critical Tradition* (1953), literary critic Meyer Howard Abrams (1912-2015) discerns four coordinates in the total situation of a work of art: the work, the artist, an audience, and a 'universe' to which the three previous coordinates relate (Abrams, 1953, p. 6).

³⁹⁵ Rank 1 music also includes music of the indigenous cultures of North and South America and sub-Saharan Africa.

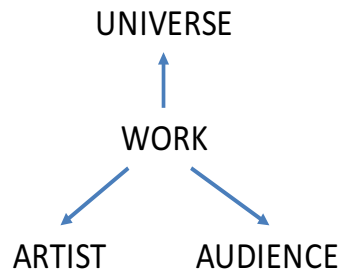


Figure 13.1. The coordinates of art criticism according to Abrams (1953, p.6).

Abrams asserts that any reasonably adequate theory takes some account of all four elements, but also exhibits a discernible orientation toward one specific aspect as a point of departure for defining, classifying, and analyzing a work of art, as well as the major criteria by which he judges its value.

From this generic framework four orientations of critical theories can be inferred (see also Pieters, 2007, pp. 46–57):

- A *mimetic* orientation relates to the idea that a literary text has a clearly recognisable relation to reality. Art consists in imitating aspects of the universe and such mimetic poetics are most prominently advocated by Plato and Aristotle.
- A *pragmatic* orientation that focuses on the relation between text and audience. Such a poetic attitude can be observed in Roman poetics of Horace where the work of art is looked upon primarily as a means to an end, an instrument for getting something done and to effect requisite responses in its readers in terms of pleasure and virtue.
- An *expressive* orientation that characterizes the Romantic period and considers poetics to be the expression and overflow of personal feelings and ideas of an artist: “a work of art is essentially the internal made external, resulting from a creative process operating under the impulse of feeling, and embodying the combined product of the poet's perceptions, thoughts, and feelings” (Abrams, 1953, p. 22).
- An *objective* orientation that focuses on the artwork as a formal structure. Here, the work of art is regarded as a “heterocosm” (Abrams, 1953, p. 27) , a world of its own, in isolation from all external points of reference and is analysed as a self-sufficient entity constituted by its parts in their internal relations, and is judged by criteria intrinsic to its own mode of being.

13.2.3 IU 3: Forms of feeling – philosophy of culture

In a series of publications, philosopher Susanne Langer (1895-1985) argues that a work of art expresses human feeling. According to Langer, an expressive form is “any perceptible or imaginable whole that exhibits relationships of parts, or points, or even qualities or aspects within the whole, so that it may be taken to represent some other whole whose elements have analogous relations” (Langer, 1957, p. 20). The role of such forms is to represents things that are not perceivable or readily imaginable. Categories such as ‘earth’ are not perceivable as an object and are therefore in need of expressive forms such as maps or little globes in order to allow further thinking about the category.

A musical work is such an expressive form and harbours a structure of temporal flow, pitch contours, and dynamics that is analogous to the felt patterns of the flow in human experience. When a listener's imagination is caught by the development of these musical contours, that person's experience starts to resonate with the felt qualities of the music.

In the case of art works, Langer differentiates between *presentation* and *representation* and argues that, although an expressive form such as music seems to represent an analogous entity, "a work of art does not point us to a meaning beyond its own presence. What is expressed cannot be grasped apart from the sensuous or poetic form that expresses it. In a work of art we have the direct presentation of a feeling, not a sign that points to it" (Langer, 1957, pp. 133–134).

Feeling the patterns of the musical motion is meaningful in the same way that any pattern of emotional flow is meaningful to us at a pre-reflective level. Active listening to music means then to imaginatively entering its motions experiencing via our vital, tactile-kinaesthetic bodies the ways in which the music moves, swells, rushes, drags, rises, and falls. Langer summarizes: "A work of art presents feeling [...] for our contemplation, making it visible or audible or in some way perceivable through a symbol, not inferable from a symptom. Artistic form is congruent with the dynamic forms of our direct sensuous, mental, and emotional life" (Langer, 1957, p. 25).

13.2.4 IU 4: Contour and convention – analytical philosophy

Peter Kivy aims at demonstrating in *The Corded Shell: Reflections on Musical Expression* (1980) that "some emotive predicates are applicable to music, and why these are applicable intersubjectively" (Kivy, 1980, p. 11). Kivy explicitly refers to Langer's point of view with regard to the analogy between feeling and music but rejects the possibility that music would directly relate to the structure of feeling and emotion and therefore makes a critical distinction between 'to express' and 'to be expressive of': the face of a Saint-Bernard is 'expressive of sadness' – it looks sad – but that does not imply that it represents the expression of the actual feeling of the dog in question. Similarly, music can be expressive of a certain emotion, without a necessary connection with the condition of the composer. In his 'contour' theory Kivy asserts that music does not refer to the structure of emotion itself, as Langer argues, but rather to the expression of emotions in vocal utterances and in bodily gesture and posture (Kivy, 1980, p. 53).

As a second element in a theory of emotive expressiveness in music, Kivy formulates his 'convention' theory of musical expressiveness which explains the expressiveness of music as a function, simply, of the customary association of certain musical features with certain emotive ones, quite apart from any structural analogy between them (Kivy, 1980, p. 77). Kivy adds that that "all expressiveness by convention was originally expressiveness by contour" (Kivy, 1980, p. 83).

13.2.5 IU 5: Forms of vitality – psycho-analysis, child development

In studies on the developmental aspects of human experience, psychiatrist Daniel Stern focuses on the patterns that mark the process and flow of our felt experience such as the build up of tension and its release, the sense of drifting, the energetic pursuit of a goal, the anxious anticipation of some coming event, and the starting and stopping of a process. Stern calls these patterns ‘vitality affects’ and describes them as “those dynamic, kinetic qualities of feeling that distinguish animate from inanimate and that correspond to the momentary changes in feeling states involved in the organic processes of being alive” (Stern, 1985, p. 156). According to Stern, vitality affects are experienced as dynamic shifts or patterned changes within ourselves or others. They do not correspond to traditional categorical affects such as joy, anger, sadness but are forms of dynamic attunement to a particular environment or event. Intersubjective affect attunement, then, is “the performance of behaviours that express the quality of feeling of a shared affect state without imitating the exact behavioural expression of the inner state” (Stern, 1985, p. 142).³⁹⁶

In a subsequent publication, Stern uses the term ‘vitality contours’ to refer to the manner in which an act is performed and the feeling that directs it. Stern suggests a global unit of social understanding that is based on an appreciation of the temporal contouring and unfolding of experience. This temporal unfolding occurs in several domains simultaneously.

There are the external, objectifiable movements and sounds, such as head turning, pointing, and facial and vocal expressions, that form and decompose. Synchronous with these behavioural events there are internal subjective events consisting, among other things, of the continual, instant-by-instant shifts in feeling state, resulting in an array of temporal feeling flow patterns that we will call vitality contours. (Stern, 1999, p. 67)

Any shift in the flow pattern of a stimulus elicits a corresponding perceivable shift in arousal, activation, and hedonic tone and subjectively integrated into temporally contoured feelings. These vitality contours are concerned with the “how” rather than the “what” of felt experiences, they disregard the content (emotions, thoughts or actions), but are constituted through feeling flow patterns that are best captured by dynamic kinetic terms, such as surging, fading-away, fleeting, explosive, tentative, effortful, accelerating, decelerating, climaxing, bursting, and drawn out (Stern, 1999, p. 68).

Stern asserts that vitality contours underlie the appreciation of most art forms that are time-based and formally devoid of ‘content’, such as most music and dance: “dance reveals to the viewer-listener multiple vitality affects and their variations, without resorting to plot or categorical affect signals from which the vitality affects can be derived. The choreographer is most often trying to express a way of feeling, not a specific content of feeling” (Stern, 1985, p. 56).

³⁹⁶ See 11.2.2.2.b.

In a 2010 monograph, Stern further specifies ‘forms of vitality’ into five dynamic events, the *fundamental dynamic pentad*, which give rise to the experience of vitality: movement is the primary element and implies the ensuing elements of force, time, space, and intention/directionality/end-point directedness.

There is a temporal contour or time profile of the movement as it begins, flows through, and ends. [...] Movement also brings with it the perception or attribution of force(s) ‘behind’ or ‘within’ the movement. In addition, movement has to happen in space [...] Finally, a movement has directionality. It seems to be going somewhere. A sense of intentionality is inevitably added. In a sense force, time, space, and directionality could be called the four daughters of movement. [...] These five theoretically different events – movement, time, force, space, and intention/directionality – taken together give rise the experience of vitality. [...] This natural Gestalt gives rise to the experience of vitality in one’s own movements and in those of others. (Stern, 2010, pp. 4–5)

For Stern, vitality is a *Gestalt* that resists analysis in terms of each separate element; it is immediately grasped from this *fundamental dynamic pentad*.

For the developmental aspect of vitality, Stern leans heavily on a framework introduced by developmental psychologist Heinz Werner which implies that wherever development occurs it proceeds from a state of relative globality and lack of differentiation to a state of increasing differentiation, articulation, and hierarchic integration which allows for more flexible behaviour (Werner, 1940/1957, p. 55). From this point of view, it can be inferred that temporal arts such as music and dance have a specific developmental role in differentiating and extending the communicative, affective repertoire of humans.³⁹⁷

13.2.6 IU 6: Embodied semantics – linguistics & philosophy

In *Metaphors We Live By* (Lakoff & Johnson, 1980), Lakoff and Johnson considered metaphor to be a fundamental but often unnoticed mechanism of mind, one that allows using what we know about our physical and social experience to provide understanding of countless other subjects. In ensuing studies Johnson observes that virtually all of our conceptualization and description of music uses metaphors whose source domains are drawn from sensorimotor experience (Johnson, 2007, p. 243) and advocates a theory of embodied semantics with regard to musical meaning.³⁹⁸

Within such a framework, meaning is not a spontaneous construction of an autonomous mind and not limited to the framing of concepts and their combination into propositions; instead, meaning is to be situated within a flow of experience that cannot exist without a biological organism engaging with its

³⁹⁷ The process is similar to the one suggested by linguist Allison Wray and Mithen in relation to evolutionary language development (Mithen, 2005, pp. 3–4).

³⁹⁸ Johnson’s insights are strongly informed by Merleau-Ponty’s views with regard to the role of the body in constituting meaning (Johnson, 2006).

environment. Meaning emerges through increasingly complex levels of organic activity, and the ‘top-down’ structure that shapes and constrains what can be meaningful and how it is meaningful are originally build upon ‘bottom-up’ and body-environment related processes (Johnson, 2006, p. 7).

Johnson grants gestures a pivotal role in the enactment of meaning and comes – via a linkage to Stern’s vitality affects (Johnson, 2006, p. 10) – to an understanding of music’s function as a presentation and enactment of felt experience. Musical meaning is primarily embodied meaning and has only limited representational value. Moreover, this type of meaning based on images, affect contours and metaphors goes far beyond conceptual and propositional content. Our human capacities for discerning meaning operate pervasively in all our experience, artistic and non-artistic alike, but in art those capacities operate in an exemplary fashion by exploring how experience can be significant and meaningful (Johnson, 2007, p. 262).

13.2.7 IU 7: *Topic theory – musicology*

In *Classic Music* (Ratner, 1980), musicologist Leonard Ratner (1916-2011) develops the field of ‘topical analysis’ to find an account for the stylistic plurality that is so eminently present in the music of the eighteenth century. Whereas the various entities in Baroque compositions (dances, movements) are ideally characterized by one single affect (Mattheson, 1739) supported by dedicated figures, 18th century Classical music allows for the possibility of an individual movement to combine disparate materials, leading to a differentiation and contrast of styles – the rise of opera can be linked to the emergence of dramatic and contextual turns in one opus. These materials and their defining musical components are typically grounded in an original, functional context (dances, ceremonies, religion) and then relocated in a new composition where for instance “a keyboard instrument can play a horn call or a string quartet can evoke sacred polyphony” (Sutcliffe, 2014, p. 118). The process of importing music from elsewhere into a new compositional context is the most characteristic aspect of topical discourse.

Musical topics are general types, capable of being represented by particular tokens. There is a common resistance among musicians to ideas of generalized meaning. According to the popular view, each musical piece, each melody and figure, is essentially unique. (Monelle, 2000, p. 15)

Topics are characteristic figures, dances, marches, genres, textures, or even entire styles that are imported, along with their general expressive correlations, into a larger work, in which they are then contextually interpreted, often as part of the dramatic trajectory, or what I call expressive genre, of that work. (Hatten, 2010, pp. 51–52)

Topic theory develops a thesaurus of characteristic figures (Ratner, 1980, p. 9) and suggests a world with enlarged musical horizons where music can be found everywhere in a society and readily

transferred from one place to another; it also allows for overturning hierarchies that may exist between types of music and their original functional contexts.

In Fig. 13.2, musicologist Kofi Agawu's list of common topics for Classic Music is presented as an orientation to the worlds of affect, style, and technique that they set in motion (Agawu, 2009, pp. 43–44).³⁹⁹

1. Alberti bass	22. fantasia style	43. musette
2. alla breve	23. French overture style	44. ombra style
3. alla zoppa	24. fugal style	45. passepied
4. allemande	25. fugato	46. pastorale
5. amoroso style	26. galant style	47. pathetic style
6. aria style	27. gavotte	48. polonaise
7. arioso	28. gigue	49. popular style
8. <i>stile legato</i>	29. high style	50. recitative (simple, accompanied, obligé)
9. bourrée	30. horn call	51. romanza
10. brilliant style	31. hunt style	52. sarabande
11. buffa style	32. hunting fanfare	53. siciliano
12. cadenza	33. Italian style	54. singing allegro
13. chaconne bass	34. <i>Ländler</i>	55. singing style
14. chorale	35. learned style	56. strict style
15. commedia dell'arte	36. <i>Lebewohl</i>	57. <i>Sturm und Drang</i>
16. concerto style	37. low style	58. tragic style
17. contredanse	38. march	59. trommelbass
18. ecclesiastical style	39. middle style	60. Turkish music
19. <i>Empfindsamer</i> style	40. military figures	61. waltz
20. <i>Empfindsamkeit</i>	41. minuet	
21. fanfare	42. murky bass	

Figure 13.2. A Universe of Topic for Classic Music (after Agawu, 2009, pp. 43–44).

13.3 Recontextualisation within the context of performative analysis

The IUs presented above originate in a variety of disciplines and intra-disciplinary orientations. From a pragmatic perspective, this mixture of epistemic backgrounds should not inhibit the 'jumping together' of informational elements. As proposed in 10.3, the type of consilience that is advocated in BCiPP is not concerned with truthfully explaining phenomena, but pragmatically invigorating and freeing the personal theories and beliefs that serve as a background to artistic action.

Introducing the IUs presented above into the field of a bio-culturally informed performative and interaction-oriented analysis potentially impacts on at least four domains: 1/ the streams of musical interaction; 2/ the intentional foci of performance; 3/ music and vitality; and 4/ bio-topics as units of performative analysis.

³⁹⁹ Ratner's original topics are represented in Appendix 15.

13.3.1 Three streams of musical interaction

Although the multiple-stream hypothesis [IU1] is an extreme reduction of the musical phenomenon by explaining it in terms of a gestural, a groovy, and an architectonic stream, it largely confirms essential aspects that can be inferred from the attractor model as presented in Chapter 11: 1/ the gestural stream can be related to melodic and motivic contour and, as such, conforms to the behavioural instruments that are put to work in affect regulation/attunement, expression and *mimesis*; 2/ the groove stream is an analogue of the concept of entrainment; and 3/ the stream that accounts for the architectonics in music can well be linked to proto-narrative aspects in affect regulation and the macro-structural aspects of diegesis.

The hypothesis of three streams can also be related to contemporary, state of the art analytical approaches that aim at accounting for expressive performative micro-timing. With a view to formulate adequate rules in order to computationally program these micro-structural deviations and adaptations, musical performance researchers Anders Friberg and Erica Bisesi look at local events that attract a listener's attention. These *loci*, called "accents", are either evident from the score ("immanent") or added by the performer ("performed"). They do not only include dynamic accents, but are also associated with grouping, meter, melody (peaks and leaps), harmony, and timbre (Friberg & Bisesi, 2014, p. 241). Friberg & Bisesi arrive at formulating four fundamental accents that can then be further linked to expressive rules of performance (Friberg & Bisesi, 2014, p. 243):

- A melodic accent occurs at local peaks and valleys of the melody.⁴⁰⁰
- A metrical accent occurs at the start of important metrical units such as the start of a measure.
- A harmonic accent occurs at chord changes.
- A phrasing (or grouping) accent occurs at the start of a phrase at any hierarchical level.

Next, the authors add a 'salience-factor' to each of the accents, based on specific contexts in which they occur to come to analyses such as the one presented in Fig. 13.3 with regard to Chopin's *Berceuse*.

⁴⁰⁰ To identify the melodic accents, first the highest and lowest tones of the whole melody are labelled, followed by an indication of local peaks and valleys. The authors indicate here that, based on their observations, peaks are more salient in terms of micro-expressivity than valleys.

C Melodic contour
H Harmonic accent
M Metrical accent
G Grouping accent

A Salience 5
A Salience 4
A Salience 3
A Salience 2
A Salience 1

Figure 13.3. Analysis of immanent accents in Chopin's *Berceuse*, Op. 57 in D flat major, bars 1–19 (Friberg & Bisesi, 2014, p. 251).⁴⁰¹

Direct links to the three-stream hypothesis and the attractor-model can be inferred from this analytical and accent-oriented mode of analysis: the melodic accents refer to the gestural stream and the ways in which the melodic contour develops; the metrical accents relate to the groove-stream and the presence of pulse; and the harmonic accents imply an architectural stream based on the succession and shifting of harmonies. The grouping accent is a new element and is intrinsically linked to the limits of perception and the need to impose order in a soundscape. It is a factor that is not discussed in the

⁴⁰¹ Permission to use and represent this material in the context of this dissertation was granted by both authors on July 28th 2017 and by Oxford University Press on August 7th 2017; onward reuse of this content is prohibited without permission of OUP. An audio example of the programmed rendition is available at http://fdslive.oup.com/www.oup.com/booksites/uk/booksites/content/9780199659647/Ch14.2f_Chopin-op57-total.mp3.

context of this chapter, but insights with regard to ‘chunking’⁴⁰² (cognitive psychology) and direct perception via variants and invariants (ecological psychology) could certainly be an additional element to be studied from an interactional perspective.⁴⁰³

One of the conclusions of the Friberg & Bisesi study is that : “the Bach piece with its regular character is performed with pronounced metrical accents and with smaller phrasing, whereas the more cantabile Chopin piece is performed without metrical accents and with rather large phrasing” (Friberg & Bisesi, 2014, p. 256). By this, the authors implicitly confirm the macro-historical impact of a three-stream hypothesis as formulated in IU1: the three streams can be traced across genres and cultures and vary in their degree of representation.

In our search for elements that could be part of a bio-culturally informed and interaction-oriented performative analysis, the three streams seem to qualify as a basic model for modelling a score in terms of interactive affordances.

13.3.2 Four focal elements of performance: monadic, dyadic, triadic, quadratic

Abrams’ four poetic orientations – mimetic, pragmatic, expressive and objective – originate in literary theory, but can they also be related to the attractor-framework related to interaction and based on modes of interaction in musicking? In Chapter 11, it was indicated how the mother-infant relation develops from a dyadic relation based on affect regulation, attunement, entrainment and expression into a triadic relation where, first via the mechanism of joined attention and later by means of *mimesis* and *diegesis*, a relation is forged between mother (father), infant, a perceivable environment and eventually an extended, imaginary environment. Informed by Abrams insights in IU 2 and taking the perspective of the performer as ‘caregiver’⁴⁰⁴ in a context of communicative musicality, it is possible to reframe these categories and link them to an expressive, pragmatic, objective and mimetic orientation.

Starting with the mode of interaction related to the expression of affects, it can be argued that this category comes close to the expressive orientation identified by Abrams as a poetics that expresses the personal feelings and ideas of an artist (self-expression). The situation in score-based performance is complex due to the involvement of two creative actors, the composer and the performer. However, for the sake of the argument and to avoid the complexity of double creation, a situation can be

⁴⁰² The process of organizing information into a meaningful, coherent and integrated whole (Miller 1956).

⁴⁰³ Elements of perception are included in the attractor model but as forming the link between action and interaction. Because of this mediating role they are not included in this interaction-focused chapter.

⁴⁰⁴ The position of the musician as caregiver may seem odd, however Descartes’ insights with regard to the therapeutic effect of music in *Les passions de l’âme* (1649) or more recent advances in the field of music-therapy corroborate such a position.

imagined in which the performer intends to act as an embodied medium with the intentional aim to be the neutral vehicle, an executant or translator (Stravinsky, 1947, pp. 123-124) through which the affective life of the composer shines through. Such a total identification with the feelings and ideas of the composer resonates with C.P.E. Bach's dictum: "the keyboard player himself has to sense the same passions as the ones the author felt when composing a new piece" [CPE Bach *Versuch* I,3 §13]⁴⁰⁵, but comes also close to the way in which it is perceived in popular music: the composer or text-writer is completely forgotten when a pop-singer performs a song, there is only the presence of the performer (see also Per Aage Brandt's analysis in 13.3.2).

Taking these considerations into account, it can be argued that a performative stance that focuses on self-expression is *monadic*, meaning that the principal focus of the performer/composer is directed inward and that the interactive and dyadic component with the audience is considered to be an epiphenomenon beyond her/his control and interest. A monadic stance relates to affect expression; the performer embodies the music as (s)he is expressing her/his own state of mind (scripted by a text), without an intentional and primary focus on the effect that it generates on the audience. This performative stance is strongly related to the notion of *Empfindsamkeit* – "*Aus der Seele muß man spielen, und nicht wie ein abgerichteter Vogel*" [C.P.E. Bach, *Versuch*, Teil I, H3 'Vom Vortrage', §7], the romantic categories of feeling and genius, and to the psycho-analytical influence on thinking about art: music fulfils the need of expressing deep, unique and hidden feelings of a talented, sensitive musician; the audience is granted the privilege of witnessing this revelation but that is not the leading concern of the artist.

If self-expression relates archetypically to a monadic performative stance, then the categories of affect regulation, attunement and entrainment can be connected to a *dyadic* stance, to Abrams' pragmatic orientation, to a rhetorical position and to the historical framework of a *Wirkungsästhetik*. Such a stance is not self- but effect-oriented; the goal of musicking is to create a sonic environment that elicits a particular effect in terms of affect, mood, emotion or feeling in the listener. Affect regulation builds on principles of action and reaction and on the art of attention modulation while attunement and entrainment rely on principles of transaction and the sharing of vitality contours. In the case of attunement, melodic contouring will be the main instrument; in the case of entrainment rhythmic pulse coupling will be a central concern; in attention and mood regulation, sudden accents and silences or descending and ascending lines will be the primary musical tools. The dyadic stance can also involve

⁴⁰⁵ Er [der Clavieriste] muß dieselbe Leidenschaften bey sich empfinden, welche der Urheber des fremden Stückes bey dessen Verfertigung hatte. Besonders aber kan der Clavieriste vorzüglich auf allerley Art sich der Gemüther seiner Zuhörer durch Fantasien aus dem Kopfe bemeistern.
<http://www.koelnklavier.de/quellen/versuch/kap1-3.html> consulted November 2016.

proto-narrative elements such as introduction, repetition, variation, development, climax, resolution (Malloch & Trevvarthen, 2009b, p. 2).

Building on the foregoing logic of performative stances and foci, it is also possible to imagine a *triadic* stance (audience-performer-work) and relate it to situations of joint attention and to Abrams' objective orientation. A triadic perspective focuses on the presence of an artwork and on its formal structure. Via the mechanism of joint attention and shared intentionality, the focus is on the composition's immanent structure and on finding, revealing and sharing elements of interactive interest. A performer's role in a triadic context does not need to be limited to being a guide, the performer co-experiences this composed environment and can also express primary and affective reactions in relation to that environment. In such a situation, the listener, confronted with a (new) sonic and composed environment, looks to the performer for guidance *to determine and to see* what an appropriate reaction would be. (S)he is potentially contaminated via a mechanism of empathy: a performer projecting enjoyment or seriousness while playing, will influence the reaction of the listener accordingly. In this last case, the monadic and triadic stance appear as an integrated whole.

Finally, the triadic stance can be further extended to a *quadratic* perspective in the case of mimesis and diegesis: a quadratic-mimetic stance focuses on the relation between the audience, the performer, the score and the elements of the 'universe' that are presented by mimesis. Biological components can be involved in mimesis such as flora, fauna, events, persona, affects, habitats, natural phenomena but also cultural memes such as dances, genres, well-known tunes. When the performer mimetically imagines and presents a *persona*, this will include elements of affective expression leading to a nuanced differentiation between a monadic and quadratic-mimetic imagination. In the context of a monadic stance and imagination, it is the expression of the performer that is granted a central role; in a quadratic-mimetic context the expression of feeling relates to an imagined organism. The expression is achieved via gestures (cfr. 13.2.4, Kivy's contour theory) or in terms of vitality contours (cfr. 13.2.5). A quadratic-diegetic triadic stance is concerned with the relation between the audience, the performer and a succession of events which are re-presented by a narrative. Since instrumental music generally does not represent concrete elements – it has a free-floating intentionality – the diegetic factor in music relates to the modes of operation and the temporal development that are related to story-telling (Meelberg, 2006, pp. 39–40). In conclusion of his study on narrativity in contemporary music, Meelberg relates narrative analysis to articulating the ways human subjects may be able to comprehend unique phenomena such as a musical composition or improvisation, and to understand "the observer's urge to integrate the artwork's elements into a graspable whole"; moreover, he concludes that "the narrativization of contemporary music leads to a construction that is fabricated by the listener, and

not to the exposure of the true essence of the music (whatever that may be)” (Meelberg, 2006, 219). By suggesting a quadratic-diegetic stance the performer bridges the void between the idiosyncrasy of the musical work and the inbuilt urge of the listener to make and to experience stories; (s)he facilitates the grasp of unity by assuming the role of a story-teller – including the vitality-states that are attached to that role.

The role of the performer is complex in its relation to the composer, the composed work, the audience, and the sonic environment that (s)he is causing and simultaneously experiencing. The foci of performance proposed here only make sense in a context where a performer’s presence is considered to be the prime point of reference in a musical interaction with an audience (see also Fig. 13.3 and Fig. 13.4). A performer can embody, simultaneously cause and experience (do and undergo) a scripted sonic environment as a persona, as a storyteller, an actor, via dyadic regulation or via action-metaphor or is a co-listener to a composed environment and acts as a guide via joint attention or as a reactive observer. From an everyday interaction perspective, it is common to combine or to switch between these foci: in telling a story, for instance, personal feelings connected to the story will shine through while attention will be paid to the listener’s responses and certain elements of the story will be enacted gesturally. However, dogmatic points of view that foreground one option from this world of possibilities are not uncommon in musical discourse: “a performer is the servant of the score”, “a performer is a guide”, “the performer is an actor”, “the performer is an orator”. The foregoing approach in terms of foci of performance offers a framework in which these dogmatic positions can be countered and differentiated in a systematic way and where one can navigate and assess focal options in function of the concrete situation (score, audience, space) and the interactive affordances that it holds. All four categories equate to potentially plausible performative approaches. The foci of performance are thus not a tool for establishing a ‘best’ approach but, on the contrary, a means of underlining the multiplicity of foci that a performer’s performative role can take.

We can summarize that the four *foci of performance* allow a performer to reflect on how to combine or to navigate performative stances by focusing on: 1/ self-expression; 2/ the effect of the performance on the audience; 3/ the immanent elements of the composition; and 4/ the suggestion by diegesis and/or mimesis of environments that are not actually present in the performance space. Since these foci seldom appear in isolation it is appropriate to refer to them as *four focal elements of performance* that can be freely combined and analysed in function of captivating musical interaction.

As will be shown more concretely with Chopin’s *Mazurka* (see 13.5), these foci are no consequence-free intentionally imagined perspectives. A qualitative performative difference can be noticed between expressing one’s own feelings/moods (monadic), inducing them (dyadic), sharing them on

the basis of elements in the direct sonic environment (triadic), or (re)presenting them (quadratic); choosing one of these options has perceivable consequences on performative parameters such as micro-timing, articulation, dynamics, and tempo.

13.3.3 Music and vitality

IUs 3 to 5 (see 13.2.3-5) relate to the idea of music as the expression/presentation of affects, emotions, moods, and feelings⁴⁰⁶ and has potential repercussions on how to assess and analyse pieces of music. As stated before, musical analysis is a field of study that has concerned itself primarily with the musical score and with structural elements present within a composition. Such a score-oriented attitude can be traced back to the rise of empiricism in the 18th century (Weber, 1994) but also to a striving for musical autonomy in the middle of the 19th century. In *Vom musikalisch Schönen* (1854), the Viennese music critic Eduard Hanslick (1825-1904) claimed that music expresses musical ideas and that “*tönend bewegte Formen*” (Hanslick, 1854, p. 32) are the content of music and that the idea of music as describing and expressing emotions is a threat to music's autonomy.

Langer, Kivy and Stern position affect-related notions such as feeling, emotion, and mood back in the very centre of musical discourse. As a point of departure for their theories they revisit the musical insights that pre-date the formal turn in music and refer more in particular to the *Doctrine of the Affections* (German, *Affektenlehre*) which relates primarily to Baroque music and which holds that music should express idealized emotional states and have listeners feel these states. In *Der vollkommene Capellmeister* (1739) all-round musician and theorist Johann Mattheson (1681-1764) describes some 30 affects but concrete musical means to represent them are only suggested for a few. For instance, large intervals to represent joy, small intervals to represent sadness, ascending motion for pride but descending motion for humility, and disordered sequences of notes for despair (Bartel, 1997). During the baroque, composers generally sought to express only a single, idealized and universal affect *per* composition. In the course of the 18th century, however, the need to have personally experienced the affection is increasingly emphasized to the point that, at the dawn of *Empfindsamkeit* (English, sensitivity), experience rather than rational knowledge of the affection became a prime element in musical creation. During the latter half of the 18th century and instigated by musicians such as Johann Joachim Quantz (1697-1773) and Carl Philipp Emanuel Bach (1714-1788), the *Doctrine of the Affections* was eventually abandoned in favour of an *Empfindsame Stil* which implied the possibility and freedom to use whatever means fantasy and intuition may suggest

⁴⁰⁶ See 11.3.2.2 for the essential distinctions between the terms: ‘affect’ is used as a cluster-term; ‘emotion’ refers to a relatively brief episode of dispositional changes or action tendencies; ‘feelings’ are the subjective representation of emotions; ‘mood’ is of lower intensity than emotion but longer in duration; ‘temperament’ refers to particular inherent/inborn affective styles.

expressing subjective feelings in music. It is within this context that C.P.E. Bach formulates in his *Versuch über die wahre Art das Clavier zu spielen* (1753) a crucial insight in how the expression of feelings via a composition relates to the performer:

A musician cannot move others unless he himself is moved. Thus he must of necessity be able to immerse himself in all the affects he wishes to arouse in his listeners; he must communicate his feelings to them in such a way as best to move them to empathy. In languid and sorrowful passages he must appear languid and sorrowful. One must see and hear it in him. The reverse is true with passionate, cheerful, and other kinds of ideas, when he immerses himself in these affects. No sooner is a passion stilled than another is excited, and thus he passes constantly from one to another. This is especially the case in pieces that are highly expressive, be they conceived by the performer himself or by somebody else; in the latter, the performer must feel the same passion within himself that the author of the piece intended at its composition. [C.P.E. Bach, *Versuch*, Teil I, H3: 'Vom Vortrage', §13] (Bach, C.P.E., 1753, p. 123; Fubini, 1994, p. 294)

With this remark, C.P.E. Bach provides a link between the generic understandings with regard to musical expression (as indicated by Langer, Kivy and Stern, see 13.2.3-5), embodiment [IU6] and performative analysis: if music expresses affects (emotion, feelings, moods) and these affects need to be embodied by a performer, then they should also be amenable to performative analysis.

Linguist and semiotician Per Aage Brandt (Brandt, 2009, p. 35) plots the relations onto a musical context via a semiotic schema⁴⁰⁷ (see Fig. 13.4).

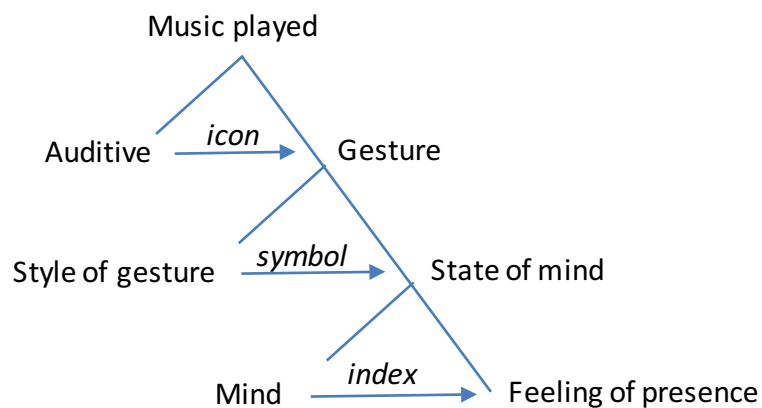


Figure 13.4. Semiotic relations in a musical context (Brandt, 2009, p. 35).

⁴⁰⁷ Brandt uses the semiotic terms icon, symbol and index to refer to the relation between sound, gesture, state of mind and feeling of presence. It is not necessary to elaborate on the specific semantics of the terms. It suffices to be aware that: 1/ 'icons' are signs that have a resemblance to their object (photos, painting); 2/ 'indices' always point, reference, or suggest something else (smoke is an index of fire); and 3/ a symbolic sign is assigned arbitrarily or is accepted as societal convention; therefore, the relationship between the symbol and its object need to be learned.

According to Brandt, in music, the rhythmic and melodic contours that can be heard suggest a body making analogue gestures. Here, the auditive form structurally resembles and signifies the bodily gesture, even if the movement is not actually shown, but only played and heard in musical sound. The idea of bodily gesturing in sound in turn signifies a person in a corresponding state of mind and emotive movement. Since this affective meaning related to a particular state of mind occurs at the very moment of hearing the music, it will ultimately yield to those who are sharing the musical experience a feeling of the presence of that musician. Ultimately, music communicates (embodied) states of mind (Juslin, 2013b, p. 1).

Stern's notion of 'vitality' (see 13.2.5) is one that is currently not embedded in musical discourse but comes close to the notion of 'states of mind' and, in our view, holds the potential to bypass the complex and differential semantics that are attached to emotion, affect, feeling and mood. As an element that can be intersubjectively shared, vitality strongly resonates with inspired action and the essential requirement of music as 'happening' without being specific on the content of what exactly is happening. As such, vitality refers to different states of mind as well in terms of its immanent structure as well as in the ways in which states of mind lead to behaviour. Moreover, and at least according to Langer, Kivy and Stern [see IUs 3 to 5 in this chapter], these states of vitality – be it in structure, gesture or contour – constitute the essence of musical meaning as the sharing of states and developments of vitality.

If 'vitality' is introduced to the attractor-framework presented in Chapter 11, we can further observe that, although affect and emotion are only explicitly present in two of the sub-attractors of 'interaction' ('affect regulation' and 'expression'), states of vitality are a necessary and grounding element in all sub-attractors. Mimesis and the use of action metaphor in music requires either a representation of the vital qualities present in a living organism or an event, or of the vital experience that is involved in undergoing, observing and exploring environments that are of a static nature. The same necessary implication applies to the elements of entrainment, joined attention and diegesis which are all activities that all involve a particular state of (embodied) mind or of vitality.

Relating these perspectives to an interest in developing a bio-culturally informed tool for performative analysis, based on the process of interaction, we can consider states of vitality as a pivotal and central entity. As already pointed out in 13.1, the field of analysis traditionally focuses on four objects of enquiry: 1/ the score as descriptive, prescriptive and expressive symbol of a sonic environment; 2/ the sound of music as physical entity that can be studied in terms of expressive microstructure; 3/ the listener's experience; and 4/ the movements, bodies and gestures of musicians that account for the visual aspect of performance. Extending Brandt's schema (Fig. 13.4) to composed music we can see how these elements relate to each other and can be analysed in terms of the score, the auditive signal,

the musical gestures and the listener's experience (see Fig.13.5). What is missing from this list is a systematic analytical interest in states of mind or states of vitality of the performer. Such an analytical perspective would open a new, alternative and phenomenology-oriented perspective.

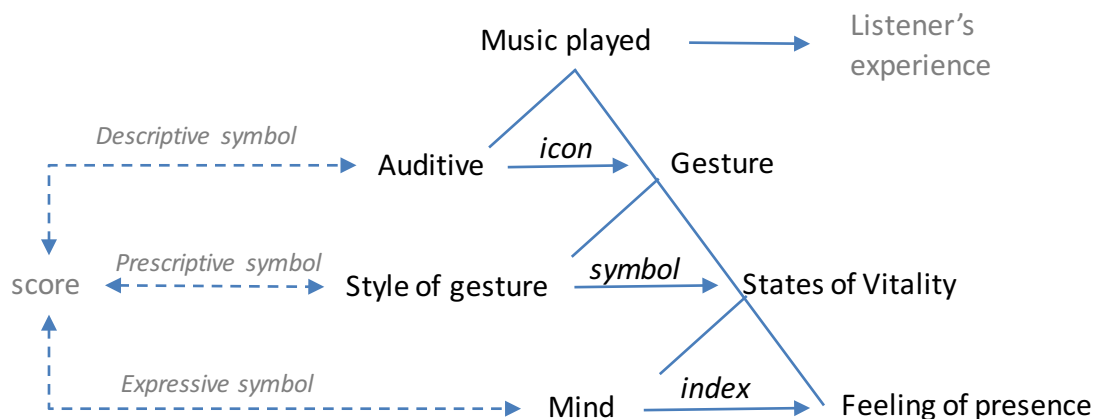


Figure 13.5. Elements of analysis: score, sound, gesture, listener's experience and states of vitality.

Educational psychologist Roland Persson has reported on performers' self-induction to altered states of awareness and how musicians very consciously manipulated recall of certain memories in order to 'get into the mood' (Persson, 2001, pp. 281–283). These induction strategies seem to be mostly developing intuitively as a result of emotion-evoking structures inherent in the music. Persson also notes that performance teachers never discuss such induction procedures during lessons, which makes it feasible to propose that mastering them is mainly a personal and intuitive matter.

Such an intuition-based state of affairs creates opportunities for further reflecting on the development of an experience-based, systematic and interaction-oriented tool for performative analysis.

13.3.4 A universe of bio-topics as units of analysis

The framework provided by topical analysis [IU 7] has two inherent limitations. Firstly, it is restricted to music of the 18th century and secondly, the topics that are being selected are intrinsically cultural: their origins are to be situated in other compositions. From the perspective of bio-culturally informed performative analysis the question arises if these cultural topics are amenable to be considered as particularisations of more fundamental and universal dispositions and if the model of analysis could serve as a template for what could be called a bio-topical analysis; an analysis that is not intended to locate cultural topics in a score, but rather *bio-topics* or units of a performer's experience and vitality while playing a piece.

A look at the characterising descriptions that are provided by Ratner (see Appendix 15) shows that each cultural topic is expressed by one or a combination of vitality states or contours: the topic of

minuet for instance is related to the vitality states ‘elegant’, ‘noble’, ‘charming’, ‘lively’; the topic of polonaise implies the qualities ‘serious’ and ‘deliberate’.

Performers do not necessarily need to rely C.P.E. Bach’s advice with regard to the embodiment of affect to realise that while playing a piece of music, the sound and micro-structures that are produced are anticipated by, and embedded in a dynamical flow of energies and vitalities. When this element is lacking, the performance will often be dull, non-stimulating and with only little interactional affordance.

During the academic year 2016-2017, a universe of frequently encountered bio-topics was assembled while playing and discussing a variety of repertoire with piano-students of the *Stedelijk Conservatorium Brugge* [Belgium]; the compositions include early stage pieces and more elaborate compositions from the canonical repertoire. In Fig. 13.6, these bio-topics are listed and in Fig. 13.7 they are topologically linked to the *six modes of interaction* present in the attractor-model (see 11.3.2.2).

The dialogue between hands-on experience and the theoretical reference-framework concerning the modes of interaction, turned out to be a source of inspiration in generating such *bio-topics*. Reflecting on bio-topical elements of diegesis from an abstract perspective, for instance, led to the top-down formulation of bio-topics such as ‘a sense of beginning’ and ‘a sense of ending’, states of vitality that would probably have stayed hidden in unconscious intuition without the systematic roadmap related to the six interactional modes.

In *Notes from the Pianist’s Bench*, Berman claims that “the performer’s creativity lies principally in the area of musical expression in finding the right feeling [...] the performer’s freedom should never be denied; rather, it must be defined” (Berman, 2000, p. 139). The framework of bio-topics does exactly what Berman proposes: it focuses in an analytical way on performative feeling and systemizes it via a universe of bio-topics and the six modes of interaction to which these embodied states of vitality can be related.

1. A sense of beginning
2. A sense of ending
3. A sense of closure
4. A sense of questioning
5. A sense of story-telling
6. A sense of time (flash back – flash forward)
7. A sense of pause
8. A sense of change
9. A sense of surprise
10. A sense of contrast
11. A sense of plot
12. A sense of becoming an organism, persona, event
13. A sense of being in a particular environment, landscape or habitat
14. A sense of season (summer, winter, spring, fall)
15. A sense of time of day (morning, noon, evening)
16. A sense of space (high, low, deep, close, far away)
17. A sense of harmony
18. A sense of light – dark – shadow
19. A sense of movement
20. A sense of flow
21. A sense of sudden stop
22. A sense of speed (fast, slow, accelerating, slowing down)
23. A sense of ascending/descending
24. A sense of fluttering
25. A sense of silence/quietness
26. A sense of singing
27. A sense of breathing
28. A sense of expanding
29. A sense of dialogue
30. A sense of floating
31. A sense of being open – closed
32. A sense of being big, small
33. A sense of power – weakness
34. A sense of fullness – emptiness
35. A sense of being static – dynamic
36. A sense of observing (environment, event, persona)
37. A sense of recognizing/remembering
38. A sense of listening
39. A sense of noticing ‘special moments’
40. A sense of being generous, happy, sad, lively, angry, tender
41. A sense of expectation, hope, ambition realisation, disappointment
42. A sense of elegance
43. A sense of simplicity
44. A sense of energy
45. A sense of excitement
46. A sense of feeling comfortable
47. A sense of insecurity
48. A sense of being cautious
49. A sense of vulnerability
50. A sense of freedom – constraint
51. A sense of tension
52. A sense of liberation
53. A sense of daydreaming
54. A sense of relief
55. A sense of walking, running
56. A sense of dancing
57. A sense of vitalizing
58. A sense of soothing
59. A sense of sharing
60. A sense of contouring
61. A sense of gesturing
62. A sense of suspension
63. A sense of asking for attention
64. A sense of varying
65. A sense of improvising
66. A sense of playfulness
67. A sense of virtuosity
68. A sense of solidarity (homophony, homorhythm, choral)
69. A sense of being capricious
70. A sense of meandering

Figure 13.6. The Universe of Bio-topic (a selection).

	<u>JOINT ATTENTION</u>	
	A sense of observing (environment, event, persona)	
<u>DIEGESIS</u>	A sense of recognizing/remembering	<u>MIMESIS</u>
A sense of beginning	A sense of listening	A sense of becoming an organism, persona, event
A sense of ending	A sense of noticing 'special moments'	A sense of being in a particular environment, landscape or habitat
A sense of closure		A sense of season (summer, winter, spring, fall)
A sense of questioning		A sense of time of day (morning, noon, evening)
A sense of speaking, narrating	<u>AFFECT REGULATION</u>	A sense of space (high, low, deep, close, far away)
A sense of pause	<u>and ATTUNEMENT</u>	A sense of harmony
A sense of time	A sense of vitalizing/waking up sb.	A sense of light – dark – shadow
A sense of change	A sense of soothing	A sense of movement
A sense of surprise	A sense of sharing	A sense of flow
A sense of contrast	A sense of contouring	A sense of sudden stop
A sense of plot	A sense of gesturing	A sense of speed (fast, slow, accelerating, slowing down)
	A sense of suspension	A sense of ascending/descending
<u>SELF-EXPRESSION</u>	A sense of asking for attention	A sense of fluttering
A sense of being generous, happy, sad, lively, angry, tender	A sense of varying	A sense of silence/quietness
A sense of expectation, hope, ambition, realisation, disappointment	A sense of improvising	A sense of singing
A sense of elegance	A sense of playfulness	A sense of breathing
A sense of simplicity	A sense of virtuosity	A sense of expanding
A sense of energy	A sense of solidarity	A sense of dialogue
A sense of excitement	(homophony, homorhythmy, choral)	A sense of floating
A sense of feeling comfortable	A sense of being capricious	A sense of being open – closed
A sense of insecurity	A sense of meandering	A sense of being big, small
A sense of being cautious		A sense of power – weakness
A sense of freedom – constraint	<u>ENTRAINMENT</u>	A sense of fullness – emptiness
A sense of tension	A sense of walking, running	A sense of being static – dynamic
A sense of liberation	A sense of dancing	
A sense of relief		

Figure 13.7. The Universe of Bio-topic plotted in terms of *the six modes of interaction*.

13.4 Reproduction: *Interactional* and *Bio-topical Performative Analysis*

The elements presented in Section 13.2 and discussed in Section 13.3 are summarized in terms of their impact in Fig. 13.8 and assembled within the attractor-framework of musical interaction (see Fig. 11.10) in Fig. 13.9.

IU	Domain	Key terms	Impact on performative analysis
1	<i>Cognitive science</i>	Three streams (gesture, grove, form), perceptual grouping	Systematic and three-part reduction of a complex phenomenon; perceptual grouping as an extra element to take into consideration.
2	<i>Literary criticism</i>	Four foci in literary analysis (author, audience, work, universe)	Systematic reduction + links with developmental processes of interaction.
3	<i>Philosophy of culture</i>	Art as the presentation of feeling	Foregrounding the relation between music and affect.
4	<i>Analytical philosophy</i>	Universal contours in perception, style-dependent conventions	Supportive of a bio-cultural approach.
5	<i>Psycho-analysis, developmental psychology</i>	Vitality-affects, -contours	Introducing the concept of vitality as an attractor in the context of musical meaning.
6	<i>Linguistics, philosophy</i>	Embodied semantics	Situating musical meaning in the context of the body (both, the performer's and listener's body).
7	<i>Musicology</i>	Cultural and style-specific musical topics	Classification and identification in analysis.

Figure 13.8 IUs impacting on practical understandings regarding interaction and performative analysis.

The first three columns of Fig. 13.9 contain *primary indicators of interaction* and allow, based on the characteristics of a composition, for an interactive analysis via an exploration of the immanent streams of interaction (three-stream hypothesis), the focal elements of performance (monadic, dyadic, triadic, quadrative) and the performative modes of interaction (self-expression, affect regulation & attunement, entrainment, joint attention, affective response, mimesis and diegesis). Column 4 refers to the musical means which are involved in musically mediating these primary indicators and column 5 lists ways by which a performer can control these means. The last column denotes a selection of *bio-topics* or *states of vitality* which are experienced by a performer in the act of performance and which are considered to be the basic elements of a communicative musicality.

The informal reproduction of the recontextualised information discussed above and summarized in Fig. 13.9 can be achieved by using terms such as vitality, entrainment and modes of interaction in a practical and didactic discourse, and create an awareness of the role and impact of bio-topics. Within

Primary indicators of interaction			Musical means of interaction	Performative control	States of vitality Bio-topics (a selection)
Three immanent streams of interaction	Four focal elements of performance	Performative Modes of interaction			
<u>Stream 1:</u> <i>Gestural</i> <i>Melodic</i> <u>Stream 2:</u> <i>'Groove'</i> <i>Meter</i> <i>Rhythm</i> <u>Stream 3:</u> <i>Form</i> <i>Architectonics</i>	Monadic <u>Performer</u>	Self-expression (feelings & moods)	<i>Contouring</i> <i>Gesturing</i> <i>Phrasing</i> <i>Action-metaphor</i> <i>Pulsing</i> <i>Mechanics of narration (rhetorics)</i> <i>Listening</i>	Timing Dynamics Articulation Tempo (Tuning) (Vibrato)	<i>A sense of beginning</i> <i>A sense of ending</i> <i>A sense of change</i> <i>A sense of surprise</i> <i>A sense of being surprised</i> <i>A sense of becoming</i> <i>A sense of singing</i> <i>A sense of being somewhere</i> <i>A sense of space</i> <i>A sense of movement</i> <i>A sense of phrasing</i> <i>A sense of flow</i> <i>A sense of arrest</i> <i>A sense of silence</i> <i>A sense of breathing</i> <i>A sense of expanding –contracting</i> <i>A sense of being static – dynamic</i> <i>A sense of recognizing</i> <i>A sense of listening</i> <i>A sense of noticing</i> <i>A sense of being generous, happy, sad, lively, angry, tender</i> <i>A sense of expectation</i> <i>A sense of realisation</i> <i>A sense of excitement</i> <i>A sense of freedom</i> <i>A sense of tension</i> <i>A sense of dancing</i> <i>A sense of sharing</i> <i>A sense of play</i>
		(Affect) regulation			
	Dyadic <u>Performer Audience</u>	(Affect) attunement			
		Entrainment			
		Joint Attention			
	Triadic <u>Performer Audience Work</u>	Affective response			
		Mimesis (presentation)			
	Quadratic <u>Performer Audience Work 'Universe'</u>	Diegesis (representation of a temporal development)			

Figure 13.9. Elements of musical interaction.

such an informal context, aphorisms such as 'the gestures and tones of music surf on states and waves of vitality' can be a leading motif in discussing and assessing musical performance.

However, the interactive framework also allows for a more systematic and formal analytical treatment. Here, the concept of an *Interactive* and *Bio-topical Performative Analysis* is presented as the bio-cultural penchant of 'topical analysis' as developed by Ratner in *Classic Music* (1980): it is concerned

with punctually identifying and assessing vitality-archetypes that present themselves in performing a piece of music. Since these bio-topics are not readily observable (as gestures and sounds are), this type of analysis can only be carried out by performers who are practicing or performing a particular composition.

Bio-topical performative analysis allows for various levels of complexity and systematization. At a basic level, it establishes an awareness of certain basic senses of vitality that are already informally present in most personal theories; these senses can be further extended by getting acquainted with the extended list of bio-topics in Fig. 13.6. The same multi-level approach applies to discussing the primary performance indicators of interaction (see Fig. 13.9 columns 1-3) which dialogue with the bio-topical analysis.

From a more formal systematic perspective, four phases are proposed to be included in an *Interactional and Bio-topical Performative Analysis*.

1. Assessing musical interaction via the three streams of musical interaction (gesture, groove, architecture).
2. Reflecting on the *foci of performance* (monadic, dyadic, triadic, quadratic) and assessing how they apply to a concrete context.
3. Further refining the *foci of performance* in terms of *modes of interaction* (expression, affect regulation & attunement, entrainment, joined attention & shared intentionality, mimesis, diegesis).
4. Reflecting on the bio-topics that could be attributed to particular instances and vitalise the sonic environment.

Taking these phases into account, the following approach to *Interactional and Bio-topical Performative Analysis* is proposed:

Interactional and Bio-topical Performative Analysis is concerned with identifying affordances for musical interaction and communicative musicality in a musical score, and with reflecting on the embodied states of vitality (bio-topics) of a performer that are involved in creating an experience affording sonic environment.

Definition 8: *Interactional and Bio-topical Performative Analysis*.

13.5 Case study: An *Interactional* and *Bio-topical Performative Analysis* of the Chopin *Mazurka* op.67 nr.4

As an illustration of how *Interactional* and *Bio-topical Performative Analysis* could look like in concrete circumstances, we now turn to Chopin's *Mazurka* op.67 nr.4 and adopt the analytical phases proposed in 13.4.⁴⁰⁸

13.5.1 *Interactional analysis – primary indicators*

13.5.1.1 The immanent streams of interaction: balancing the three streams

Pieces such as the *Mazurka*'s are prominent case studies to assess the operationalisation of a three-stream approach to music. The concern in performing pieces such as the *Mazurka* is mostly directed at finding a balance between the three streams, i.e. the element of metric entrainment, the melodic gestures and the overall development of the piece. The issue becomes more complicated when realizing that, according to the original dance style at least, there should be an accentuation of the weak beats. Taking into account that regular metre allows for a basic engagement and synchronicity with the music and that tempo stability is one of the crucial environmental invariants⁴⁰⁹, compromising these factors are elements that could potentially weaken interactive entrainment. If we add the factor *rubato*, which is closely connected to the gestural stream, then we have already two elements that could easily destabilise the performance; 'sacrificing' both the elements of easy and predictable engagement can potentially result in decreasing interactive quality.

Mastering the balance between these parameters is a daunting task that likely culminates in a stage of surrender and the exploration of alternative repertoire when a student has no 'innate' or otherwise acquired feeling for this particular genre. Of course, there is not one way of approaching a challenge, especially in instrumental didactics.⁴¹⁰ The framework of the immanent streams of interaction,

⁴⁰⁸ Selecting a Chopin *Mazurka* for this case study is related to: 1/ the prominence of mazurka's in the analytical literature (Cook, 2007; Ohriner, 2014); 2/ the brevity of the piece; and 3/ its value in introducing early-stage pianists to Chopin's work.

⁴⁰⁹ In Ecological Psychology the elements of a relatively permanent, yet ever-transforming environment, are called 'invariants' and two types are discerned: 1/ transformational invariants are those relational aspects of the information that specify the identity of a particular pattern of change. Whenever a pianist plays, (s)he produces a range of sounds (dynamically and qua pitch) that are distinguishable from sounds generated on other instruments; and 2/ structural invariants, on the other hand, are relational properties specific to the structure of the source object undergoing a particular style of change. The mechanical properties of a piano, or even the pianist's toucher, correspond to the invariant structural features of tone production on a piano. Within a musical context, tempo, can be considered both as a structural (one tempo) and transformational (*ritardando*, *ritenuto*) invariant.

⁴¹⁰ Another non-verbal and analogue approach to be recommended would certainly be the *Silent Piano Technique* as briefly indicated in Section 12.3.

however, can be a first reference in approaching and assessing a coded sonic environment and create awareness of the multi-layered presence of interactive components in this music.

13.5.1.2 Focal elements of performance and modes of interaction

A further element of an interactional analysis is to explore how the *Mazurka* allows for the adoption and integration of different *focal elements* and *modes of interaction*.

From a monadic point of view, the *Mazurka* could function as a *metaphor for a sense of self-possessed and personally felt freedom and enjoyment* expressed in the form of a miniature (the *Mazurka* is an elegant and rather short piece). Such a perspective could occasion an intimate and inward-looking rendition of the piece with a modest dynamic range, anticipatory micro-timing, subtle moments of change, and a rather uniform affective style and temperament⁴¹¹; however, the ‘forte’ that is indicated at the beginning of the Chopin manuscript dating from 1848 (Chopin 1953/2015, pp 152-153) is suggestive of a more passionate rendering with great emotions and large romantic gestures. Looking at concrete instances such as the opening of the piece, it can be inferred that a monadic stance will occasion an anticipated E, followed by a powerful placed bass note in the left hand and a stormy continuation in the right hand. A recording of the first 33 bars of the *Mazurka* in a monadic style in a rendition of the author can be seen at <https://vimeo.com/231298237> [Password: JoostPhD]. An example of a monadic approach is a recording by Dénes Várjon (92nd Street Y, 2009)⁴¹².

Adopting an effect-oriented, rhetorical and dyadic stance, the performer can prefer to open with a first note that grabs the attention of the listener⁴¹³ and comes as a surprise. In this scenario, the first left hand note is crucial for instigating a strong feel of entrainment and would therefore demonstrate an energetic ‘bounce’; the playful contours in the right hand will be used to hold attention and add emphases in a rhetorical way and the general descent that characterizes the contours in A1 will afford a soothing attunement. Elements of change, such as for instance in B1, can potentially be upgraded to a contrasting effect. A recording of the first 33 bars of the *Mazurka* in a dyadic, entrainment-oriented style in a rendition of the author can be viewed at <https://vimeo.com/231297883> [Password: JoostPhD]. An example of a dyadic approach is Rubenstein’s recording (ArRubMusic, 2009)⁴¹⁴.

⁴¹¹ “Affective style refers to relatively stable dispositions that bias an individual toward perceiving and responding to people and objects with a particular emotional quality, emotional dimension, or mood. Temperament refers to particular affective styles that are apparent early in life, and thus may be determined by genetic factors” (R. J. Davidson, Scherer, & Goldsmith, 2003, p. xiii).

⁴¹² <https://www.youtube.com/watch?v=AcxZRI6aews>.

⁴¹³ In the posthumous Fontana Edition (Chopin, 1953/2015, pp.150-151) an emphasis is added to the first note ‘<’.

⁴¹⁴ <https://www.youtube.com/watch?v=AcxZRI6aews>.

From a triadic perspective, the role of the performer is one of revealing and illuminating the composition as an autonomous environment that needs performative guidance. Such a stance will imply careful following the melodic contours and paying attention to ‘special’ moments and invariants. Such ‘special moments’ include elements such as the highest note [B26], the lowest note [B9], harmonic variants [B4], modulatory events [C1], and chromatic contouring [B14-15].

From a quadratic point of view, the *Mazurka* can be considered as a presentation of a succession of events (mimesis) or as a representation of those events (diegesis). In the case of a quadratic-mimetic perspective, the *Mazurka* is considered to be the presentation of a succession of events where it could be imagined that one or more scenes concern a *persona* (or another organism) who moves and behaves ‘Mazurka-like’ in a space. Such a viewpoint can emphasize the gestural contours that go along with the dancing and will consider the macro-structural changes as a change of scenery, involving another space and potentially other *personae*. Another possibility is to adopt a perspective in which the melodic contours refer to the structure of experience of a *persona* and that the macro-structural changes refer to changes in the state of mind; within such a context C1 could be related to a state of daydreaming for instance. the role of the performer is either to become that person (or to observe him/her) or organism and experience the vitality of movement and dancing or to take the stance of an observer who assesses and lives the state of mind of a *persona* empathically. In the latter case, the performance will be less vivid and evoke a more matured and distanced experience. A recording of the *Mazurka* in a quadratic-mimetic style in a rendition of the author can be consulted at <https://vimeo.com/231296869> [password: JoostPhD]. An example of a quadratic-mimetic approach is Evgeny Kissin’s recording of the piece (KEUDER, 2008)⁴¹⁵.

Such an imaginative quadratic-mimetic and observational perspective comes close to a quadratic-diegetic viewpoint which is likely to engender an even more detached representation and narrative stance. With adjoining support of the monadic, dyadic and triadic elements, the macro-structural elements of the environment now become the primary focus of attention as well as an underlying *sense of serene story-telling*. An observational stance implies reflection, inviting a less vivid rendition than a mimetic perspective. The opening of the piece will sound as an invitation to listen very much as “once upon a time...”, and the phrasing will be concerned with following the contours that are characteristic of telling a story (such as beginning and ending a phrase/story, breathing between phrases, pausing).

Arbitrating between or integrating performative stances and modes of interaction is not a matter of truth-finding but one of assessment, flexibility, of creating options and pragmatic affordances; it allows

⁴¹⁵ <https://www.youtube.com/watch?v=qgOzDDPIFjI>.

the performer to reflect on one's own experience and to go beyond first intuitions and performative habits by systematically exploring the affordances provided by the coded environment (the score) in a stimulating fashion.

One outcome of such deliberation – the most appealing one in the author's view – could be to adopt primarily a quadratic-mimetic approach where a *persona*, a dancer is presented and observed who expresses her/his joyous and elegant state of mind and the development of that vitality throughout the macro-structural entities, supported by the gestural and entraining characteristics of a Mazurka. Within such a quadratic-mimetic framework, monadic, dyadic and triadic elements can be called upon to support a more captivating interactional experience.

13.5.2 Assigning bio-topics

The assignment and consideration of bio-topics is the last phase of analysis and implies a reflection on the fundamental states of (embodied) mind that are required and precede the gestural and dynamic contours that are then further specified in terms of micro-timing, articulation, tempo and dynamics. Taking a quadratic-mimetic stance as a primary interactional focus, a suggestion for bio-topics in Chopin's *Mazurka* op.67 nr.4 is indicated in Fig. 13.10-11 and discursively commented on below.

- 'A sense of play', 'a sense of enjoyment' and 'a sense of freedom': the tempo indication *allegretto* which is usually defined as 'slightly less fast than *allegro*' (Randel, 2003) refers from a bio-topical point of view to the availability of time that makes one feel at ease and allows for elegant play. The sense of play which is implied in the tempo indication is also present in the type of contouring that Chopin chooses, the vivid use of thrills, 'the sense of variation and freedom' in A2, and the way in which entrainment develops from 'a sense of hypermeasured⁴¹⁶ and suspended dancing' into 'a sense of measured waltzing' in B1. As already mentioned, the sense of dance-induced entrainment is of a special kind, it combines cyclic entrainment with 'a sense of mazurkian suspension'.
- 'A sense of beginning', 'a sense of contouring', 'a sense of ending': in the right hand these bio-topics relate to the gestural behaviour of an imagined dancer (*persona*) and following the delicate contours of the melodic line, 'a sense of elegance' can be attributed to these gestures. The 'sense of ending' is varied in the *Mazurka*: the eight-bar phrases suggest inconclusive endings that elegantly pass over into the beginning of the next phrase; such a *modus operandi* fits well the 'sense of elegance' that marks the piece; even the last bar lacks 'a sense of conclusion' and keeps the joyful yet melancholic feeling in the air.
- 'A sense of change': the structural changes in the piece can be interpreted either of an experiential or environmental nature. In section B1 it is not so much a change of scenery but

⁴¹⁶ A 'hypermeasure' is a unit in which each regular measure is one beat of a larger meter; in this case, the meter of 3/4 can temporarily evolve into a 6/4 meter. The opposite phenomenon of 'hypomeasure' occurs when a beat with a meter evolves into a measure *an sich*; hypomeasure implies 'a sense of slowing down' and can be used in concluding a piece.

rather one of vitality, evolving from a descending line and 'a sense of play' into an ascending line and a 'a sense of cautiousness'. The 'sense of change' in C1 is more drastic; an important invariant, the key, is modified; this intuitively evokes a change of scenery (either in natural or in mental environment). Moreover, this particular section has not upbeat and very discrete metrical support. This passus may be experienced as a focal shift, a move from a quadratic-mimetic to a quadratic-diegetic perspective that does not present but rather represents a new dream-like situation.

- The sense of change in B21 is of a more subtle nature: the ascending line evolves into a harmoniously supported descending line and evokes 'a sense of comfort and relief'.
- 'A sense of height', 'a sense of depth': these loci imply elements of the triadic focus which is also inherent to the composition. They can be considered as 'special moments' and be implicitly shown by means of timing, anticipated articulation and dynamics.

Allegretto [Movement that allows for a sense of freedom and playfulness]

A1 [s.o. beginning] [s.o. demanding attention] [s.o. soothing descending line] [s.o. ending] [s.o. lowness] [s.o. contoured] [s.o. elegance] [s.o. play] [s.o. liberation] [s.o. meandering] [s.o. voluminous breathing] [s.o. shadow]

A2 [s.o. expansion and extension] [s.o. (hypermeasured) dancing] [s.o. suspension] [s.o. depth] [s.o. repetition, variation, caprice, recognition, freedom and comfort] [s.o. closure] [s.o. cautious breathing]

B1 [s.o. change] [s.o. cautiousness] [s.o. expectation] [s.o. change] [s.o. sweet relief, harmony, flow] [s.o. complexity] [s.o. (measured) dancing]

B2 [s.o. repetition] [s.o. height] [s.o. fluttering down like a leaf] [s.o. sudden stop] [s.o. depth]

C1 [s.o. closure] [s.o. breathing] [s.o. change] [s.o. simplicity] [s.o. cautious entrainment] [s.o. measured dancing]

Figure 13.10. Chopin *Mazurka* op. 67 nr.4, page 1⁴¹⁷.

⁴¹⁷ The score used for this example is based on an open-domain edition (Chopin, 1880) with corrections as indicated in the autograph from 1848 (Chopin, 2015, pp.152-153).

C2

38 [s.o. generosity & comfort]

45 [s.o. disappearance] [s.o. shared expectation] [s.o. resolution]

51 [a sense of recognizing, coming home]

60 *dolce*

68

76 [s.o. concluding]

Figure 13.8. Chopin Mazurka op. 67 nr.4, page 2.

13.6 Assessment

What we developed in this chapter is an analytical tool and a vocabulary both rooted in a model of interactional musicality and facilitating the communication and reflection on the interactional and performative possibilities that a musical script holds in relation to states of vitality (or bio-topics). The

framework of this analysis exemplifies how bio-cultural informed performership could work: it starts from an *Image* – a reservoir of personal theories and proto-typical intuitions – allowing a process wherein extra-disciplinary information impacts on that *Image* and then pragmatically and creatively ‘jumps together’ to come to an informed and more systematic understanding.

Relating personal experience to an informed and systemic framework forms a dialogical win-win situation: from the conceptual framework – which in this case includes interactional streams, various focal elements of performance and modes of interaction and musical devices – environment-related bio-topics can be generated that are informative to intuition-based performance and *vice versa*; from playing the music new insights can be inferred with regard to a systematic integration of a universe of interactional and bio-topical possibilities.

Because *Interactional* and *Bio-topical Performative Analysis* is informed by a multi-layered range of information units and is embedded in a broader bio-culturally framework, it allows for further expansion and critical review of its tenets. Rather than an opinion or dogma, it is an assembled structure of recontextualized information to be shared and discussed among musicians in order to come to intra-practical and transdisciplinary dialogue and creativity.

From a functional point of view, being able to discursively communicate about and reflect on a shared intentional object (a coded or sonic environment) by means of a systematic framework, offers opportunities both for aspirant performers and professionals.

For musicians in the early stages of their formation, *Interactional* and *Bio-topical Performative Analysis* can open doors towards a differentiated, experience-based understanding of repertoire and the performative possibilities that they afford. In addition to deep learning, *Interactional* and *Bio-topical Performative Analysis* allows for the development of a repertoire of differentiated interactional instruments and vitalities. Rather than seeing instrumental didactics focus on developing in a step-wise manner a sequence of technical aspects, a bio-topical perspective can offer new didactical possibilities in making pianists, in the early stages of their engagement with the instrument, aware of primary bio-topics such as ‘a sense of beginning’, ‘a sense of ending’, ‘a sense of enjoying’, ‘a sense of recognizing’ (in early ABA-forms) and gradually and comparatively exploring the more extended universe of bio-topics.

The complexity, ambiguity and nuanced way in which bio-topics develop in notated music can be considered in a more generic sense as a laboratory for human development and experience, and could well be the location where the treasure and value of Western Art Music in education and society is to be situated.

For the professional, bio-topical analysis presents an opportunity to extend and better understand one’s personal repertoire of expressive and interactional tools. Comparing it to the technical baggage that can be attributed as a signature to professional musicians, performers are able to develop their

own signature repertoire from the reservoir of bio-topics. In such a context, the pool of bio-topics is a dynamic instrument that continuously assesses new repertorial applications.

General conclusion and future directions

This dissertation is an attempt to carefully and systematically evaluate the state of musicianship in an age of informative abundance and connectedness, to consider ways of re-balancing its epistemic grounds and attuning its information systems, with a view to artistic development, enrichment and/or liberation, and to put these contextual re-arrangements to the test in practical situations. The chapters and case-studies included in this dissertation report on travelling through extra-disciplinary terrains of knowledge production via the vehicle of information, and on coming back to the homestead of artistic practice. Voyaging in these environments brought about challenges, unexpected encounters, and tentative, pragmatic solutions that are the intended contributions to knowledge and understanding summarized, discussed and commented on in four PARTS and thirteen chapters. The most prominent contributory elements are:

- The development of a bio-culturally informed, discipline-specific understanding of *information* in the context of imagination- and freedom-oriented fields of human action, such as artistic practice, by considering information not as a determining factor of the *status quo* but rather as a difference that (potentially) makes a difference with regard to our personal and collective *Image* related to art production and reception, and the actions and imaginations that build upon that Image (see Chapters 2, 3 & 4).
- Defining a mental space to the notion of an *informed performer* by linking it to an active, prospective, and systematic interest in information that originates from extra-disciplinary fields of enquiry (see Chapter 5).
- Situating an informed performership within the contexts of an Information Age, the European Higher Education Area and of the framework of Artistic Research, and valuing the opportunities that these environments hold with regard to: 1/ the exchange of knowledge via information; 2/ an informed participation in socio-cultural debates; 3/ the historical integration of a theoretical, practical, productive track in musical practice; and 4/ the development of a dedicated research space for Artistic Information Researchers within the context of Artistic Research (see Chapters 6,7 & 8).
- Challenging the dualism between practice and theory by interposing *personal theory* and a *reservoir of personal theories* as an experienced-based and processual mediator (see Chapter 9).
- Proposing the notion of a *Performers' Practice* as an interconnected array of doings, sayings and (proto-)theoretical understandings and as a performer-centred alternative to the established notion of *Performance Practices* (see Chapter 9).
- Introducing a bio-cultural understanding of music as a common ground between musical practice and *academia* and defining the concept of a *Bio-Culturally informed Performers' Practice* [BCiPP] as an interconnected array of activities and understandings within the broader category of score-based performership that is underpinned by a shared and active interest in information on generics and particulars in musical experience, action and interaction (see Chapter 10).

- The construction of a topical attractor-model that acts as an information system mediating between a performer and the information galaxy, and that attracts and connects information via a set of boundary objects considered to be primary magnets in a galaxy of information (see Chapter 11).
- Proposing a bio-culturally informed instrumental technique with regard to the basic stroke in piano-playing [*quadrant technique*] (see Chapter 12).
- Introducing the concept of an *Interactional* and *Bio-topical Performative Analysis* as an experience- and interaction-based tool to vitalise score-based performances (see Chapter 13).

Combined, these contributions provide an answer to the ‘what’, ‘why now’, and ‘how’-questions that we set out to explore at the beginning of our inquiry, and they create a mental, contextual and practical space for an informed performership in the 21st Century; a performership that is firmly grounded in practice but is able to cross the disciplinary borders in a systematic and dialogical way via an activity-based and process-oriented concept of information as disembodied knowledge.

It was a well-considered option to focus on meta-practical considerations in terms of concept, facilitating contexts, and practical bottlenecks, rather than a bottom-up approach based on practical examples. Although in our age, information is readily available via numerous channels, the day to day reality in musical practice – as manifested in curricula, bachelor- and master-theses – demonstrates that the cooperation between practical knowledge and information generated by extra-disciplinary domains is a hard nut to crack. There are ideological and practical points of resistance and individual efforts and examples struggle to occasion an epistemic shift in this domain. Based on educational experience and conversations with colleagues, it can be asserted that there is no lack of eagerness and interest amongst musicians in wishing to develop their artistic identities and abilities in the direction of acquiring new knowledge and being able to situate their own activities within a broader epistemic framework. However, specific challenges such as the complex conceptual vocabulary that characterizes scholarly texts, the lack of immediate connections with practice, the scarcity of time, and a limited epistemic background, are often a hindrance to fruitful integration.

It is this state of affairs that led to the need for digging beneath the surface of daily practice and, by acknowledging the importance of conceptual and contextual thinking as an intricate part of musical practice, for aiming at a better understanding of the roots of these resistances and at a reconstruction of the basic building blocks into a positive project. A meta-practical approach allowed for the creation of a space in which to reflect on what informed performership is, what it can be, and how it relates to human nature, culture and society. The importance and impact of meta-practical considerations in locating the practitioner within its dominant meanings (Usher, Bryant & Johnston, 2003, p. 390) justifies – in our view – an active and informed participation of practitioners in reflecting on and

constructing such meta-practical frameworks rather than relying on the work and insights of policy-makers and 'art-observers' for guidance in these matters (see Chapter 6 on the corollaries of the Information Age in terms of scientification and the informed participation in socio-cultural debates). Indeed, the main claim that surfaces from this investigation is that – *contra* the opinion of influential scholars and thinkers such as Kivy, Weizsäcker, and Benjamin – a constructive interaction between imagination, freedom, personal knowledge and a wider world of enquiry is possible via the notion of information as disembodied and freely available knowledge; moreover, from such perspective, more specific sub-frameworks and instruments can be conceived that are of assistance in travelling through an information galaxy.

Throughout the dissertation, the method that has been adopted to come to such an operational understanding of an informed performership relates in a performative way to the concept itself. Rather than devising conceptual solutions and insights *ex nihilo* or primarily based on personal experience, an exploration of extra-disciplinary units of information has been taken as the basis for further consilient contextualization and operationalisation in the field of score-based performance. This course of action which embeds score-based performance in a larger framework of enquiry and understanding is presented as a 21st century epistemic alternative and complement to experience-, intuition-, master-, tradition-, genius-, or inspiration-based opinion formation, and aims at maximizing the benefits of living in an Information Age.

From a more generic perspective, the way of approaching (research-)questions as proposed in the concept of the informed performer, can be labelled as an *Informed Pluralistic and Creative Pragmatism* [IPCP] and can, in our view, also be adopted in other contexts than a musical one.

Within the framework of IPCP, the method involved in addressing opportunities and challenges in a particular domain of interest follows four successive stages. Firstly, a perspective on a particular state of affairs is obtained by collecting the opinions and personal theories of the members and stakeholders that constitute that domain (a reservoir of *Images*). Secondly, information is located and collected in relation to the issue of concern. In an ideal scenario, the information represents both cultural and biological perspectives: cultural information provides an orientation on how these questions have been approached throughout history and how they are currently addressed in other domains; biological information relates to insights with regard to evolutionary and biology ingrained limitations, tendencies and pre-dispositions. In a third phase, the assembled information is presented to the stakeholders of a field as a basis for a pluralistic conversation and discussion over these units of information (pluralism and relativism). Since information is always incomplete and does not have an absolute and determining character, an assessment will be needed to come to a pragmatic and creative (consilient) decision or strategy, one that seems to be most plausible or promising in the given

circumstances and future projections, but is at the same time fallible and open to revision when feedback becomes available. The incorporation of a liability of error in decision-making and strategy-development is an essential component of avoiding ego-led persistence in continuing a certain agreed upon strategy. With fallibility as an inherent part of the decision, an intelligent assessment of the consequences of the decision is already implied in that decision and within the framework of IPCP, error rather than a failure is an opportunity for reviewing the information units, the pluralistic perspective, and the pragmatic assessment.

As a generic spin-off from our considerations with regard to the informed performer, IPCP is proposed as a consensus model and a middle-ground searching alternative to punctual information critiques such as the ones discussed in Chapter 1 and also more generically formulated by philosopher and publicist Coen Simon in (as translated from the Dutch publication) *And then we knew everything: a plea for superficiality* (Simon, 2013). Simon advocates a common-sense approach with regard to the questions of our time instead of infinitely trusting in scientific knowledge and rationality. Such an attitude, according to Simon, implies returning to the surface of things, to stories and our own situated understandings. IPCP addresses these concerns by limiting the reach of information to being a pivotal instrument in human action and by including in the *modus operandi* a dialectal relation between realism and relativism, and more in particular between practical and personal understandings, scientific insights, cultural knowledge and personal perspectives.

Throughout the thirteen chapters of this dissertation, an extensive amount of professional jargon and context is used as well as created. The *modus operandi* connected to IPCP and BCiPP has indeed a tendency to become hyper-extensive, especially when both cultural and biological sources are in play, as is for instance the case in PART I. It is clear that such a wide-ranging enquiry does not comply with the energy, attentional and time-resources that a practising musician has available to explore the information space. Therefore, a distinction and a complementarity has been proposed between an *Informed Performer* and an *Artistic Information Researcher* in Chapter 8. “To achieve creativity in an existing domain, there must be surplus attention available” (Csikszentmihalyi, 1996, p.8); it is argued that this surplus can be created by assigning a dedicated place to systematic and mediating information gathering and processing in the realm of Artistic Research. Such a development would be the best guarantee to address the informational opportunities and challenges of musicking and score-based performance in the 21st century with care, breadth and depth. In Chapters 12 and 13 examples were given of how such a performer-tailored informed musicianship could work out in a practical setting, given that the performer has an adequate information system and reference framework at her/his disposal.

This last requirement brings us to future developments and the reproduction of BCiPP in performance curricula. Already in PART I of the dissertation, the conclusion was drawn that an informed performership can not function without a background and reference framework (an *Image*) against which new information is assessed. Moreover, this requirement does not present itself exclusively in the context of the (archetypical) informed performer; an artistic trajectory seldom limits itself to a look inward by means of creating an idiosyncratic reflective discourse or a materialized language implicitly present in an artwork or artistic activity. Be it in a phase of inspiration, argumentation or justification, at a certain point and in varying degrees of weight, the artist will be confronted with theories, findings, terms and concepts that acquired meaning within another disciplinary context and that are encircled by a certain context of discovery, critique, justification, interpretation and application which is related to the methods and objectives of certain other research disciplines.

Acquiring a reference framework that allows for selecting, assessing and recontextualising information on a personal basis, requires many years of immersion and exploration in a vast field of knowledge production. Although such a trajectory is to a certain extent inevitable and holds opportunities vis-à-vis the development of an artistic identity, such process can benefit from reproduction of the basic orientations in the framework of a performance-curriculum.

At the doctoral level, and more in particular within the context of the docARTES-curriculum⁴¹⁸, such a module has been developed under the label ‘crossing borders: extra-disciplinary explorations’. The module is directed at stimulating a musician’s dialogue with extra-disciplinary fields, both on a disciplinary and topical basis, and has been a laboratory for inter- and transdisciplinary exchange since its inception in 2015.⁴¹⁹ The ‘crossing borders’-module offers first-year docARTES-students an outward look into fields of knowledge that orbit their artistic nests with a view to acquire a critical apparatus and an epistemic compass along the way. The overall structure of the module is one in which during each of the sessions, a disciplinary field (or a cluster of fields)⁴²⁰ is presented by an invited speaker (or the chair of the session) who points out the main objects of study within that field (the questions, interests, goals and challenges) and the methods that are (or have been) used within that same discipline to approach these interests. Following the presentation of such an introductory, disciplinary map, in each session sub-disciplinary regions are indicated and discussed that may be of interest to musicians. A topical exploration of and a discussion on boundary objects is a final element of a crossing borders meeting and relates to locating and discussing notions of shared interest such as imagination, improvisation, listening, action, interaction. These sessions have been very stimulating for the past

⁴¹⁸ <http://www.docartes.be/en>.

⁴¹⁹ It has been a privilege to the author to have been appointed as chair and invited speaker for these sessions since 2015.

⁴²⁰ Musicology and its subdisciplines, philosophy, psychology, sociology/cultural studies, The ‘hard’ sciences: biology/physics/(technology), the other arts.

three years, with dedicated and valuable contributions and feedback by students, staff and invited speakers, and substantiated the case and need for a look outward in art practice.

The crossing-borders-approach, which combines punctual contextual information with regard to disciplinary *mores*, with the exploration of common ground via boundary topics, is a *modus operandi* that could be adapted to suit the needs of students at other levels of education (bachelor, master). In recent years, the conservatoire-curriculum has already initiated a turn outward by including electives and curriculum modules on selected disciplines such as sociology, philosophy, psychology, anatomy. However, the *crossing borders* formula where disciplinary insights serve as an introduction to boundary topics, offers the opportunity to transcend disciplinary limitations, to widen the epistemic horizon while holding on to a groundedness in artistic practice. The development of such level-oriented and -graded course is a research spin-off that would certainly meet at least some of the epistemic needs and questions of a 21st century musician.

In all of this, it is essential to realize that the general context in which a bio-culturally informed performership operates is one of an extendable openness, personal orientation and flexibility and fallible pragmatism. These characteristics relate to the sense in which the information as well as the proposed solutions have a pragmatic value, rather than a determining and truth-related one, and are inherently open to critique, extension and reconfiguration. From this perspective, the fundamentals of an informed performership that have been proposed also set an agenda for future developments other than curricular ones.

Some elements in the foregoing research report have been explicitly labelled as 'proto-typical'. The topical attractor model presented in Chapter 11 pertains to that category and is an environment that will benefit from extra fine-tuning via a process of collegial feedback, more information units, and advancing insights in extra-disciplinary terrains. Closely linked to the attractor model is the database which has been the result of a decennium of personal information hunting. The catalogue is currently semi-structured and contains over 7000 items. One of the intended future directions of the investigative path related to BCiPP is to extend the structural components into a digital, transpersonal format publically accessible for contributions by interested parties. Such an information-oriented repository of seminal publications and directions in knowledge-development will facilitate the work of new generations of Artistic Researchers and informavorous performers.

Next to the attractor model and the data-base, the open structure of both the *Quadrant-technique* (Chapter 12) and the framework of *Interactional* and *Bio-topical Performative Analysis* (Chapter 13) constitute an inherent and explicit invitation to further reflect on the development of tools that systemize and extend the state of art in the domains of performative experience and (inter)action.

Building and developing a conceptual space such as BCiPP is not unlike nurturing a child. Although a concept often has a name attributed to it very early in life, initially it is fragile and quasi-defenceless, it needs to be nourished and requires protection from detrimental influences. However, once the concept acquires a more mature status, it should break free from the dyadic conversation with its developer(s) and be introduced in society to run free and develop, all in open dialogue with further critical stimulation by other people than its primary caregiver(s). It is hoped that for the conceptual and practical space that has been attributed to a *Bio-Culturally informed Performers' Practice*, a productive and creative future lie ahead; that it instigate new approaches to performance, education, didactics, enquiry and epistemic orientation and that it contribute to facing the challenges of musicianship in the years to come.

References

- 92nd Street Y. (2009). Dénes Várjon performs Chopin: Mazurka in A minor, Op.67, No.4. Retrieved from <https://www.youtube.com/watch?v=h98IzN6aUfk>
- Aarts, H., & Dijksterhuis, A. (2000). Habits as knowledge structures: Automaticity in goal-directed behavior. *Journal of Personality and Social Psychology*, 78(1), 53–63.
- Abbate, C. (2004). Music—Drastic or Gnostic? *Critical Inquiry*, 30(3), 505–536.
- Abrams, M. H. (1953). *The mirror and the lamp: romantic theory and the critical tradition*. London.
- Ackoff, R. L. (1989). from Data to Wisdom, presidential address to ISGSR, June 1988. *Journal of Applied Systems Analysis*, 16, 3–9.
- Adams, J. A. (1971). A closed-loop theory of motor learning. *Journal of Motor Behavior*, 3(2), 111–149.
- Adorno, T. W. (2006). *Philosophy of new music*. (R. Hullot-Kentor, Trans.). Minneapolis: University of Minnesota Press (Philosophie der neuen Musik, 1949).
- Adriaans, P. (2013). information. In E. Zalta N. (Ed.), *The Stanford Encyclopedia of Philosophy*. Retrieved from <http://plato.stanford.edu/archives/fall2013/entries/information/>
- AEC/Polifonia Third Cycle Working Group. (2007). *Guide to third cycle studies in higher music education*. Utrecht, The Netherlands: Association Européenne des Conservatoires, Académies de Musique et Musikhochschulen (AEC).
- Agawu, V. K. (2009). *Music as discourse: semiotic adventures in romantic music*. New York: Oxford University Press.
- Agsteribbe, F., & Dejang, P. (Eds.). (1999). *Theory into practice: composition, performance and the listening experience*. Leuven, Belgium: Leuven University Press.
- Ajzen, I. (1985). From Intentions to Actions: A Theory of Planned Behavior. In J. Kuhl & J. Beckmann (Eds.), *Action control: from cognition to behavior*, pp. 11–39. Berlin: Springer.
- Ajzen, I. (2005). *Attitudes, personality and behavior* (2. ed., reprint). Maidenhead: Open Univ. Press.
- Allahyari, M., & Kochut, K. (2015). Automatic Topic Labelling Using Ontology-Based Topic Models, *Proceedings of the 2015 IEEE 14th International Conference on Machine Learning and Applications (ICMLA)*, pp. 259–264.
- Allahyari, M., & Kochut, K. (2009). OntoLDA: An Ontology-based Topic Model for Automatic Topic Labeling. IOS Press.
- Altenmüller, E., Ioannou, C. I., & Lee, A. (2015). Apollo's curse: neurological causes of motor impairments in musicians. In *Progress in Brain Research* (Vol. 217, pp. 89–106). Elsevier.
- Anderson, C. A., Lepper, M. R., & Ross, L. (1980). Perseverance of social theories: The role of explanation in the persistence of discredited information. *Journal of Personality and Social Psychology*, 39(6), 1037–1049.
- Anderson, D. K. (1972). Musicians. *Current Musicology*, 0(14), 84.
- Archambault, A., & Venet, M. (2007). Le développement de l'imagination selon Piaget et Vygotsky: d'un acte spontané à une activité consciente. *Revue des sciences de l'éducation*, 33(1), 5–24.
- Argyris, C., & Schön, D. A. (1974). *Theory in practice: increasing professional effectiveness*. San Francisco: Jossey-Bass Publishers.
- Aristotle. (1882). *Peri psyches. Aristotle's psychology, in Greek and English, with introduction and notes by Edwin Wallace*. (E. Wallace, Trans.). Cambridge: Cambridge University Press.

- Aristotle. (1912). *The works of Aristotle*. (J. A. Smith & W. D. Ross, Eds., A. S. L. Farquharson, Trans.). Oxford: At the Clarendon Press.
- Aristotle. (1915). *Magna moralia ; Ethica eudemia ; De virtutibus et vitiis*. (W. D. Ross, Trans.). Oxford: Clarendon Press.
- Aristotle. (1924). *Metaphysics*. (W. D. Ross, Trans.). Oxford: Clarendon Press.
- Aristotle. (2006). *Metaphysics*. (W. D. Ross, Trans.). Stilwell, KS: Digireads.com.
- Aristotle. (2013). *Over de ziel* (B. Schomakers, Trans.). Zoetermeer; [Kalmthout]: Klement; Pelckmans.
- Aristotle. (2012). *De Anima, On the Soul*. (M. Shiffman, Trans.). Newburyport: Focus Publishing/R. Pullins Co.
- ArRubMusic. (2009). Arthur Rubinstein - Chopin Mazurka, Op. 67 No. 4. Retrieved from <https://www.youtube.com/watch?v=AcxZRI6aews>
- Arx, V. A. von. (2014). *Piano lessons with Claudio Arrau: a guide to his philosophy and techniques*. New York: Oxford University Press.
- Ashley, D. (1993). *Music beyond sound: Maria Curcio, a teacher of great pianists*. New York: P. Lang.
- Association of College and Research Libraries [ACRL]. (1989). *Presidential Committee on Information Literacy: Final Report*. Retrieved from <http://www.ala.org/acrl/publications/whitepapers/presidential>
- Atkinson, T., & Claxton, G. (Eds.). (2000). *The intuitive practitioner: on the value of not always knowing what one is doing*. Buckingham [England]; Philadelphia: Open University Press.
- Audi, R. (1999). *The Cambridge dictionary of philosophy*. Cambridge; New York: Cambridge University Press.
- Augustinus of Hippo. (1955). *Confessions*. (A. C. Outler, Ed. & Trans.). Retrieved from [https://en.wikisource.org/wiki/The_Confessions_of_Saint_Augustine_\(Outler\)](https://en.wikisource.org/wiki/The_Confessions_of_Saint_Augustine_(Outler)).
- Aune, T. K., Pedersen, A. V., & Ingvaldsen, R. P. (2008). Dominant Paradigms in Motor Behavior Research: The Motor-Action Controversy Revisited. *Perceptual and Motor Skills*, 106(2), 573–578.
- Austin, J. L. (1970). *Philosophical Papers*. (J. O. Urmson & G. J. Warnock, Eds.) (2. ed.). Oxford: Clarendon Press. (Original work published 1961)
- Bach, C. P. E. (1753). *Versuch über die wahre Art das Clavier zu spielen*. Berlin: Königl. Hof-Buchdrucker Christian Friedrich Henning.
- Bacon, F. (1863). *Of the Proficiency and Advancement of Learning, Divine and Human*. (T. Markby, Ed.) (4th edition). London: Parker, Son and Bourn, West Strand. (Original work published 1605)
- Bacon, F. (1989). *New Atlantis and the Great Instauration*. (J. Weinberger, Ed.) (Rev. ed). Arlington Heights, Ill: Crofts Classics. (Original work published 1620)
- Bacon, F. (2000). *The new organon*. (L. Jardine & M. Silverthorne, Eds.). Cambridge [U.K.]; New York: Cambridge University Press. (Original work published 1620)
- Bal, M.G. (1990). The point of narratology. *Poetics Today*, 11(4), 727-753.
- Bal, M. (1997). *Narratology: introduction to the theory of narrative* (2nd ed). Toronto; Buffalo: University of Toronto Press. (Original work published 1985)
- Banham, G. (2005). *Kant's Transcendental Imagination*. Basingstoke: Palgrave Macmillan.
- Bargh, J. A., & Morsella, E. (2008). The Unconscious Mind. *Perspectives on Psychological Science*, 3(1), 73–79.

- Baron-Cohen. (2006). The biology of the imagination: how the brain can both play with truth and survive a predator? In R. H. Wells & J. McFadden (Eds.), *Human nature: fact and fiction* (pp. 103–110). London; New York: Continuum International Pub. Group.
- Bartel, D. (1997). *Musica poetica: musical-rhetorical figures in German Baroque music*. Lincoln: University of Nebraska Press.
- Barth, J. R. (2005). imagination. In M. C. Horowitz (Ed.), *New dictionary of the history of ideas* (pp. 1102–1107). Farmington Hills: Thomson Gale.
- Bates, M. J. (1989). The design of browsing and berrypicking techniques for the online search interface. *Online Review*, 13(5), 407–424.
- Bates, M. J. (2010a). information. In M. J. Bates & M. N. Maack (Eds.), *Encyclopedia of library and information sciences* (3rd ed, Vol. 3, pp. 2347–2360). Boca Raton, FL: CRC Press.
- Bates, M. J. (2010b). information behavior. In M. J. Bates & M. N. Maack (Eds.), *Encyclopedia of library and information sciences* (3rd ed, Vol. 3, pp. 2381–2391). Boca Raton, FL: CRC Press.
- Bateson, G. (1987). *Steps to an ecology of mind: collected essays in anthropology, psychiatry, evolution, and epistemology*. Northvale, N.J: Aronson.
- Baumeister, R. F., & Vohs, K. D. (Eds.). (2007). *Encyclopedia of social psychology*. Thousand Oaks, Calif: Sage Publications.
- Beelaert, S., Dejana, P., & Snyers, K. (Eds.). (2007). *Towards tonality: aspects of Baroque music theory*. Leuven: Leuven University Press.
- Behnke, R. S. (2012). *Kinetic anatomy* (3rd ed). Champaign, IL: Human Kinetics.
- Beilock, S. L., & Carr, T. H. (2001). On the fragility of skilled performance: What governs choking under pressure? *Journal of Experimental Psychology: General*, 130(4), 701–725.
- Belkin, N. J. (1984). Cognitive models and information transfer. *Social Science Information Studies*, 4(2–3), 111–129.
- Belkin, N. J., & Robertson, S. E. (1976). Information science and the phenomenon of information. *Journal of the American Society for Information Science*, 27(4), 197–204.
- Bell, D. (1973). *The Coming of Post-industrial Society; a venture in social forecasting*. New York: Basic Books.
- Belsey, C. (2006). Biology and imagination: the role of culture. In R. H. Wells & J. McFadden (Eds.), *Human nature: fact and fiction* (pp. 111–127). London ; New York: Continuum International Pub. Group.
- Bendegem, J. P. van. (2009). *Hamlet en entropie: de twee culturen, een halve eeuw later: een pamflettair essay*. Brussel: VUBPress.
- Beniger, J. R. (1986). *The Control Revolution: technological and economic origins of the Information Society* (5. print). Cambridge, Mass.: Harvard Univ. Press.
- Benjamin, W. (2003). *Das Kunstwerk im Zeitalter seiner technischen Reproduzierbarkeit: drei Studien zur Kunstsoziologie* (Sonderausg). Frankfurt a.M: Suhrkamp. (Original work published 1935)
- Benjamin, W. (2007). The storyteller. In H. Arendt (Ed.), H. Zohn, (Trans.), *Illuminations* (pp. 83–110). New York: Schocken Books. (Original work published 1937)
- Benzon, W. L. (1993). Stages in the evolution of music. *Journal of Social and Evolutionary Systems*, 16(3), 273–296.
- Benzon, W. L. (2008). *Beethoven's anvil: music in mind and culture*. Oxford: Oxford University Press.
- Benzon, W. L., & Hays, D. G. (2006). The Evolution of Cognition. *Substance Use & Misuse*, 41(14), 1837–1860.

- Bergé, P., D'Hoe, J., Caplin, W. E., & Beethoven, L. van (Eds.). (2012). *Beethoven's Tempest Sonata (first movement): five annotated analyses for performers and scholars*. Leuven: Peeters.
- Berger, K. (2000). *A theory of art*. New York: Oxford University Press.
- Berlin, I. (1980a). *Against the current: essays in the history of ideas*. New York: Viking Press.
- Berlin, I. (1980b). The Divorce between the Sciences and the Humanities. In *Against the current: essays in the history of ideas* (pp. 80–110). New York: Viking Press.
- Berlin, I. (1997). The Hedgehog and the Fox: *an essay on Tolstoy's view of history*. In H. Hardy & R. Hausheer (Eds.), *the proper study of mankind* (pp. 436–488). New York: Farrar, Straus and Giroux. (Work originally published 1953)
- Berliner Philharmoniker. (2009). *Schumann: Piano Concerto / Uchida · Rattle · Berliner Philharmoniker*. Retrieved from <https://www.youtube.com/watch?v=TOKcktmk5o>
- Berman, B. (2000). *Notes from the pianist's bench*. New Haven; London: Yale University Press.
- Bernard, C. (1865). Introduction à l'étude de la médecine expérimentale. Retrieved from http://classiques.uqac.ca/classiques/bernard_claude/intro_etude_medecine_exp/intro_medecine_exper.pdf
- Bernstein, B. B. (1996). *Pedagogy, symbolic control, and identity: theory, research, critique*. London; Washington, D.C: Taylor & Francis.
- Bernstein, B. B. (1999). Vertical and Horizontal Discourse: An essay. *British Journal of Sociology of Education*, 20(2), 157–173.
- Bernstein, B. B. (2000). *Pedagogy, Symbolic Control, and Identity: theory, research, critique* (Rev. ed). Lanham, Md: Rowman & Littlefield Publishers.
- Bernstein, B. B. (2003). *Class, Codes, and Control (Volume III): Towards a Theory of Educational Transmissions*. Hoboken: Taylor & Francis.
- Bernstein, N. (1984). Some emergent problems of the regulation of motor acts. In H. T. A. Whiting & N. A. Bernshteïn (Eds.), *Human motor actions: Bernstein reassessed* (pp. 343–371). Amsterdam; New York: North-Holland.
- Bernstein, S. (1991). *20 Lessons in Keyboard Choreography: the basics of physical movements at the piano*. New York: Seymour Bernstein Music.
- Berry, W. (1989). *Musical Structure and Performance*. New Haven: Yale University Press.
- Bickerton, D. (2000). How Protolanguage Became Language. In C. Knight, M. Studdert-Kennedy, & J. R. Hurford (Eds.), *The Evolutionary emergence of language: social function and the origins of linguistic form* (pp. 264–284). Cambridge; New York: Cambridge University Press.
- Bie, R. van der. (2009). *De Macht Van de Statistiek: De Centrale Commissie Voor de Statistiek. Samenstelling en Rekrutering, 1892-1899*. Amsterdam University Press.
- Black, A., Muddiman, D., & Plant, H. (2007). *The Early Information Society: information management in Britain before the computer*. Aldershot, England; Burlington, VT: Ashgate.
- Blackburn, S. (1996). *The Oxford Dictionary of Philosophy*. Oxford; New York: Oxford University Press.
- Blacking, J. (1969). The Value of Music in Human Experience. *Yearbook of the International Folk Music Council*, 1, 33.
- Blacking, J. (2000). *How Musical is Man?* (6. printing). Seattle: University of Washington Press. (Work originally published 1973)
- Blair, A. (2010). *Too Much to Know: managing scholarly information before the modern age*. New Haven [Conn.]: Yale University Press.
- Blake, W. (n.d.-a). Annotations to Berkeley's Siris. Retrieved from <http://www.blakearchive.org/exist/blake/archive/erdgen.xq?id=b12.9>

- Blake, W. (n.d.-b). Annotations to Wordsworth's Poems. Retrieved from <http://www.blakearchive.org/exist/blake/archive/erdgen.xq?id=b12.9>
- Boethius. (1973). *The Consolation of Philosophy*. (H. F. Stewart, E. K. Rand, & S. J. Tester, Trans.). Harvard University Press. Retrieved from http://www.loebclassics.com/view/boethius-consolation_philosophy/1973/work.xml
- Bogdan, R. J. (1994). *Grounds for cognition: how goal-guided behavior shapes the mind*. Hillsdale, N.J.: L. Erlbaum Associates.
- Böhme, G., & Stehr, N. (Eds.). (1986). *The Knowledge society: the growing impact of scientific knowledge on social relations*. Dordrecht: Reidel.
- Boole, G. (1847). *The mathematical analysis of logic : being an essay towards a calculus of deductive reasoning*. Cambridge : Macmillan, Barclay, & Macmillan. Retrieved from <http://archive.org/details/mathematicalanal00booluoft>
- Borgdorff, H. (2012). *The conflict of the faculties: perspectives on artistic research and academia*. Amsterdam: Leiden University Press.
- Boulding, K.E.(1955). Notes on the Information Concept. *Exploration*, 6, 103–112.
- Boulding, K. E. (1961). *The Image: Knowledge in Life and Society*. University of Michigan Press.
- Bourdieu, P. (1977). *Outline of a theory of practice*. (R. Nice, Trans.). Cambridge: Cambridge University Press (Esquisse d'une theorie de la pratique, précédé de trois etudes d'ethnologie kabyle, 1972).
- Bourdieu, P. (1990). *In other words: essays towards a reflexive sociology*. (M. Adamson, Trans.). Stanford, California: Stanford University Press. (Original essays published 1982, 1987)
- Bourdieu, P. (1993a). *Sociology in question*. (R. Nice, Trans.). London; Thousand Oaks, California: Sage Publications (Questions de Sociologie, 1984).
- Bourdieu, P. (1993b). *The field of cultural production: essays on art and literature*. New York: Columbia University Press.
- Bower, C. M. (2002). The transmission of ancient music theory into the Middle Ages. In T. Christensen (Ed.), *The Cambridge History of Western Music Theory* (7. print, pp. 136–137). Cambridge: Cambridge University Press.
- Bowman, W. D. (1998). *Philosophical perspectives on music*. New York: Oxford University Press.
- Boyer, E. L. (1990). *Scholarship Reconsidered: Priorities of the Professoriate*. Princeton, NJ: Carnegie Foundation for the Advancement of Teaching.
- Brandt, P. A. (2009). Music and how we became human - a view from cognitive semiotics: Exploring imaginative hypotheses. In S. Malloch & C. Trevarthen (Eds.), *Communicative Musicality: Exploring the Basis of Human Companionship*. Oxford ; New York: Oxford University Press. Retrieved from 31-44
- Brann, E. T. H. (1993). *The World of the Imagination Sum and Substance*. Lanham: Rowman & Littlefield Publishers. Retrieved from <http://public.ebib.com/choice/publicfullrecord.aspx?p=1331729>
- Breithaupt, R. M. (1906-1916). *Die Natürliche Klaviertechnik, Teil I: Handbuch der Modernen Technik und Spielpraxis; Teil II: Die Grundlagen des Gewichtspiels; Teil III: Praktische Studien. Spielpraxis*. Leipzig: C.F. Kahnt.
- Breithaupt, R. M. (1909). *Die Natürliche Klaviertechnik, Teil II: Die Grundlagen des Gewichtspiels (English translation: the school of weight-touch)*. Leipzig: C.F. Kahnt.
- Breithaupt, R. M. (1916). *Praktische Studien zur natürlichen Klaviertechnik*. Leipzig: C.F. Kahnt.

- Breithaupt, R. M. (1921). *Die Naturliche Klaviertechnik, Teil I: Handbuch der Modernen Technik und Spielpraxis*. (fifth edition). Leipzig: C.F. Kahnt.
- Brendel, A. (1991). *Musical thoughts & after-thoughts*. New York: Farrar Straus Giroux.
- Broadbent, D. E. (1958). *Perception and communication*. New York: Pergamon Press.
- Brockman, J. (1995). *The Third Culture*. New York: Simon & Schuster.
- Brooks, W. (Ed.). (2014). *Ohne Worte: vocality and instrumentality in 19th-century music*. Leuven: Leuven Univ. Press.
- Brouwer, B. (2006). *Pianistisch Perspectief: toonaangevende analyse van de pianotechniek volgens de inzichten van Tobias Matthay*. Budel: Damon.
- Brown, H. M., Hiley, D., Page, C., Kreitner, K., Walls, P., Page, J. K., ... Brinner, B. (n.d.). Performing practice. In *Grove Music Online. Oxford Music Online*. Oxford University Press.
- Brown, S. (1999). The "Musilanguage" Model of Music Evolution. In N. L. Wallin, B. Merker, & S. Brown (Eds.), *The origins of music* (pp. 271–300). Cambridge, Mass: MIT Press.
- Brubaker, B. (2007). Questions Not Answers: the Performer as Researcher. *Dutch Journal of Music Theory (Special Issue, Practice-Based Research in Music)*, 12(1), 66–87.
- Bruce, S., & Yearley, S. (2006). *The Sage Dictionary of Sociology*. London; Thousand Oaks, California: SAGE.
- Bundy, M. W. (1927). *The Theory of Imagination in Classical and Mediaeval Thought*. Urbana: the University of Illinois.
- Burgin, M. S. (2010). *Theory of Information: fundamentality, diversity and unification*. Hackensack, NJ: World Scientific Pub Co Inc.
- Butt, J. (2002). *Playing with History: the historical approach to musical performance*. Cambridge; New York: Cambridge University Press.
- Cacioppo, J. T., Priester, J. R., & Berntson, G. G. (1993). Rudimentary determinants of attitudes: II. Arm flexion and extension have differential effects on attitudes. *Journal of Personality and Social Psychology*, 65(1), 5–17.
- Capurro, R. (1978). *Information: ein Beitrag zur etymologischen und ideengeschichtlichen Begründung des Informationsbegriffs*. München: Saur.
- Capurro, R. (1978). *Information: ein Beitrag zur etymologischen und ideengeschichtlichen Begründung des Informationsbegriffs*. München: Saur.
- Capurro, R. (2009). Past, present, and future of the concept of information. *TripleC*, 7(2), 125–141.
- Capurro, R., & Hjørland, B. (2003). The concept of information. *Annual Review of Information Science and Technology*, 37(1), 343–411.
- Capurro, R., & Hjørland, B. (2003). In B. Cronin (Ed.), *Annual review of information science and technology. Volume 37* (pp. 343–411). Medford, N.J.: Information Today.
- Capurro, R., & Hjørland, B. (2015). The Concept of Information. *Annual Review of Information Science and Technology (ARIST)*, 37, 343–411.
- Cardinal, G. D. (2010). *Analysis of wrist flexion and extension in piano performance: biomechanical and anthropometrical perspectives*. Indiana University.
- Carr, W. (1980). The Gap between Theory and Practice. *Journal of Further and Higher Education*, 4(1), 60–69.
- Carr, W. (1986). Theories of Theory and Practice. *Journal of Philosophy of Education*, 20(2), 177–186.
- Carroll, J. (2004). *Literary Darwinism: evolution, human nature, and literature*. New York: Routledge.
- Carroll, N. (2004). Art and Human Nature. *The Journal of Aesthetics and Art Criticism*, 62(2), 95–107.

- Case, D. O., & Given, L. M. (2016). *Looking for information: a survey of research on information seeking, needs, and behavior*.
- Castells, M. (1996). *The rise of the network society* (2nd ed., with a new pref). Chichester, West Sussex; Malden, MA: Wiley-Blackwell.
- Castells, M. (1997). *The power of identity* (2nd ed., with a new preface). Malden, MA: Wiley-Blackwell.
- Castells, M. (1998). *End of millennium*. Oxford ; Malden, MA: Blackwell Publishers.
- Castells, M. (2010). *The rise of the network society* (2nd ed., with a new pref). Chichester, West Sussex ; Malden, MA: Wiley-Blackwell.
- Cervino, A. (2012, May 7). *Mapping the performer's creative space. An exploration in and through piano playing*. KULeuven, Leuven. Retrieved from <https://lirias.kuleuven.be/handle/123456789/343464>
- Choo, C. W. (2006). *The knowing organization: how organizations use information to construct meaning, create knowledge, and make decisions* (2nd ed). New York: Oxford University Press.
- Choo, C. W., Detlor, B., & Turnbull, D. (2000). *Web Work* (Vol. 1). Dordrecht: Springer Netherlands.
- Chopin, F. (2015). Complete works vol. X: Mazurkas (ed. Paderweski). Warsaw: Instytut Fryderyka Chopina. (Work originally published 1953)
- Chopin, F. (1880). Mazurka in a op.67 nr.4. In Friedrich Chopin's Werke. (Vol. XIII, pp. 22–23). Leipzig: Breitkopf und Härtel.
- Christensen, T.S. (2002). Introduction. In T. Christensen (Ed.), *The Cambridge History of Western Music Theory* (7. print, pp. 1–26). Cambridge: Cambridge University Press.
- Christensen, T. S. (Ed.). (2002). *The Cambridge History of Western Music Theory*. Cambridge ; New York: Cambridge University Press.
- Chua, D. K. L. (1999). *Absolute music and the construction of meaning*. Cambridge, UK ; New York: Cambridge University Press.
- Cicero. (1942). *De Oratore*. (E. W. Sutton & H. Rackham, Trans.). Harvard University Press. Retrieved from http://www.loebclassics.com/view/marcus_tullius_cicero-de_oratore/1942/work.xml
- Clapham, C., & Nicholson, J. (2014). attractor. In *The concise Oxford Dictionary of Mathematics*.
- Clarance. (2015). A Proposal for the Creation of a Dance Ontology. In A. L. Brooks, E. Ayiter, & O. Yazicigil (Eds.), *Arts and Technology* (Vol. 145, pp. 86–99). Cham: Springer International Publishing.
- Clarke, D., & Clarke, E. F. (Eds.). (2011). *Music and consciousness: philosophical, psychological, and cultural perspectives*. Oxford ; New York: Oxford University Press.
- Clarke, E. F. (1993). Generativity, mimesis and the human body in music performance. In I. Cross & I. Deliège (Eds.), *Music and the cognitive sciences 1990: proceedings of Cambridge Conference on Music and the Cognitive Sciences, 1990* (pp. 207–219). Yverdon: Harwood.
- Clarke, E. F. (1995). Hoofdstuk 6: Uitvoering en expressie. In F. Evers (Ed.), *Muziekpsychologie: muzikale ontwikkeling, schepping, beleving, waarneming* (pp. 105–122). Assen: van Gorcum.
- Clarke, E. F. (2001). Generative principles in music performance. In J. Sloboda (Ed.), *Generative Processes in Music The Psychology of Performance, Improvisation, and Composition*. Oxford: Oxford University Press.
- Clarke, E. F. (2005). *Ways of listening: an ecological approach to the perception of musical meaning*. Oxford ; New York: Oxford University Press.

- Clayton, M. (2013). Entrainment, Ethnography and Musical Interaction. In M. Clayton, B. Dueck, & L. Leante (Eds.), *Experience and meaning in music performance* (pp. 17–39). New York: Oxford University Press.
- Clayton, M., Sager, R., & Will, U. (2004). In time with the music: The concept of entrainment and its significance for ethnomusicology. *ESEM CounterPoint*, 1, 1–82.
- Clynes, M. (1977). *Sentics: The Touch of Emotions*. London: Souvenir Press Ltd : [distributor] Bookpoint.
- Clynes, M. (1995). Microstructural musical linguistics: composers' pulses are liked most by the best musicians. *Cognition*, 55(3), 269–310.
- Cobbledick, S. (1996). The Information-Seeking Behavior of Artists: Exploratory Interviews. *The Library Quarterly: Information, Community, Policy*, 66(4), 343–372.
- Cobussen, M. (2007). The Trojan Horse: Epistemological Explorations Concerning Practice-based Research. *Dutch Journal of Music Theory (Special Issue, Practice-Based Research in Music)*, 12(1), 18–33.
- Cochrane, T. (2009). Joint Attention to Music. *The British Journal of Aesthetics*, 49(1), 59–73.
- Cocking, J. M., & Murray, P. (1991). *Imagination: a study in the history of ideas*. London ; New York: Routledge.
- Coessens, K., Crispin, D., & Douglas, A. (2009). *The Artistic Turn: a Manifesto*. Leuven: Leuven University Press.
- Cohen, A. (2002). Performance Theory. In T. Christensen (Ed.), *The Cambridge History of Western Music Theory* (7. print, pp. 534–553). Cambridge: Cambridge University Press.
- Cohen, H. F. (2010). Music as Science and as Art. The Sixteenth/Seventeenth-Century Destruction of Cosmic Harmony. In R. Bod, J. Maat, & T. Weststeijn (Eds.), *The Making of the Humanities* (pp. 59–74). Amsterdam: Amsterdam University Press.
- Coleridge, S. T. (1817). *Biographia Literaria*. Retrieved from http://www.gutenberg.org/ebooks/6081?msg=welcome_stranger#link2HCH0013
- Colman, A. M. (2014). *A Dictionary of Psychology* (3rd ed). Oxford; New York: Oxford University Press.
- Colwell, et al. (n.d.) Music education. in Grove Music Online. Oxford Music Online. Oxford University Press.
- Commission of the European Communities. (1993). *Growth, competitiveness, employment: the challenges and ways forward into the 21st century: white paper*. Luxembourg : [Lanham, MD: Office for Official Publications of the European Communities ; UNIPUB, distributor].
- Constant, P. (1900). *Le Conservatoire national de musique et de declamation : documents historiques et administratifs*. Paris: Imprimerie Nationale.
- Coogan, M. D., & Brettler, M. Z. (Eds.). (2010). *The new Oxford annotated Bible: new revised standard version with the Apocrypha; an ecumenical study Bible* (Fully rev. 4. ed). Oxford: Oxford Univ. Press.
- Cook, N. (1987). *A guide to musical analysis*. London: J.M. Dent.
- Cook, N. (1992). *Music, imagination, and culture* (1. publ. in paperback). Oxford: University Press.
- Cook, N. (2007). Performance Analysis and Chopin's Mazurkas. *Musicae Scientiae*, 11(2), 183–207.
- Cooke, D. (1959). *The language of music*. London: Oxford University Press.
- Cooke, J. F. (1913). *Great pianists on piano playing*. Philadelphia: THEO. PRESSER CO.
- Copland, A. (1952). *Music and imagination*. Cambridge: Harvard University Press.
- Corballis, M. C. (2009). The Evolution of Language. *Annals of the New York Academy of Sciences*, 1156(1), 19–43.

- Cornelius, I. (1996). Information and interpretation. In P. Ingwersen & N. O. Pors (Eds.), *Integration in Perspective, Proceedings of CoLIS 2: Second International Conference on Conceptions of Library and Information Science, Oct. 13-16, 1996* (pp. 11–21).
- Cox, A. (2016). *Music and Embodied Cognition: listening, moving, feeling, and thinking*. Bloomington ; Indianapolis: Indiana University Press.
- Crawford, D. W. (2003). Kant's Theory of Creative Imagination. In P. Guyer (Ed.), *Kant's Critique of the power of judgment: critical essays* (pp. 143–170). Lanham, Md: Rowman & Littlefield Publishers.
- Crispin, D. (Ed.). (2009). *New Paths: aspects of music theory and aesthetics in the age of romanticism*. Leuven: Leuven University Press.
- Crispin, D. (Ed.). (2012). *Dramma Giocoso: four contemporary perspectives on the Mozart/Da Ponte operas*. Leuven: Leuven University Press.
- Cross, I. (2003a). Music and Biocultural Evolution. In M. Clayton, T. Herbert, & R. Middleton (Eds.), *The cultural study of music: a critical introduction* (pp. 19–31). New York: Routledge.
- Cross, I. (2003b). Music as a Biocultural Phenomenon. *Annals of the New York Academy of Sciences*, 999(1), 106–111.
- Cross, I. (2006). Music, Cognition, Culture, and Evolution. *Annals of the New York Academy of Sciences*, 930(1), 28–42.
- Csikszentmihalyi, M. (1996). *Creativity: flow and the psychology of discovery and invention*. New York: Harper Collins.
- Curran, A. (2016). *Routledge Philosophy Guidebook to Aristotle and the Poetics*. Milton Park, Abingdon, Oxon ; New York, NY: Routledge.
- Damasio, A. R. (1994). *Descartes' Error: emotion, reason, and the human brain*. New York: Putnam.
- Danuser, H. (1996). Interpretation. In *die Musik in Geschichte und Gegenwart*.
- Dart, T. (1954). *The Interpretation of Music (Fourth Edition)* (fourth reprint). London: Hutchinson.
- Darwin, C. (1981). *The Descent of Man, and Selection in Relation to Sex*. Princeton, N.J.: Princeton University Press. (Work originally published 1871)
- Daston, L. (1999). In M. Biagioli (Ed.), *The Science Studies Reader* (pp. 110–123). New York: Routledge.
- Daston, L., & Galison, P. (2010). *Objectivity* (Paperback ed). New York, NY: Zone Books.
- Davenport, T. H., & Prusak, L. (1998). *Working Knowledge: how organizations manage what they know*. Boston, Mass: Harvard Business School Press.
- Davidson. (1995). What Does the Visual Information Contained in Music performances Offer the Observer? Some Preliminary Thoughts. In R. Steinberg (Ed.), *Music and the Mind Machine* (pp. 105–114). Berlin, Heidelberg: Springer Berlin Heidelberg.
- Davidson, J. W. (1993). Visual Perception of Performance Manner in the Movements of Solo Musicians. *Psychology of Music*, 21(2), 103–113.
- Davidson, J. W. (2001). The Role of the Body in the Production and Perception of Solo Vocal Performance: A Case Study of Annie Lennox. *Musicae Scientiae*, 5(2), 235–256.
- Davidson, R. J., Scherer, K. R., & Goldsmith, H. H. (Eds.). (2003). *Handbook of affective sciences*. Oxford ; New York: Oxford University Press.
- Dawkins, R. (2006). *The Selfish Gene* (30th anniversary ed). Oxford ; New York: Oxford University Press. (Work originally published 1976)
- Day, R. E. (2001). *The Modern Invention of Information: discourse, history, and power*. Carbondale: Southern Illinois University Press.

- de Assis, P. (n.d.). MusicExperiment21. Retrieved from <http://www.orpheusinstituut.be/nl/projecten/musicexperiment21>
- Dearnley, J., & Feather, J. (2001). *The Wired World: an introduction to the theory and practice of the information society*. London: Library Association Pub.
- Deci, E. L., & Ryan, R. M. (2008). Self-determination theory: A macrotheory of human motivation, development, and health. *Canadian Psychology/Psychologie Canadienne*, 49(3), 182–185.
- Defoe, D. (1887). *An Essay Upon Projects*. Lonon, Paris, New York, Melbourne: Cassell & Co. Retrieved from <http://www.gutenberg.org/ebooks/4087>
- Deleuze, G., & Guattari, F. (1987). *A Thousand Plateaus: capitalism and schizophrenia*. (B. Massumi, Trans.). Minneapolis: University of Minnesota Press.
- Dennett, D. C. (1991). *Consciousness Explained* (1st ed). Boston: Little, Brown and Co.
- Dentico, D., Cheung, B. L., Chang, J.-Y., Guokas, J., Boly, M., Tononi, G., & Van Veen, B. (2014). Reversal of cortical information flow during visual imagery as compared to visual perception. *NeuroImage*, 100, 237–243.
- Derrida, J. (1981a). *Dissemination*. (B. Johnson, Trans.). London: Athlone Press.
- Derrida, J. (1981b). The Double Session. In B. Johnson (Trans.), *Dissemination*. London: Athlone Press.
- Dervin, B. (1977). Useful Theory for Librarianship: Communication, Not Information. *Drexel Library Quarterly*, 13(3), 16–32.
- Dervin, B. (1992). From the Mind's Eye of the "User": The Sense-Making Qualitative-Quantitative Methodology. In J. D. Glazier & R. R. Powell (Eds.), *Qualitative Research in Information Management* (pp. 61–84). Libraries Unlimited.
- Descartes, R. (1641). *Meditationes De Prima Philosophia. In qua Dei existentia, & animæ humanæ à corpore distinctio, demonstratur*. Retrieved from <http://www.wright.edu/~charles.taylor/descartes/med1.html>
- Descartes, R. (1649). *Les Passions de l'Ame*. Paris: Henri le Gras.
- Dewey, J. (1896). The reflex arc concept in psychology. *Psychological Review*, 3(4), 357–370. h
- Dewey, J. (1910). *How We Think*. Boston: D.C. Heath & co.
- Dewey, J. (1920). *Reconstruction in Philosophy*. New York: Henry Holt and Company.
- Dewey, J. (1925). *Experience & Nature*. Chicago: Open Court Publishing Company.
- Dewey, J. (1929). *The Quest for Certainty: a Study of the Relation of Knowledge and Action*. New York: Minton, Balch & Co.
- Dewey, J. (1934). *Art as Experience* (Perigee trade pbk. ed). New York, NY: Perigee.
- Dewey, J. (1938). *Logic, the Theory of Inquiry*. New York: Henry Holt and Company. Retrieved from <https://www.abebooks.co.uk/book-search/title/logic-theory-of-inquiry/author/dewey-john/>
- Diderot, D., & d'Alembert, J. (2002). Encyclopedia. *Encyclopedia of Diderot & d'Alembert - Collaborative Translation Project*. Retrieved from <http://hdl.handle.net/2027/spo.did2222.0000.004>. (Encyclopédie ou Dictionnaire raisonné des sciences, des arts et des métiers, par une Société de Gens de lettres, 1751-1772)
- Diderot, D., & d'Alembert, J. (Eds.). (1751-1772). *Encyclopédie ou Dictionnaire raisonné des sciences, des arts et des métiers, par une Société de Gens de lettres*. Retrieved from <http://encyclopedia.uchicago.edu>
- Dilthey, W. (1989). *Introduction to the Human Sciences*. (R. A. Makkreel & F. Rodi, Trans.). Princeton, N.J: Princeton University Press (Einleitung in die Geisteswissenschaften, 1883).
- Dolmetsch, A. (1915). *The Interpretation of the Music of the XVIIth and XVIIIth centuries revealed by Contemporary Evidence*. London; New York: Novello; H. W. Gray.

- Donald, M. (1991). *Origins of the Modern Mind: three stages in the evolution of culture and cognition*. Cambridge, Mass: Harvard University Press.
- Donald, M. (1993). Précis of Origins of the Modern Mind: Three stages in the evolution of culture and cognition. *Behavioral and Brain Sciences*, 16(4), 737-791.
- Donington, R. (1965). *The Interpretation of Early Music (second edition)*. London: Faber and Faber.
- Donohew, L., & Tipton, L. (1973). A conceptual model of information seeking, avoiding and processing. In P. Clarke (Ed.), *New models for mass communication research* (pp. 243–269). Beverly Hills: Sage Publications.
- Drake, K. (1981). *The Sonatas of Beethoven, as He Played and Taught Them*. Bloomington: Indiana University Press.
- Dreyfus, L. (2007). Beyond the Interpretation of Music. *Dutch Journal of Music Theory*, 12(3), 253–272.
- Drucker, P. F. (1969). *The Age of Discontinuity: Guidelines to Our Changing Society*. London: Heinemann.
- Du Bois, J. W. (2010). Towards a Dialogic Syntax. Retrieved from http://www.lattice.cnrs.fr/IMG/pdf/DuBois_forthcoming_Towards_a_Dialogic_Syntax-DRAFT_2-2-1.pdf
- Du Sautoy, M. (2016). *What We Cannot Know: Explorations at the Edge of Knowledge*. London: 4th Estate.
- Dunsby, J. (1995). *Performing Music: Shared Concerns*. Oxford; New York: Clarendon Press; Oxford University Press.
- Dutton, D. (2009). *The Art Instinct: Beauty, Pleasure, & Human Evolution*. Oxford: Oxford University Press.
- Easterlin, N. (2012). *A Biocultural Approach to Literary Theory and Interpretation*. Baltimore, Md: Johns Hopkins University Press.
- Eco, U. (1989). *The Open Work*. Cambridge, Mass: Harvard University Press.
- Egan, K. (1992). *Imagination in Teaching and Learning: the middle school years*. Chicago: University of Chicago Press.
- Eigeldinger, J.-J. (2004). *Chopin: Pianist and Teacher as seen by his Pupils* (Reprinted). Cambridge: Cambridge Univ. Press.
- Eikeland, O. (2007). From Epistemology to Gnoseology – understanding the knowledge claims of action research. *Management Research News*, 30(5), 344–358.
- Eikeland, O. (2008). *The ways of Aristotle: Aristotelian phrónêsis, Aristotelian philosophy of dialogue, and action research*. Bern; New York: Peter Lang.
- Ekman, P., Friesen, W. V., & Ellsworth, P. (1972). *Emotion in the Human Face: Guidelines for Research and an Integration of Findings*. New York: Pergamon Press.
- Elliott, D. J. (1995). *Music Matters: a new philosophy of music education*. New York: Oxford University Press.
- Ellis, D. (1989). A behavioural model for information retrieval system design. *Journal of Information Science*, 15(4–5), 237–247.
- Elsner, B., & Hommel, B. (2001). Effect anticipation and action control. *Journal of Experimental Psychology: Human Perception and Performance*, 27(1), 229–240.
- Elsner, B., Hommel, B., Mentschel, C., Drzezga, A., Prinz, W., Conrad, B., & Siebner, H. (2002). Linking Actions and Their Perceivable Consequences in the Human Brain. *NeuroImage*, 17(1), 364–372.

- Engell, J. (1981). *The creative imagination: Enlightenment to Romanticism*. Cambridge, Mass: Harvard University Press.
- Engell, J. (2012). imagination. In R. Greene, S. Cushman, C. Cavanagh, J. Ramazani, P. F. Rouzer, H. Feinsod, ... A. Slessarev (Eds.), *The Princeton Encyclopedia of Poetry and Poetics* (pp. 666–674). Princeton: Princeton University Press.
- Ernout, A., Meillet, A., & André, J. (2001). *Dictionnaire étymologique de la langue latine: histoire des mots* (Retirage de la 4. éd. augm. d'additions et de corr). Paris: Klincksieck.
- European Commission. (2008). *The European Qualifications Framework for Lifelong Learning (EFQ)*. Luxembourg: Office for Official Publications of the European Communities.
- Evans, J. S. B. T. (1984). Heuristic and analytic processes in reasoning. *British Journal of Psychology*, 75(4), 451–468.
- Evans, J. S. B. T., & Stanovich, K. E. (2013). Dual-Process Theories of Higher Cognition: Advancing the Debate. *Perspectives on Psychological Science*, 8(3), 223–241.
- Fabian, D. (2000). Musicology and Performance Practice: In Search of a Historical Style with Bach Recordings. *Studia Musicologica Academiae Scientiarum Hungaricae*, 41(1/3), 77–106.
- Fabian, D. (2001a). The Meaning of Authenticity and The Early Music Movement: A Historical Review. *International Review of the Aesthetics and Sociology of Music*, 32(2), 153.
- Fabian, D. (2001b). The Meaning of Authenticity and The Early Music Movement: A Historical Review. *International Review of the Aesthetics and Sociology of Music*, 32(2), 153–167.
- Fabian, D. (2003). *Bach performance practice, 1945-1975: a comprehensive review of sound recordings and literature*. Aldershot: Ashgate.
- Feather, J., & Sturges, R. P. (2003). *International Encyclopedia of Information and Library Science* (2nd edition). London; New York: Routledge.
- Feldenkrais, M. (1990). *Awareness Through Movement: Health Exercises for Personal Growth* (1st HarperCollins pbk. ed). San Francisco: Harper.
- Fernald, A. (1992). Meaningful Melodies in Mothers' Speech to Infants. In H. Papoušek, U. Jürgens, & M. Papoušek. Mechthild (Eds.), *Nonverbal vocal communication: comparative and developmental approaches* (pp. 262–282). Cambridge: Cambridge University Press.
- Ferry, L. (2011). *A Brief History of Thought: A Philosophical Guide to Living*. (T. Cuffe, Trans.). New York: Harper Perennial.
- Field. (n.d.). Dewey, John. In *Internet Encyclopedia of Philosophy*. Retrieved from <http://www.iep.utm.edu/dewey/#H2>
- Fink, S. (1992). *Mastering Piano Technique: a Guide for Students, Teachers, and Performers*. Portland, Or: Amadeus Press.
- Floridi, L. (2005). Is Semantic Information Meaningful Data? *Philosophy and Phenomenological Research*, 70(2), 351–370.
- Floridi, L. (2010). *Information: a Very Short Introduction*. Oxford; New York: Oxford University Press.
- Floridi, L. (2014). *The 4th Revolution: how the infosphere is reshaping human reality*. New York; Oxford: Oxford University Press.
- Floridi, L. (2016). Semantic Conceptions of Information. In E. N. Zalta (Ed.), *The Stanford Encyclopedia of Philosophy* (Fall 2016). Retrieved from <http://plato.stanford.edu/archives/fall2016/entries/information-semantic/>
- Flory, D. (1996). Stoic Psychology, Classical Rhetoric, and Theories of Imagination in Western Philosophy. *Philosophy & Rhetoric*, 29(2), 147–167.

- Foucault, Mi. (1979). *Discipline and Punish: The Birth of the Prison*. Harmondsworth: Peregrine Books.
Harmondsworth: Peregrine Books.
- Franks, D. D., & Turner, J. H. (Eds.). (2013). *Handbook of Neurosociology*. New York: Springer.
- Fraser, A. (2003). *The Craft of Piano Playing: a New Approach to Piano Technique* (1st ed). Lanham, Md: Scarecrow Press.
- Fraser, A. (2010). The Craft of Piano Playing DVD - Breakthrough Piano Technique. Retrieved from <https://www.youtube.com/watch?v=jYqeq5KxSZk>
- Fraser, A. (2011). *The Craft of Piano Playing: a New Approach to Piano Technique* (2nd ed). Lanham, Md: Scarecrow Press.
- Freud, S. (1908). The Relation of the Poet to Day-Dreaming. In B. Nelson (Ed.), I. F. Grant Duff (Trans.), *On creativity and the unconscious: the psychology of art, literature, love, and religion* (pp. 44–54). New York: Harper Perennial.
- Friberg, A., & Bisesi, E. (2014). Using Computational Models of Music Performance to Model Stylistic Variations. In D. Fabian, R. Timmers, & E. Schubert (Eds.), *Expressiveness in music performance: empirical approaches across styles and cultures* (1st edition, pp. 240–259). Oxford: Oxford University Press.
- Friedman, R. S., & Förster, J. (2000). The Effects of Approach and Avoidance Motor Actions on the Elements of Creative Insight. *Journal of Personality and Social Psychology*, 79(4), 477–492.
- Frijda, N. H. (1986). *The Emotions*. Cambridge: New York: Cambridge University Press.
- Frijda, N. H., Manstead, A. S. R., & Bem, S. (Eds.). (2000). *Emotions and beliefs: how feelings influence thoughts*. Cambridge, U.K.; New York: Paris: Cambridge University Press; Editions de la Maison des sciences de l'homme.
- Fubini, E. (Ed.). (1994). *Music & culture in eighteenth-century Europe: a source book*. (B. J. Blackburn, Trans.). Chicago: University of Chicago Press.
- Furlong, E. J. (2014). *Imagination*. Place of publication not identified: Routledge.
- Furuya, S., Aoki, T., Nakahara, H., & Kinoshita, H. (2012). Individual differences in the biomechanical effect of loudness and tempo on upper-limb movements during repetitive piano keystrokes. *Human Movement Science*, 31(1), 26–39.
- Furuya, S., Osu, R., & Kinoshita, H. (2009). Effective utilization of gravity during arm downswing in keystrokes by expert pianists. *Neuroscience*, 164(2), 822–831.
- Gabbay, J., & le May, A. (2004). Evidence based guidelines or collectively constructed “mindlines?” Ethnographic study of knowledge management in primary care. *BMJ*, 329(7473), 1013.
- Gabbay, J., & Le May, A. (2011). *Practice-based evidence for healthcare: clinical mindlines*. London ; New York: Routledge.
- Gadamer, H.-G. (2004). *Truth and Method*. (J. Weinsheimer & D. G. Marshall, Trans.). London; New York: Continuum (Wahrheit und Methode, 1960).
- Gadamer, H.-G. (2007). *Wahrheit und Methode*. (G. Figal, Ed.). Berlin: Akademie Verlag. (Work originally published 1960)
- Gates, B. (1996). The Smithsonian Time Machine. *Smithsonian*, 27(5), 23.
- Gavin, W. J. (2008). Habit. In J. Lachs & R. B. Talisse (Eds.), *American Philosophy: an Encyclopedia* (pp. 352–355). New York: Routledge.
- Gibbons, M. (Ed.). (1994). *The New Production of Knowledge: the Dynamics of Science and Research in Contemporary Societies*. London ; Thousand Oaks, Calif: SAGE Publications.
- Gibbons, M. (2008). Why is knowledge translation important? Grounding the conversation. *Focus Technical Brief*, 21, 1–9.

- Gibson, J. J. (2015). *The ecological approach to visual perception*. New York; Hove, England: Psychology Press.
- Giddens, A. (1979). *Central Problems in Social Theory*. London: Macmillan Education UK.
- Giddens, A. (1992). *The Nation-state and Violence* (Reprint). London: Macmillan. (Work originally published 1985)
- Giddens, A., & Sutton, P. W. (2009). *Sociology* (6. ed). Cambridge: Polity Press.
- Glare, P. G. W. (Ed.). (1968). *Oxford Latin Dictionary*. Oxford: Clarendon Press; Oxford University Press.
- Gleick, J. (2011). *The Information: A History, A Theory, A Flood*. New York: Knopf Doubleday Publishing Group.
- Godin, B. (2010). The Knowledge Economy: Fritz Machlup's Construction of a Synthetic Concept. *The Capitalization of Knowledge : A Triple Helix of University-Industry-Government*, 261–290.
- Goebel, W., & Palmer, C. (2008). Tactile Feedback and Timing Accuracy in Piano Performance. *Experimental Brain Research*, 186(3), 471–479.
- Goebel, W., & Palmer, C. (2013). Temporal Control and Hand Movement Efficiency in Skilled Music Performance. *PLoS ONE*, 8(1), e50901.
- Goehr, L. (1992). *The Imaginary Museum of Musical Works: An Essay in the Philosophy of Music*. Oxford University Press.
- Gollwitzer, P. M., & Bargh, J. A. (Eds.). (1996). *The Psychology of Action: linking cognition and motivation to behavior*. New York: Guilford Press.
- Goodfellow, I., Bengio, Y., & Courville, A. (2016). *Deep Learning*. Cambridge, Massachusetts: The MIT Press.
- Gorman, S. E., & Gorman, J. M. (2017). *Denying to The Grave: Why We Ignore The Facts That Will Save Us*. Oxford ; New York: Oxford University Press.
- Gould, S. J. (2011). *The Hedgehog, the Fox, and the Magister's Pox: mending the gap between science and the humanities* (1st Harvard University Press ed). Cambridge, Mass: Belknap Press of Harvard University Press. (Work originally published 2003)
- Gower, J. (1979). *The English Works of John Gower*. London; New York: Published for the Early English Text Society by the Oxford University Press.
- Green, B., & Gallwey, W. T. (1987). *The Inner Game of Music*. London: Pan Books.
- Gregory, S. (2005). Creativity and Conservatoires: the agenda and the issues. In G. Odam & N. Bannan (Eds.), *The Reflective Conservatoire: Studies in Music Education* (pp. 19–31). London : Aldershot, Hants, England: Guildhall School of Music & Drama ; Ashgate.
- Gross, P. R., & Levitt, N. (1994). *Higher Superstition: the Academic Left and Its Quarrels with Science*. Baltimore: Johns Hopkins University Press.
- Gruber, T. (2009). Ontology. In L. Liu & M. T. Özsu (Eds.), *Encyclopedia of Database Systems*. New York: Springer.
- Gruber, T. R. (1995). Toward principles for the design of ontologies used for knowledge sharing? *International Journal of Human-Computer Studies*, 43(5–6), 907–928.
- Guthrie, W. K. C. (1962). *A History of Greek Philosophy. 1: The earlier presocratics and the pythagoreans* (reprint). Cambridge: Cambridge University Press.
- Gutknecht, D. (n.d.). Aufführungspraxis. In *Musik in Geschichte und Gegenwart (MGG)*.
- Haefner, K. (Ed.). (1992). *Evolution of information processing systems: an interdisciplinary approach for a new understanding of nature and society*. Berlin; New York: Springer-Verlag.

- Hahn, T. (2007). *Sensational Knowledge: embodying culture through Japanese dance*. Middletown, Conn: Wesleyan University Press.
- Hanslick, E. (1854). *Vom Musikalisch-Schönen*. Leipzig: Rudolf Weigel.
- Hargreaves, D. J., Miell, D., & MacDonald, R. A. R. (Eds.). (2012). *Musical Imaginations: multidisciplinary perspectives on creativity, performance, and perception*. Oxford: Oxford University Press.
- Harnoncourt, N. (1995). *Baroque Music Today: music as speech; ways to a new understanding of music*. (R. G. Pauly, Ed., M. O'Neill, Trans.). Portland, OR: Amadeus Press (Musik als Klangrede: Wege zu einem neuen Musikverständnis, 1982).
- Harnoncourt, N. (2004). *Musik als Klangrede: Wege zu einem neuem Musikverständnis; Essays und Vorträge* (Neuauf). St. Pölten: Residenz-Verl. (Original work published 1982)
- Hatten, R. S. (2010). Performance and Analysis—Or Synthesis: Theorizing Gesture, Topics, and Tropes in Chopin's F-Minor Ballade. *Indiana Theory Review*, 28(1/2), 45–66.
- Haug, G., & Kirstein, J. (1999). Trends in Learning Structures in Higher Education. Retrieved from http://www.eua.be/Libraries/higher-education/offdoc_bp_trend_i-1068715136182.pdf?sfvrsn=0
- Hauser, M. D. (1996). *The Evolution of Communication*. Cambridge, Mass: MIT Press.
- Hauser, M., & Wood, J. (2010). Evolving the Capacity to Understand Actions, Intentions, and Goals. *Annual Review of Psychology*, 61(1), 303–324.
- Hawking, S., & Mlodinow, L. (2010). *The Grand Design*. New York: Bantam Books.
- Haynes, B. (2007). *The End of Early Music: a period performer's history of music for the twenty-first century*. Oxford ; New York: Oxford University Press.
- Headrick, D. R. (2000). *When Information Came of Age: Technologies of Knowledge in the Age of Reason and Revolution, 1700 - 1850*. Oxford: Oxford University Press.
- Hemmig, W. (2009). An Empirical Study of the Information-seeking Behavior of Practicing Visual Artists. *Journal of Documentation*, 65(4), 682–703.
- Hemmig, W. S. (2008). The Information-seeking Behavior of Visual Artists: a literature review. *Journal of Documentation*, 64(3), 343–362.
- Herreweghe, P. (2017, February 5). Het journaal L - 02/05/17. Retrieved from <http://deredactie.be/cm/vrtnieuws/videozone/programmas/journaal/2.49722>
- hhaayyddnn. (2015). *Mitsuko Uchida - Bach French Suite - Sarabande*. Retrieved from <https://www.youtube.com/watch?v=q2hZHE0gZgE>
- Higgs, J., & Titchen, A. (Eds.). (2001). *Practice knowledge and expertise in the health professions*. Oxford [u,a,]: Butterworth-Heinemann.
- Hjørland, B. (2007). Information: Objective or subjective/situational? *Journal of the American Society for Information Science and Technology*, 58(10), 1448–1456.
- Hobart, M. E., & Schiffman, Z. S. (2000). *Information ages: literacy, numeracy, and the computer revolution*. Baltimore, Md.: Johns Hopkins University Press.
- Hodges, D. A., & Sebald, D. C. (2011). *Music in the human experience: an introduction to music psychology*. New York, NY: Routledge.
- Hofstetter, Y. (2014). *Sie wissen alles: wie intelligente Maschinen in unser Leben eindringen und warum wir für unsere Freiheit kämpfen müssen* (1. Auflage). München: Bertelsmann Verlag.
- Holstege, G. (1992). The Emotional Motor System. *European Journal of Morphology*, 30(1), 67–79.
- Homer. (2007). *The Odyssey*. (I. C. Johnston, Trans.) (2nd ed). Arlington, Va: Richer Resources Publications.

- Hommel, B. (1996). The Cognitive Representation of Action: Automatic Integration of Perceived Action Effects. *Psychological Research*, 59(3), 176–186.
- Hommel, B. (2015). The Theory of Event Coding (TEC) as Embodied-Cognition Framework. *Frontiers in Psychology*, 6, 1–5.
- Hookway, C. (2016). Pragmatism. In E. N. Zalta (Ed.), *The Stanford Encyclopedia of Philosophy* (Summer 2016). Metaphysics Research Lab, Stanford University. Retrieved from <https://plato.stanford.edu/archives/sum2016/entries/pragmatism/>
- Horowitz, M. C. (Ed.). (2005). *New Dictionary of the History of Ideas*. Farmington Hills: Thomson Gale.
- Hu, Z., Luo, G., Sachan, M., Xing, E., & Nie, Z. (2016). Grounding topic models with knowledge bases. In *Proceedings of the 24th International Joint Conference on Artificial Intelligence*.
- Hume, D. (1896). *A Treatise of Human Nature*. Oxford: Clarendon Press. (Work originally published 1739)
- Hume, D. (2007). *Traktaat Over de Menselijke Natuur*. (F. L. van Holthoon, Trans.). Amsterdam: Boom. (Work originally published 1739)
- Hume, D. (2008). *An Enquiry Concerning Human Understanding*. (P. J. R. Millican, Ed.) (Reissued). Oxford: Oxford Univ. Press. (Work originally published 1748)
- Humphrey, N. (2006). *Seeing Red: a Study in Consciousness*. Cambridge, Mass: Harvard University Press. (Work originally published 1748)
- Huron, D. B. (2006). *Sweet Anticipation: Music and the Psychology of Expectation*. Cambridge, Mass: MIT Press.
- Husserl, E. (1999). *Cartesian Meditations: an Introduction to Phenomenology*. (D. Cairns, Trans.) (12. impr). Dordrecht: Kluwer Academic Publishers (Cartesianische Meditationen, 1950).
- Huvila, I., Anderson, T. D., Jansen, E. H., McKenzie, P., & Worrall, A. (2017). Boundary objects in information science. *Journal of the Association for Information Science and Technology*, 68(8), 1807–1822.
- International Symposium on Performance Science, Williamon, A., Pretty, S., & Buck, R. (Eds.). (2009). *Proceedings of the International Symposium on Performance Science 2009*. Utrecht, The Netherlands: Association européenne des conservatoires, académies de musique et Musikhochschulen (AEC).
- Iser, W. (1993). *The Fictive and the Imaginary: Charting Literary Anthropology*. (D. Henry, Trans.) Baltimore: J. Hopkins University Press (Das Fiktive und das Imaginäre - Perspektiven literarischer Anthropologie, 1991).
- Jaell, M. (1897). *Le Mécanisme du Toucher: l'étude du piano par l'analyse expérimentale de la sensibilité tactile*. Paris: A. Colin. Retrieved from <http://archive.org/details/lemcanismeduto00jael>
- Jaëll, M. (1899). *Le Toucher, Enseignement du Piano basé sur la Phsysiologie*. Paris: Breitkopf & Hartel. Paris: Breitkopf & Hartel.
- James, W. (1890). *The Principles of Psychology, in two volumes*. New York: Henry Holt and Company.
- James, W. (1907). *Pragmatism, a new name for some old ways of thinking; popular lectures on philosophy*. New York: Longmans, Green, and Co.
- James, W. (1909). *The Meaning of Truth*. New York: Longmans, Green & Co.
- Jankélévitch, V. (2003). *Music and the Ineffable*. (C. Abbate, Trans.). Princeton, N.J: Princeton University Press (La Musique et l'Inéffable, 1961).
- Jarvis, P. (1999). *The Practitioner-Researcher: developing theory from practice*. San Francisco: Jossey-Bass.

- Jensenius, A. R., Wanderley, M. M., Godøy, R. I., & Leman, M. (2010). Musical Gestures: Concepts and Methods in Research. In R. I. Godøy & M. Leman (Eds.), *Musical gestures: sound, movement, and meaning* (pp. 12–35). New York: Routledge.
- Joaquin, A. D. L. (2013). Resonance in Dialogic Interaction. In A. D. L. Joaquin & J. H. Schumann (Eds.), *Exploring the interactional instinct* (pp. 57–87). Oxford; New York, NY: Oxford University Press.
- Johansson, G. (1973). Visual Perception of Biological Motion and a Model for its Analysis. *Perception & Psychophysics*, 14(2), 201–211.
- Johnson, M. (2006). Merleau-Ponty's Embodied Semantics - From Immanent Meaning, to Gesture, to Language. *EurAmerica*, 36(1), 1–27.
- Johnson, M. (2007). *The Meaning of the Body: aesthetics of human understanding*. Chicago: University of Chicago Press.
- Johnson, S. (1785, 1755). Fancy. In *A dictionary of the English language: in which the words are deduced from their originals, and illustrated in their different significations by examples from the best writers: to which are prefixed, a history of the language, and an English grammar* (2 volumes). (6th edition). London: J. F. And C. Rivington.
- Jung, C. G. (1968). *The Archetypes and the Collective Unconscious*. (R. F. C. Hull, Trans.) (2. ed.). London: Routledge. (Work originally published 1959)
- Juslin, P. N. (2013). What does music express? Basic emotions and beyond. *Frontiers in Psychology*, 4.
- Juslin, P. N., & Sloboda, J. A. (Eds.). (2001). *Music and Emotion: Theory and Research*. Oxford; New York: Oxford University Press.
- Juslin, P. N., & Sloboda, J. A. (Eds.). (2010). *Handbook of Music and Emotion: Theory, Research, and Applications*. Oxford; New York: Oxford University Press.
- Kagan, J. (2009). *The Three Cultures: Natural Sciences, Social Sciences, and the Humanities in the 21st Century*. Cambridge; New York: Cambridge University Press.
- Kahneman, D. (2003). A perspective on judgment and choice: Mapping bounded rationality. *American Psychologist*, 58(9), 697–720.
- Kahneman, D. (2011). *Thinking, fast and slow* (1st ed). New York: Farrar, Straus and Giroux.
- Kant, I. (1798). *Anthropologie in pragmatischer Hinsicht (Akademieausgabe von Immanuel Kants Gesammelten Werken, Band VII)*. Retrieved from <https://korpora.zim.uni-duisburg-essen.de/kant/aa07/>
- Kant, I. (1956). *Kritik der reinen Vernunft*. (R. Schmidt, Ed.). Hamburg: Felix Meiner Verlag. (Work originally published 1781/1787)
- Kant, I. (1974). *Anthropology from a Pragmatic Point of View*. (M. J. Gregor, Trans.). The Hague: Nijhoff. (Anthropologie in pragmatischer Hinsicht, 1798)
- Kant, I. (1986a). *Kritik der praktischen Vernunft (Nachdr.)*. Stuttgart: Reclam. (Work originally published 1788)
- Kant, I. (1986b). *Kritik der Urteilskraft (Nachdr.)*. Stuttgart: Reclam. (Work originally published 1790)
- Kant, I. (1996a). *Immanuel Kant: Practical philosophy*. (M. J. Gregor & A. W. Wood, Eds.). Cambridge: Cambridge University Press.
- Kant, I. (1996b). On the common saying: That may be correct in theory, but it is of no use in practice (1793). In M. J. Gregor & A. W. Wood (Eds.), *Immanuel Kant: Practical philosophy* (pp. 273–310). Cambridge: Cambridge University Press. (Über den Gemeinspruch: Das mag in der Theorie richtig sein, taugt aber nicht für die Praxis, 1793)

- Kant, I. (2000). *Critique of the Power of Judgment*. (P. Guyer, Ed., P. Guyer & E. Matthews, Trans.). Cambridge, UK; New York: Cambridge University Press (Kritik der Urteilkraft, 1790).
- Kant, I. (2004). *Kritiek van de Zuivere Rede*. (J. Veenbaas & W. Visser, Trans.). Amsterdam: Boom (Kritik der reinen Vernunft, 1781/1787).
- Kant, I. (2006). *Kritiek van de Praktische Rede*. (J. Veenbaas & W. Visser, Trans.). Amsterdam: Boom (Kritik der praktischen Vernunft, 1788).
- Kant, I. (2009). *Kritiek van het Oordeelsvermogen*. (J. Veenbaas & W. Visser, Trans.). Amsterdam: Boom (Kritik der Urteilkraft, 1790).
- Kant, I. (2010). *The Critique of Pure Reason*. (J. Manis, Ed., J. M. D. Meiklejohn, Trans.). The Electronic Classics Series (Kritik der reinen Vernunft, 1781/1787). Retrieved from <http://www.metaphysicspirit.com/books/The%20Critique%20of%20Pure%20Reason.pdf>
- Karvalics, L. Z. (2009). *Information Society Dimensions*. Szeged, Hungary: JATEpress.
- Kay, B. A., Turvey, M. T., & Meijer, O. G. (2003). An Early Oscillator Model: Studies on the Biodynamics of the Piano Strike (Bernstein & Popova, 1930). *Motor Control*, 7(1), 1–45.
- Kearney, R. (1988). *The Wake of Imagination: Toward a Postmodern Culture*. London: Routledge.
- Kearney, R. (1998). *Poetics of imagining: Modern to Post-Modern*. New York: Fordham University Press.
- Kenyon, N. (Ed.). (1988). *Authenticity and Early Music: a Symposium*. Oxford; New York: Oxford University Press.
- Kerman, J. (1985). *Contemplating Music: Challenges to Musicology*. Cambridge, Mass: Harvard Univ. Press.
- KEUDER. (2008). Evgeny Kissin plays Chopin- Mazurka op.67 no.4. Retrieved from <https://www.youtube.com/watch?v=qgOzDDPIFjI>
- Kind, A. (Ed.). (2016). *The Routledge Handbook of Philosophy of Imagination*. New York: Routledge.
- Kind, A. (n.d.). Imagery and Imagination. In *Internet Encyclopedia of Philosophy*. Retrieved from <http://www.iep.utm.edu/imagery/>
- King, Ri., J. (2007). The Emergence of a New Global Culture in the Imagination Age. In *talking Trans-Atlantic* (pp. 50–51).
- Kingsbury, H. (1988). *Music, Talent, and Performance: A Conservatory Cultural System*. Philadelphia: Temple University Press.
- Kitchin, R. (2014). Big Data, New Epistemologies and Paradigm Shifts. *Big Data & Society*, 1(1).
- Kivy, P. (1980). *The Corded Shell: reflections on musical expression*. Princeton: Princeton University Press.
- Kivy, P. (1997). *Authenticities: philosophical reflections on musical performance* (1st paperback print). Ithaca: Cornell Univ. Press.
- Kivy, P. (2002). On the Historically Informed Performance. *The British Journal of Aesthetics*, 42(2), 128–144.
- Kloppenburg, W. C. M. (1951). *De ontwikkelingsgang van de piano-methoden: Van het begin af tot aan de methode van Deppe (circa 1550 tot 1895)*. Utrecht Brussel: Uitgeverij Het Spectrum.
- Kloppenburg, W. C. M. (1992). *Pianomethoden van de 20ste eeuw*. Amsterdam: Broekmans & Van Poppel.
- Knighton, T., & Fallows, D. (1992). *Companion to Medieval and Renaissance Music*. University of California Press.
- Koch, I., & Kunde, W. (2002). Verbal response-effect compatibility. *Memory & Cognition*, 30(8), 1297–1303.

- Kochevitsky, G. A. (1967). *The Art of Piano Playing: a scientific approach*. Evanston, Ill.: Summy-Birchard Co.
- Kochevitsky, G. A. (2004). *Kochevitsky collection*. White Plains, NY: Pro/Am Music Resources.
- Kolb, D. A. (1984). *Experiential Learning: experience as the source of learning and development*. Englewood Cliffs, N.J.: Prentice-Hall.
- Kolbert, E. (2017, February). Why facts don't change our minds. *The New Yorker*. Retrieved from <http://www.newyorker.com/magazine/2017/02/27/why-facts-dont-change-our-minds>
- Koopman, C. (2007). Review: The Reflective Conservatoire: Studies in Music Education (eds. George Odam & Nicholas Bannan). *Dutch Journal of Music Theory (Special Issue, Practice-Based Research in Music)*, 12(1), 155–157.
- Koopman, T. (2008). *Authenticiteit in de Historische Uitvoeringspraktijk van de Oude Muziek*. Leiden : Faculteit der Kunsten, Universiteit Leiden.
- Kostagiolas, P., Martzoukou, K., & Lavranos, C. (Eds.). (2016). *Trends in Music Information Seeking, Behavior, and Retrieval for Creativity*. IGI Global.
- Kristeller, P. O. (1951). The Modern System of the Arts: A Study in the History of Aesthetics Part I. *Journal of the History of Ideas*, 12(4), 496-527.
- Kristeller, P. O. (1952). The Modern System of the Arts: A Study in the History of Aesthetics Part II. *Journal of the History of Ideas*, 13(1), 17-46.
- Kuhlthau, C. C. (1991). Inside the search process: Information seeking from the user's perspective. *Journal of the American Society for Information Science*, 42(5), 361–371.
- Kuhlthau, C. C. (2004). *Seeking Meaning: a Process Approach to Library and Information Services* (2nd ed). Westport, Conn: Libraries Unlimited.
- Kuijken, B. (2013). *The Notation Is Not the Music: Reflections on Early Music Practice and Performance*. Bloomington ; Indianapolis: Indiana University Press.
- Kunde, W. (2001). Response-effect compatibility in manual choice reaction tasks. *Journal of Experimental Psychology: Human Perception and Performance*, 27(2), 387–394.
- Kutik, Y. (2016, June). 10 views on the benefits of slow practice. *The Strad*. Retrieved from <http://www.thestrad.com/10-views-benefits-slow-practice/>
- Lakoff, G., & Johnson, M. (1980). *Metaphors we live by*. Chicago: University of Chicago Press.
- Lakoff, G., & Johnson, M. (1999). *Philosophy in the flesh: the embodied mind and its challenge to Western thought*. New York: Basic Books.
- Lalande, A. (1992). *Vocabulaire technique et critique de la philosophie*. Paris: Presses Univ. de France.
- Lane, R. E. (1966). The Decline of Politics and Ideology in a Knowledgeable Society. *American Sociological Review*, 31(5), 649–662.
- Langer, S. K. (1957). *Problems of art; ten philosophical lectures*. New York: Scribner.
- Lawson, C. (2007). Practising Research – Researching Practice. *Dutch Journal of Music Theory (Special Issue, Practice-Based Research in Music)*, 12(1), 57–65.
- Lawson, C., & Stowell, R. (Eds.). (2012). *The Cambridge History of Musical Performance*. Cambridge : New York: Cambridge University Press.
- Lawton, J. N. (2013). *Management of Hand Fractures, An Issue of Hand Clinics, E-Book*. Elsevier Health Sciences.
- Lee, R. E., Wallerstein, I. M., & Aytar, V. (Eds.). (2004). *Overcoming the Two Cultures: Science versus the Humanities in the Modern World-system*. Boulder, Colo: Paradigm Publishers.
- Lehmann, A. C., Sloboda, J. A., & Woody, R. H. (2007). *Psychology for Musicians: Understanding and Acquiring the Skills*. Oxford ; New York: Oxford University Press.

- Leimer, K., & Gieseeking, W. (1972). *Piano technique consisting of the two complete books The shortest way to pianistic perfection and Rhythmics, dynamics, pedal and other problems of piano playing*. New York: Dover Publications.
- Leman, M. (2008). *Embodied Music Cognition and Mediation Technology*. Cambridge, Mass: MIT Press.
- Leman, M., Lesaffre, M., & Maes, P.-J. (2017). *The Routledge Companion to Embodied Music Interaction*. New York: Routledge.
- Lenski, W. (2010). Information: A Conceptual Investigation. *Information*, 1(2), 74–118.
- Leong, D., & McNutt, E. (2005). Virtuosity in Babbitt's "Lonely Flute." *Music Theory Online*, 11(1).
- Leslie, A. M. (1987). Pretense and representation: The origins of "theory of mind." *Psychological Review*, 94(4), 412–426.
- Levinson, J. (1993). Performative vs. Critical Interpretation in Music. In M. Krausz (Ed.), *The Interpretation of music: philosophical essays* (pp. 33–60). Oxford: Oxford; New York: Clarendon Press; Oxford University Press.
- Levinson, J. (2006). *Contemplating Art: essays in aesthetics*. Oxford; New York: Clarendon Press; Oxford University Press.
- Levy, L. (2014). Sartre and Ricoeur on Productive Imagination: Sartre and Ricoeur on Productive Imagination. *The Southern Journal of Philosophy*, 52(1), 43–60.
- Lewin, K. (1964). *Field Theory in Social Science: Selected Theoretical Papers*. Harper and Row.
- Lewis, C., T., & Short, C. (1879). *A Latin Dictionary. Founded on Andrews' edition of Freund's Latin dictionary. revised, enlarged, and in great part rewritten by. Charlton T. Lewis, Ph.D. and. Charles Short, LL.D.* Oxford: Clarendon Press.
- Lieberman, A. M., & Mattingly, I. G. (1985). The motor theory of speech perception revised. *Cognition*, 21(1), 1–36.
- Liddell, H. G., & Scott, R. (1940). *A Greek-English lexicon* (Rev. and augm. throughout by Sir Henry Stuart Jones. with the assistance of Roderick McKenzie. With a revised supplement.). Oxford : New York: Clarendon Press ; Oxford University Press. Retrieved from <http://www.perseus.tufts.edu>
- Lister-Sink, B. (1996a). *Basic stroke*. retrieved from <https://www.youtube.com/watch?v=OjSWu8ZADzI>
- Lister-Sink, B. (1996b). *Freeing the Caged Bird: Developing Well-Coordinated, Injury-Preventive Piano Technique* [DVD].
- Livingstone, R. S., & Thompson, W. F. (2009). The emergence of music from the theory of mind. *Musicae Scientiae*, 13(2 Suppl), 83–115.
- Lobkowicz, N. (1967). *Theory and Practice: History of a Concept from Aristotle to Marx*. Notre Dame - London: University of Notre Dame Press.
- Lobkowicz, N. (1977). On the History of Theory and Praxis. In T. Ball (Ed.), *Political Theory and Praxis: New Perspectives* (pp. 13–27). Minneapolis: University of Minnesota.
- Locke, J. (1999). *An Essay Concerning Human Understanding by John Locke*. Retrieved from The Pennsylvania State University.
- Lukasiewicz, J. (1994). *The Ignorance Explosion: Understanding Industrial Civilization*. Ottawa: Carleton University Press.
- Lyotard, J.-F. (1979). *La Condition Postmoderne: Rapport sur le Savoir*. Paris: Éditions de Minuit.

- Lyotard, J.-F. (1984). *The Postmodern Condition: a Report on Knowledge*. (G. Bennington & B. Massumi, Trans.) (Repr). Manchester: University Press (*La condition postmoderne: rapport sur le savoir, 1979*).
- MacDonald, R. A. R., Hargreaves, D. J., & Miell, D. (Eds.). (2002). *Musical Identities*. Oxford; New York: Oxford University Press.
- MacDonald, R. A. R., Hargreaves, D. J., & Miell, D. (Eds.). (2016). *Handbook of Musical Identities*. New York, NY: Oxford University Press.
- Machlup, F. (1962). *The Production and Distribution of Knowledge in the United States*. Princeton, NJ: Princeton University Press.
- Machlup, F., & Mansfield, U. (Eds.). (1983). *The Study of Information: Interdisciplinary Messages*. New York: Wiley.
- MacIntyre, A. C. (2007). *After virtue: a study in moral theory* (3rd ed). Notre Dame, Ind: University of Notre Dame Press. (Work originally published 1981)
- MacKay, D. M. (1969). *Information, Mechanism and Meaning*. Cambridge, Mass: MIT Press.
- MacRitchie, J. (2015). The art and science behind piano touch: A review connecting multi-disciplinary literature. *Musicae Scientiae*, 19(2), 171–190.
- Madden, A. D. (2000). A definition of information. *Aslib Proceedings*, 52(9), 343–349.
- Madden, A. D. (2004). Evolution and Information. *Journal of Documentation*, 60(1), 9–23.
- Magee, C. (1993). The Age of Imagination: Coming Soon to a Civilization Near You (Vol. 1, pp. 95–98). Presented at the Proceedings of the Second International Symposium: “National Security & National competitiveness: open source solutions,” Omni Shoreham in Washington, D.C.
- Malloch, S., & Trevarthen, C. (Eds.). (2009a). *Communicative Musicality: Exploring the Basis of Human Companionship*. Oxford; New York: Oxford University Press.
- Malloch, S., & Trevarthen, C. (2009b). Musicality: communicating the vitality and interest of life. In S. Malloch & C. Trevarthen (Eds.), *Communicative Musicality: Exploring the Basis of Human Companionship*. Oxford; New York: Oxford University Press.
- Mansell, R. (Ed.). (2009). *The information society: critical concepts in sociology*. Milton Park, Abingdon, Oxon; New York: Routledge.
- Marcuse, H. (2009). *Negations: essays in critical theory*. (J. J. Shapiro, Trans.). London: MayFlyBooks.
- Martin, E. (2015). *Concise medical dictionary*. Oxford: Oxford University Press. (Work originally published 1968)
- Maslow, A. H. (1963). The Need to know and the Fear of Knowing. *The Journal of General Psychology*, 68(1), 111–125.
- Matherne, S. (2016). Kant’s theory of the imagination. In A. Kind (Ed.), *The Routledge Handbook of Philosophy of Imagination* (pp. 55–68). London; New York: Routledge, Taylor & Francis Group.
- Mathews, R. (2002). *Fantasy: the Liberation of Imagination* (1st Routledge paperback ed). New York: Routledge.
- Maton, K. (2010). Progress and canons in the arts and humanities: Knowers and gazes. In K. Maton & R. Moore (Eds.), *Social realism, knowledge and the sociology of education: coalitions of the mind* (pp. 154–178). London; New York: Continuum.
- Matsumoto, D. R. (Ed.). (2009). *The Cambridge Dictionary of Psychology*. Cambridge; New York: Cambridge University Press.
- Mattelat, A. (2003). *The Information Society: an Introduction*. London; Thousand Oaks, California: Sage.

- Matthay, T. (1903). *The Act of Touch in all its Diversity: an Analysis and Synthesis of Pianoforte Tone-production*. London: Bosworth & Co.
- Matthay, T. (1932). *The Visible and Invisible in Pianoforte Technique*. New York: Oxford University Press.
- Mattheson, J. (1739). *Der vollkommene Capellmeister*. Hamburg: Christian Herold.
- Mauss, M. (1934). *Les Techniques du Corps*. Retrieved from http://archive.wikiwix.com/cache/?url=http%3A%2F%2Fclassiques.uqac.ca%2Fclassiques%2Fmauss_marcel%2Fsocio_et_anthropo%2F6_Techniques_corps%2FTechniques_corps.html
- McCorduck, P. (1979). *Machines who think: a personal inquiry into the history and prospects of artificial intelligence* (25th anniversary update). Natick, Mass: A.K. Peters.
- McGrath, A. E. (2012). *Theology: the basics* (3rd ed). Malden, MA: Wiley-Blackwell.
- McLean, G. F. (2008). The emerging role of imagination. In P. Chkheidze, H. T. Tho, & I. Pas'ko (Eds.), *Symbols in cultures and identities in a time of global interaction* (pp. 11–35). Washington, D.C.: Council for Research in Values and Philosophy.
- McLuhan, M. (1962). *The Gutenberg galaxy: the making of typographic man* (1st ed). Toronto; Buffalo: University of Toronto Press.
- McLuhan, M. (1994). *Understanding Media: the Extensions of Man* (1st MIT Press ed). Cambridge, Mass: MIT Press.
- McNeill, W. H. (1995). *Keeping Together in Time: Dance and Drill in Human History*. Cambridge, Mass: Harvard University Press.
- McPherson, G., & Welch, G. (Eds.). (2012). *The Oxford Handbook of Music Education*. New York: Oxford University Press.
- Meelberg, V. (2006). *New Sounds, New stories: Narrativity in Contemporary Music*. Amsterdam: Leiden University Press.
- Mellon, C. A. (2015). Library Anxiety: A Grounded Theory and Its Development. *College & Research Libraries*, 76(3), 276–282.
- Menuhin, Y. (1972). Musicology vs. Performance. *Current Musicology*, 0(14), 142.
- Mercier, H., & Sperber, D. (2017). *The Enigma of Reason*. Cambridge, Massachusetts: Harvard University Press.
- Meyer, L. B. (1956). *Emotion and Meaning in Music*. Chicago: Univ. of Chicago Press.
- Meyer, L. B. (1957). Meaning in Music and Information Theory. *The Journal of Aesthetics and Art Criticism*, 15(4), 412–424.
- Miller, G. A. (1956). The magical number seven, plus or minus two: some limits on our capacity for processing information. *Psychological Review*, 63(2), 81–97.
- Miller, G. A. (1983). Informavores. In F. Machlup & U. Mansfield (Eds.), *The Study of information: interdisciplinary messages* (pp. 111–113). New York: Wiley.
- Mirandola, G. F. P. D. (1930). *On the Imagination, the Latin Text with an Introduction, an English Translation, and Notes*. (H. Caplan, Trans.). Pub. For Cornell University, Yale University Press H. Milford, Oxford University Press (De imaginatione sive phantasia, 1500).
- Misak, C. (2008). Belief. In J. Lachs & R. B. Talisse (Eds.), *American philosophy: an encyclopedia* (pp. 75–76). New York: Routledge.
- Mithen, S. J. (1988). Looking and Learning: Upper Palaeolithic Art and Information Gathering. *World Archaeology*, 19(3), 297–327.
- Mithen, S. J. (1996). *The Prehistory of the Mind: a search for the origins of art, religion and science*. London: Phoenix.

- Mithen, S. J. (2001). The Evolution of Imagination: An Archaeological Perspective. *SubStance*, 30(1), 28–54.
- Mithen, S. J. (2005). *The Singing Neanderthals: the Origins of Music, Language, Mind and Body*. London: Weidenfeld & Nicolson.
- Mizoguchi, R., & Ikeda, M. (1998). Towards Ontology Engineering. *Journal-Japanese Society for Artificial Intelligence*, 13, 9–10.
- Moelants, D. (Ed.). (2010). *Partimento and Continuo Playing in Theory and in Practice*. Leuven: Leuven University Press.
- Moelants, D. (Ed.). (2014). *Improvising Early Music: the History of Musical Improvisation from the late Middle Ages to the early Baroque*. Leuven: Leuven University Press.
- Mohr, J. W., & Bogdanov, P. (2013). Introduction—Topic models: What they are and why they matter. *Poetics*, 41(6), 545–569.
- Monelle, R. (2000). *The sense of music: semiotic essays*. Princeton, N.J: Princeton University Press.
- Moore, C., & Dunham, P. J. (Eds.). (1995). *Joint attention: its origins and role in development*. Hillsdale, N.J: Lawrence Erlbaum Associates.
- Morsella, E. (2009). The Mechanisms of Human Action: Introduction and Background. In E. Morsella, J. A. Bargh, & P. M. Gollwitzer (Eds.), *Oxford handbook of human action* (pp. 1–34). Oxford ; New York: Oxford University Press.
- Mulder, T. (2002). *De Geboren Aanpasser: over beweging, bewustzijn en gedrag*. Amsterdam: Uitgeverij Contact.
- Murray, P. (1981). Poetic Inspiration in Early Greece. *The Journal of Hellenic Studies*, 101, 87.
- MusicFrame Films. (2015). *Interview with the Kuijken brothers*. Retrieved from <https://www.youtube.com/watch?v=Epf2gEe0O7Q>
- Narmour, E. (1977). *Beyond Schenkerism: the need for alternatives in music analysis*. Chicago: University of Chicago Press.
- Narmour, E. (1990). *The analysis and cognition of basic melodic structures: the implication-realization model*. Chicago: University of Chicago Press.
- Neisser, U. (2014). *Cognitive psychology*. New York: Psychologyc Press. (Original Work Published 1967)
- Neuhaus, H. (1973). *The Art of Piano Playing*. (K. A. Leibovitch, Trans.). New York & Washington: Praeger Publishers.
- Newell, A., Shaw, J. C., & Simon, H. A. (1958). Elements of a theory of human problem solving. *Psychological Review*, 65(3), 151–166.
- Nightingale, A. W. (2004). *Spectacles of truth in classical Greek philosophy: theoria in its cultural context*. Cambridge, U.K.; New York: Cambridge University Press.
- Noë, A. (2006). *Action in Perception*. Cambridge, Mass: MIT Press.
- Nowacek, D., & Teener, J. (2013). Multifocal Motor Neuropathy. *Seminars in Neurology*, 32(5), 500–505.
- Nowotny, H., Scott, P., & Gibbons, M. (2003). Introduction: ‘Mode 2’ Revisited: The New Production of Knowledge. *Minerva*, 41(3), 179–194.
- Noy, N. F., & McGuiness, D. L. (2001). *Ontology Development 101: A Guide to Creating Your First Ontology* (Technical Report). Stanford Knowledge Systems Lab/Stanford Medical Informatics.
- Nyrnes, A. (2006). Lighting from the Side: Rhetoric and Artistic Research. *Sensuous Knowledge Journal: “Focus on Artistic Research and Development”*, 3.

- Odam, G., & Bannan, N. (Eds.). (2005). *The reflective conservatoire: studies in music education*. London: Aldershot, Hants, England: Guildhall School of Music & Drama; Ashgate.
- O'Dea, J. (1993). Phronesis in Musical Performance. *Journal of Philosophy of Education*, 27(2), 233–243.
- Ohriner, M. (2014). Elicited Asynchronies in Recorded Performances of Chopin's Mazurkas. *Empirical Musicology Review*, 9(2), 101.
- Ortmann, O. (1925). *The Physical Basis of Piano Touch and Tone*. London: Kegan Paul, Trench, Trubner.
- Ortmann, O. (1929). *The Physiological Mechanics of Piano Technique*. London: Kegan Paul, Trench, Trubner.
- Overill, R., E. (2012). Information Theory. In *Grove Music Online*. Oxford Music Online. Oxford University Press.
- Oxford English Dictionary. (n.d.-a). "imagination, n."
- Oxford English Dictionary. (n.d.-b). "information, n."
- Palti, R., & Vigler, M. (2012). Anatomy and Function of Lumbrical Muscles. *Hand Clinics*, 28(1), 13–17.
- Papoušek, H., & Papoušek, M. (1981). Musical elements in the infant's vocalizations: Their significance for communication, cognition, and creativity. In L. P. Lipsitt & C. Rovee-Collier (Eds.), *Advances in infancy research*. Vol. 1 (pp. 163–224). Stamford; London: Ablex Publishing Corporation.
- Papoušek, M. (1996). Intuitive patenting: A hidden source of musical stimulation in infancy. In I. Deliège & J. Sloboda (Eds.), *Musical Beginnings. Origins and development of musical competence* (pp. 88–112). Oxford: Oxford University Press.
- Pappas, N. (2013). *The Routledge Guidebook to Plato's Republic*. New York: Routledge.
- Parncutt, R., & McPherson, G. (Eds.). (2002). *The Science & Psychology of Music Performance: creative strategies for teaching and learning*. Oxford; New York: Oxford University Press.
- Parrott, A., & Da Costa, N. (n.d.). Performance Practice. In *The Oxford Companion to Music*.
- Parry, R. (2014). Episteme and Techne. In E. N. Zalta (Ed.), *The Stanford Encyclopedia of Philosophy* (Fall 2014). Metaphysics Research Lab, Stanford University. Retrieved from <https://plato.stanford.edu/archives/fall2014/entries/episteme-techne/>
- Pashler, H. (Ed.). (2004). *Attention*. Hove: Psychology Press.
- Peirce, C. S. (1877). The Fixation of Belief. *Popular Science Monthly*, 12, 1–15.
- Peirce, C., S. (1878). How to Make Our Ideas Clear. *Popular Science Monthly*, 12, 286–302.
- Perna, M. A. (2001). Imagination & Creativity in Jean-Paul Sartre. *Philosophy Now*, 32.
- Persson, R. S. (2001). The subjective world of the performer. In P. N. Juslin & J. A. Sloboda (Eds.), *Music and Emotion: theory and research* (pp. 275–289). Oxford; New York: Oxford University Press.
- Peters, J. D. (1988). Information: Notes Toward a Critical History. *Journal of Communication Inquiry*, 12(2), 9–23.
- Pfeiffer, J. E. (1982). *The Creative Explosion: an Inquiry into the Origins of Art and Religion*. New York: Harper & Row.
- Pfeiffer, J., E. (1983). Was Europe's Fabulous Cave Art the Start of the Information Age? *Smithsonian*, 14(1), 36–45.
- Philostratus, F. (1912). *The life of Apollonius of Tyana: in two volumes. 1: Books I - V*. (F. C. Conybeare, Trans.) (Reprinted). Cambridge, Mass.: Harvard Univ. Press.

- Piaget, J. (1945). *La formation du symbole chez l'enfant: imitation, jeu et rêve, image et représentation*. Paris: Delachaux et Niestlé.
- Piaget, J. (1951). *Play, dreams and imitation in childhood*. (C. Cattegno & F. M. Hodgson, Trans.). London: Routledge (La formation du symbole chez l'enfant; imitation, jeu et rêve, image et représentation, 1945).
- Pierce, A. (2007). *Deepening musical performance through movement: the theory and practice of embodied interpretation*. Bloomington: Indiana University Press.
- Pieters, J. (2007). *Beste Lezer,: een inleiding in de algemene literatuurwetenschap*. Gent: Academia Press.
- Pirolli, P. (2007). *Information foraging theory: adaptive interaction with information*. Oxford; New York: Oxford University Press.
- Plutchik, R. (1980). A General Psychoevolutionary Theory of Emotion. In R. Plutchik & H. Kellerman (Eds.), *Theories of emotion* (pp. 3–34). New York: Academic Press.
- Polanyi, M. (1958). *Personal knowledge: towards a post-critical philosophy*. London: Routledge.
- Polanyi, M. (1966). *The tacit dimension*. New York: Doubleday.
- Poovey, M. (1998). *A history of the modern fact: problems of knowledge in the sciences of wealth and society*. Chicago: University of Chicago Press.
- Popper, K. R. (1978). Three Worlds. Presented at the The Tanner Lectures on Human Values, Michigan: University of Michigan. Retrieved from http://tannerlectures.utah.edu/_documents/a-to-z/p/popper80.pdf
- Porter, J. R. (1993). creation. In B. M. Metzger & M. D. Coogan (Eds.), *The Oxford Companion to the Bible*. New York: Oxford University Press.
- Postill, J. (2010). Introduction: Theorising Media and Practice. In B. Bräuchler & J. Postill (Eds.), *Theorising media and practice* (pp. 1–34). New York: Berghahn Books.
- Poulin, P. L. (1990). A View of Eighteenth-Century Musical Life and Training: Anton Stadler's "Musick Plan." *Music & Letters*, 71(2), 215–224.
- Pratt, A. D. (1977). The Information of the Image. *Libri*, 27(1), 204–220.
- Pratt, A. D. (1998). *Information of the image*. Greenwich, Conn: Ablex Pub.
- Preminger, A., & Brogan, T. V. F. (Eds.). (1993). *The New Princeton encyclopedia of poetry and poetics*. Princeton, N.J: Princeton University Press.
- Preus, A. (2007). *Historical dictionary of ancient Greek philosophy*. Lanham, Md: Scarecrow Press.
- Randel, D. M. (Ed.). (2003). *The Harvard Dictionary of Music* (4th ed). Cambridge, Mass: Belknap Press of Harvard University Press.
- Ratner, L. G. (1980). *Classic Music: Expression, Form, and Style*. New York: Schirmer Books.
- Ratner, L. G. (1983). *The Musical Experience: sound, movement, and arrival*. New York: W.H. Freeman.
- Reale, G. (1990). *A History of Ancient Philosophy*. (J. R. Catan, Trans.). Albany: State University of New York Press.
- Reckwitz, A. (2002). Toward a Theory of Social Practices: A Development in Culturalist Theorizing. *European Journal of Social Theory*, 5(2), 243–263.
- Refsum, G. (2009). *Personal theory towards a model of knowledge development for design practitioners*. Presented at the Nordic Design Research Conferences. Retrieved from retrieved 19 september 2012 from <http://ocs.sfu.ca/nordes/index.php/nordes/2007/paper/view/149/103>.

- Regelski, T. A. (1998). The Aristotelian Bases of Praxis for Music and Music Education as Praxis. *Philosophy of Music Education Review*, 6(1), 22–59.
- Reid, T. R. (2001). *The chip: how two Americans invented the microchip and launched a revolution* (Rev. ed). New York: Random House.
- Reybrouck, M. (2008). The Musical Code between Nature and Nurture: Ecosemiotic and Neurobiological Claims. In M. Barbieri (Ed.), *The codes of life: the rules of macroevolution* (pp. 395–434). New York: Springer.
- Reybrouck, M., & Maeder, C. (Eds.). (2015). *Music, analysis, experience new perspectives in musical semiotics*. Leuven: Leuven University Press.
- Rich, R. F. (1975). Selective Utilization of Social Science Related Information by Federal Policy-makers. *Inquiry*, 12(3), 239–245.
- Ricœur, P. (1977). *History and truth*. (C. Kelbley, Trans.). Evanston: Northwestern University Press (Histoire et Vérité, 1955).
- Ricoeur, P. (1978). Imagination in Discourse and in Action. In A.-T. Tymieniecka (Ed.), *Analecta Husserliana, the yearbook of phenomenological research, volume VII: The Human Being in Action*. (pp. 3–22). Dordrecht: Springer Netherlands.
- Ricoeur, P. (1981). Sartre and Ryle on the Imagination. In P. A. Schilpp (Ed.), *The Philosophy of Jean-Paul Sartre* (pp. 167–178). La Salle, Illinois: Open Court.
- Riordan, M., & Hoddeson, L. (1998). *Crystal fire: the invention of the transistor and the birth of the information age*. New York: Norton.
- Riordan, M., Hoddeson, L., & Herring, C. (1999). The invention of the transistor. *Reviews of Modern Physics*, 71(2), S336–S345.
- Ritterman, J. (2002). *Musical performance: a guide to understanding*. (J. Rink, Ed.). Cambridge; New York: Cambridge University Press.
- Rizzolatti, G., & Arbib, M. A. (1998). Language within our grasp. *Trends in Neurosciences*, 21(5), 188–194.
- Robins, K., & Webster, F. (1999). *Times of the technoculture: from the information society to the virtual life*. London; New York: Routledge.
- Rochat, P. (Ed.). (1999). *Early social cognition: understanding others in the first months of life*. Mahwah, N.J: Lawrence Erlbaum Associates.
- Rorty, R. (1979). *Philosophy and the mirror of nature*. Princeton: Princeton University Press.
- Rosenstiel, L. (1972). Introduction and Overview. *Current Musicology*, 0(14), 81.
- Ross, L., Lepper, M. R., & Hubbard, M. (1975). Perseverance in self-perception and social perception: Biased attributional processes in the debriefing paradigm. *Journal of Personality and Social Psychology*, 32(5), 880–892.
- Rowley, J. (1998). What is information? *Information Services & Use*, 18, 243–254.
- Rupert, D. (1963). *The physiological errors and the reshaping of piano technique*. University of Rochester, Rochester.
- Ryan, R. M. (Ed.). (2012). *The Oxford Handbook of Human Motivation*. New York: Oxford University Press.
- Rylander, A. (2012). *Pragmatism and Design Research - an overview*. Designfakultetens kunskapssammanställningar, KTH.
- Ryle, G. (1949). *The concept of mind*. London: Hutchinson & Company.
- Sanders, G., & Perez, M. (2007). Sex Differences in Performance with the Hand and Arm in near and Far Space: A Possible Effect of Tool Use. *Evolutionary Psychology*, 5(4), 786–800.

- Sándor, G. (1981). *On Piano Playing: Motion, Sound, and Expression*. New York: London: Schirmer Books; Collier Macmillan.
- Sartre, J.-P. (1988). *"What is literature?" and other essays*. (S. Ungar, Ed.). Cambridge, Mass: Harvard University Press.
- Sartre, J.-P. (2001). *The psychology of imagination*. London: Routledge (L'Imaginaire : psychologie phénoménologique de l'imagination, 1940).
- Sartre, J.-P. (2004). *The imaginary: a phenomenological psychology of the imagination*. (A. Elkaïm-Sartre, Ed., J. Webber, Trans.). London; New York: Routledge (L'Imaginaire : psychologie phénoménologique de l'imagination, 1940).
- Sartre, J.-P. (2007). *L' imagination* (Réimpr. de la 6. éd). Paris: Presses Univ. de France (L'Imagination, 1936).
- Schatzki, T. R. (1996). *Social practices: a Wittgensteinian approach to human activity and the social*. New York: Cambridge University Press.
- Schatzki, T. R., Knorr-Cetina, K., & Savigny, E. von (Eds.). (2001). *The practice turn in contemporary theory*. New York: Routledge.
- Schenker, H. (1935). *Der Freie Satz*. Vienna: Universal Edition.
- Schlutz, A. M. (2009). *Mind's world: imagination and subjectivity from Descartes to Romanticism*. Seattle, WA: University of Washington Press.
- Schmidt, R. A., & Lee, T. D. (2011). *Motor control and learning: a behavioral emphasis* (5th ed). Champaign, IL: Human Kinetics.
- Schneider, A., & Godøy. (2001). perspectives and challenges of musical imagery. In R. I. Godøy & H. Jørgensen (Eds.), *Musical imagery* (pp. 5–26). Lisse: Swets & Zeitlinger Publ.
- Schoenberg, A. (1978). *Theory of Harmony*. Berkeley: University of California Press (Harmonielehre, 1911).
- Schön, D. A. (1983). *The Reflective Practitioner: how professionals think in action*. New York: Basic Books.
- Schön, D. A. (1987). *Educating the Reflective Practitioner: toward a new design for teaching and learning in the professions*. San Francisco: Jossey-Bass.
- Schooler, J. W., & Melcher, J. (1995). The ineffability of insight. In S. M. Smith, T. B. Ward, & R. A. Finke (Eds.), *The creative cognition approach /: edited by Steven M. Smith, Thomas B. Ward, and Ronald A. Finke* (pp. 1997–134). Cambridge, Mass: MIT Press.
- Schopenhauer, A. (1844). *Die Welt als Wille und Vorstellung*. Retrieved from <http://www.zeno.org/nid/2000926678X>
- Schopenhauer, A. (1909). *The World as Will and Idea. Vol. I, II & III*. (R. B. Haldane & J. Kemp, Trans.). London: Kegan Paul, Trench, Trubner & Co (Die Welt als Wille und Vorstellung, 1844). Retrieved from <http://www.gutenberg.org/>
- Schopenhauer, A. (2012). *De wereld als wil en voorstelling*. (M. Doorman, Ed., H. Driessen, Trans.). Amsterdam: Wereldbibliotheek (Die Welt als Wille und Vorstellung, 1844).
- Schwab, M. (2011). Editorial. *Journal for Artistic Research (JAR)*, 0.
- Scott, J. (2014). *A Dictionary of Sociology*. Oxford: Oxford University Press.
- Scott, J., & Marshall, G. (Eds.). (2009). *A Dictionary of Sociology* (3rd ed. rev). Oxford; New York: Oxford University Press.
- Scribner, S. (2001). imagination. In V. E. Taylor & C. E. Winqvist (Eds.), *Encyclopedia of postmodernism* (pp. 186–187). London; New York: Routledge.

- Scruton, R. (1982). *Art and Imagination: a Study in the Ophilosophy of Mind*. London; Boston: Routledge & Kegan Paul.
- Scully, V. (2009). *Architecture: the Natural and the Manmade*. New York: St. Martin's Press.
- Seaton, D. (Ed.). (2001). *The Mendelssohn companion*. Westport, CT: Greenwood Press.
- Seaton, D. (2014). Plot and Narrative in Mendelssohn's Chamber Music for Strings and Piano. In W. Brooks (Ed.), *Ohne Worte: vocality and instrumentality in 19th-century music* (pp. 147–200). Leuven: Leuven Univ. Press.
- Seiffert, H. (1971). *Information über die Information: Verständigung im Alltag, Nachrichtentechnik, wissenschaftliches Verstehen, Informationssoziologie, das Wissen des Gelehrten*. München: Beck.
- Shannon, C. E. (1948). A Mathematical Theory of Communication. *Bell System Technical Journal*, 27(3), 379–423.
- Shannon, C. E., & Weaver, W. (1949). *The mathematical theory of communication*. Urbana: Univ. of Illinois Press.
- Shelley, P. B. (1904). *a Defense of Poetry*. Indianapolis: the Bobbs-Merrill Company.
- Shiner, L. E. (2001). *The Invention of Art: a Cultural History*. Chicago: University of Chicago Press.
- Sicilia, M.-A. (2006). Metadata, semantics, and ontology: providing meaning to information resources. *International Journal of Metadata, Semantics and Ontologies*, 1(1), 83.
- Sidney, P. (1890). *The Defense of Poesy: otherwise known as an Apology for Poetry / Sir Philip Sidney; edited with introduction and notes by Albert S. Cook*. Boston: Ginn & Company. (Work originally published 1595)
- Simon, C. (2013). *En toen wisten we alles: een pleidooi voor oppervlakkigheid*. Amsterdam: Ambo.
- Simon, H., A. (1971). Designing organizations for an information-rich world. In M. Greenberger (Ed.), *Computers, communications, and the public interest*. Baltimore: Johns Hopkins Press.
- Slingerland, E. G. (2008). *What science offers the humanities: integrating body and culture*. Cambridge; New York: Cambridge University Press.
- Slingerland, E. G., & Collard, M. (Eds.). (2012). *Creating Consilience: integrating the Sciences and the Humanities*. New York: Oxford University Press.
- Sloboda, J. A. (2005). *Exploring the musical mind: cognition, emotion, ability, function*. Oxford ; New York: Oxford University Press.
- Sloman, S. A., & Fernbach, P. (2017). *The knowledge illusion: why we never think alone*.
- Small, C. (1998). *Musicking: the meanings of performing and listening*. Hanover: University Press of New England.
- Snow, C. P., & Collini, S. (2012). *The Two Cultures*. Cambridge, U.K.; New York: Cambridge University Press. (Work originally published 1959)
- Snyder, B. (2000). *Music and Memory: an introduction*. Cambridge, Mass: MIT Press.
- Snyder, T. (2017). *On tyranny: twenty lessons from the twentieth century*. New York: Tim Duggan Books.
- Soetewey, M., & T'Seyen, E. (2010). Barthold Kuijken. Aantekeningen van een autodidact. VRT Cultuur voor Canvas.
- Sokal, A. D. (1996a). Transgressing the Boundaries: Toward a Transformative Hermeneutics of Quantum Gravity. *Social Text*, (46/47), 217–252.
- Sokal, A. D. (1996b). Transgressing the Boundaries: An Afterword. *Philosophy and Literature*, 20(2), 338–346.

- Solymosi, T. (2011). A reconstruction of freedom in the age of neuroscience: A view from neuropragmatism. *Contemporary Pragmatism*, 8(1), 153–171.
- Solymosi, T. (2013). Can the Two Cultures Reconcile? Reconstruction and Neuropragmatism. In D. D. Franks & J. H. Turner (Eds.), *Handbook of neurosociology* (pp. 83–98). New York: Springer.
- Sorrentino, R. M., & Higgins, E. T. (Eds.). (1986). *Handbook of motivation and cognition: foundations of social behavior*. New York: Guilford Press.
- Spink, A. (2010). *Information behavior: an evolutionary instinct*. Dordrecht; New York: Springer.
- Spinozzi, P. (2010). The Origin of Art: Towards Humanistic-Scientific Theories and Methodologies. In P. Spinozzi & A. Zironi (Eds.), *Origins as a paradigm in the sciences and in the humanities* (pp. 59–80). Göttingen: V & R Unipress.
- Spinozzi, P., & Zironi, A. (Eds.). (2010). *Origins as a paradigm in the sciences and in the humanities*. Göttingen: V & R Unipress.
- Spyns, P., Meersman, R., & Jarrar, M. (2002). Data Modelling Versus Ontology Engineering. *SIGMOD Rec.*, 31(4), 12–17.
- St. Augustine. (1886). *The Confessions and Letters of St. Augustin, with a Sketch of his Life and Work*. (P. Schaff, Trans.). New York: Christian Literature Publishing Co. Retrieved from http://www.documentacatholicaomnia.eu/03d/1819-1893,_Schaff,_Philip,_2_Vol_01_St._Augustine's_Life._Confessions._Letters,_EN.pdf
- St. Victor, H. of. (1961). *The Didascalicon of Hugh of St. Victor. A Medieval Guide to the Arts*. (J. Taylor, Trans.). New York; London: Columbia University Press.
- Stanislavsky, K. (1948). *Rabota Aktera Nad Soboi [the actor works]*. Moscow: Khudozhestvennaya Literatura.
- Star, S. L., & Griesemer, J. R. (1989). Institutional Ecology, 'Translations' and Boundary Objects: Amateurs and Professionals in Berkeley's Museum of Vertebrate Zoology, 1907-39. *Social Studies of Science*, 19(3), 387–420.
- Stehr, N., & Ericson, R. V. (Eds.). (1992). *The Culture and power of knowledge: inquiries into contemporary societies*. Berlin; New York: W. de Gruyter.
- Stehr, N., & Ufer, U. (2009). On the global distribution and dissemination of knowledge. *International Social Science Journal*, 60(195), 7–24.
- Steinberg, R. (Ed.). (1995). *Music and the Mind Machine*. Berlin, Heidelberg: Springer Berlin Heidelberg. Retrieved from <http://link.springer.com/10.1007/978-3-642-79327-1>
- Steinhausen, F. A. (1905). *Über die physiologischen Fehler und die Umgestaltung der Klaviertechnik*. Leipzig: Breitkopf & Härtel.
- Stenzl, J. (1995). In Search of a History of Musical Interpretation. *The Musical Quarterly*, 79(4), 683–699.
- Stern, D. N. (1985). *The interpersonal world of the infant: a view from psychoanalysis and developmental psychology*. London: Karnac Books.
- Stern, D.N. (1999). Vitality Contours: The Temporal Contour of Feelings as a Basic Unit for Constructing the Infant's Social Experience. In P. Rochat (Ed.), *Early social cognition: understanding others in the first months of life* (pp. 67–80). Mahwah, N.J: Lawrence Erlbaum Associates.
- Stern, D. N. (2010). *Forms of Vitality: Exploring Dynamic Experience in Psychology, the Arts, Psychotherapy, and Development*. Oxford; New York: Oxford University Press.

- Stichweh, R. (2001). Scientific Disciplines, History of. In N. J. Smelser & P. B. Baltes (Eds.), *International encyclopedia of the social & behavioral sciences* (1st ed, pp. 13727–13731). Amsterdam; New York: Elsevier.
- Stokes, D. (2016). The Role of Imagination in Creativity. In E. S. Paul & S. B. Kaufman (Eds.), *The philosophy of creativity: new essays* (pp. 157–184). New York: Oxford University Press.
- Stowell, R. (2012). The evidence. In C. Lawson & R. Stowell (Eds.), *The Cambridge History of Musical Performance* (pp. 63–104). Cambridge: New York: Cambridge University Press.
- Stravinsky, I. (1947). *Poetics of Music, in the form of six lessons*. (A. Knodel & I. Dahl, Trans.). Cambridge: Harvard University Press.
- Sudnow, D., & Dreyfus, H. L. (2001). *Ways of the hand: a rewritten account*. Cambridge, Mass: MIT Press.
- Sutcliffe, W. D. (2014). Topics in Chamber Music. In D. Mirka (Ed.), *The Oxford handbook of topic theory* (pp. 118–140). New York, NY: Oxford University Press.
- Taruskin, R. (1988). The Pastness of the Present and the Presence of the Past. In N. Kenyon (Ed.), *Authenticity and early music: a symposium* (pp. 137–207). Oxford; New York: Oxford University Press.
- Taruskin, R. (1995). *Text and act: essays on music and performance*. New York: Oxford University Press.
- Taylor, G. H. (2006). Ricoeur's Philosophy of Imagination. *Journal of French and Francophone Philosophy*, 16(1/2), 93–104.
- Taylor, R. (1982). Value-Added Processes in the Information Life Cycle. *Journal of the American Society for Information Science*, 33(5), 341.
- Taylor, R. S. (1986). *Value-added processes in information systems*. Norwood, N.J: Ablex Pub. Corp.
- Taylor, R., S. (1991). Information Use Environments. In B. Dervin & M. J. Voigt (Eds.), *Progress in Communication Sciences* (pp. 217–255). Norwood, N.J: Ablex Publishing Corporation.
- Thorndike, E. L. (1905). *The elements of psychology*. New York: A.G. Seiler.
- Toffler, A. (1980). *The Third Wave*. New York: Bantam Books.
- Tomasello, M. (1999). *The Cultural Origins of Human Cognition*. Cambridge, Mass: Harvard University Press.
- Tomasello, M., & Carpenter, M. (2007). Shared intentionality. *Developmental Science*, 10(1), 121–125.
- Tomasello, M., Carpenter, M., Call, J., Behne, T., & Moll, H. (2005). Understanding and sharing intentions: The origins of cultural cognition. *Behavioral and Brain Sciences*, 28(5).
- Trehub, S. E., Schellenberg, E. G., & Hill, D. S. (1997). Perception and Cognition of Music. In I. Deliège & J. Sloboda (Eds.), *The origins of music perception and cognition: A developmental perspective* (pp. 103–128). Hove, England: Psychology Press.
- Trevarthen, C. (1979). Communication and cooperation in early infancy. A description of primary intersubjectivity. In M. Bullowa (Ed.), *Before Speech: The Beginning of Interpersonal Communication* (first edition, pp. 321–347). Cambridge; New York: Cambridge University Press.
- Trevarthen, C. (1999). Musicality and the Intrinsic Motive Pulse: Evidence from Human Psychobiology and Infant Communication. *Musicae Scientiae*, 3(1 suppl), 155–215.
- Tureck, R. (1972). Toward a Unity of Performance and Musicology. *Current Musicology*, 0(14), 164–172.

- Turing, A. M. (1937). On Computable Numbers, with an Application to the Entscheidungsproblem. *Proceedings of the London Mathematical Society*, s2-42(1), 230–265.
- Turner, B. S. (Ed.). (2006). *The Cambridge dictionary of sociology*. Cambridge [England] ; New York: Cambridge University Press.
- Turner, M. (2006). Prologue. In M. Turner (Ed.), *The artful mind: cognitive science and the riddle of human creativity* (pp. xv–xvi). Oxford; New York: Oxford University Press.
- Turner, S. P. (1994). *The social theory of practices: tradition, Tacit knowledge and presuppositions*. Cambridge: Polity Press.
- UNESCO. (2005). *Towards Knowledge Societies*. Paris: Unesco Publ.
- Uschold, M., & Gruninger, M. (1996). Ontologies: principles, methods and applications. *The Knowledge Engineering Review*, 11(2), 93–136.
- Usher, R., & Bryant, I. (1989). *Adult Education as Theory, Practice, and Research: The Captive Triangle*. Taylor & Francis.
- Usher, R., Bryant, I., & Johnston, R. (1997). *Adult education and the postmodern challenge: learning beyond the limits*. London; New York: Routledge.
- Usher, R., Bryant, I., & Johnston, R. (2003). Reconceptualising Theory and Practice. In D. Scott (Ed.), *Curriculum studies* (Vol. I, pp. 373–392). London; New York: RoutledgeFalmer.
- Vanmaele, J. (2014). *Crossing Borders: extra-disciplinary explorations*. Presented at the DocArtes-meeting (doctoral curriculum in the arts), Ghent.
- Vanmaele, J. (2017a). F. Chopin Mazurka op.67 nr.4 [fragment] (monadic focus). Gent: Rode Kamer Orpheus Instituut. <https://vimeo.com/231298237> [Password: JoostPhD].
- Vanmaele, J. (2017b). F. Chopin Mazurka op.67 nr.4 [fragment] (dyadic-entrainment focus). Gent: Rode Kamer Orpheus Instituut. <https://vimeo.com/231297883> [Password: JoostPhD]
- Vanmaele, J. (2017c). F. Chopin Mazurka op.67 nr.4 (quadratic mimetic focus). Gent: Rode Kamer Orpheus Instituut. <https://vimeo.com/231296869> [Password: JoostPhD]
- Varela, F. J., Thompson, E., & Rosch, E. (1991). *The embodied mind: cognitive science and human experience*. Cambridge, Mass: MIT Press.
- Vattimo, G. (1991). *The end of modernity: nihilism and hermeneutics in postmodern culture*. Baltimore: Johns Hopkins University Press.
- Vattimo, G. (1992). *The transparent society*. (D. Webb, Trans.). Cambridge: Polity Press (La società trasparente, 1989).
- Vermaas, P. E. (Ed.). (2011). *A Philosophy of Technology: from technical artefacts to sociotechnical systems*. San Rafael, Calif.: Morgan & Claypool.
- Vincenzo V. (2012). *Mozart sonata in C K.545 2nd mov, Mitsuko Uchida Piano*. Retrieved from <https://www.youtube.com/watch?v=Gj4LjyTOMD0>
- Vlaams Ministerie van Onderwijs en Vorming. (2015). CONCEPTNOTA DKO: Conceptnota van de Vlaamse Regering op voorstel van Vlaams Minister van Onderwijs Hilde Crevits. Retrieved from <https://onderwijs.vlaanderen.be/sites/default/files/atoms/files/Conceptnota-dko.pdf>
- Vygotsky, L.S. (1998) *The Collected Works of L.S. Vygotsky*. Volume 5: Child Psychology. (R.W. Rieber ed.; M.J. Hall, Transl.). New York, Plenum Press.
- Vygotsky, L. S. (2004). Imagination and Creativity in Childhood. *Journal of Russian & East European Psychology*, 42(1), 7–97 (Voobrazhenie i tvorchestvo v detskom vozraste, 1930)
- Walls, P. (2003). *History, Imagination, and the Performance of Music*. Woodbridge, Suffolk; Rochester, NY: Boydell Press.

- Walton, K. L. (1990). *Mimesis as Make-believe: on the foundations of the representational arts*. Cambridge, Mass.: Harvard University Press.
- Warnock, M. (1978). *Imagination*. Berkeley: Univ. of California Press.
- Wason, R., W. (2002). Musica Practica: Music Theory as Pedagogy. In T. Christensen (Ed.), *The Cambridge history of Western music theory* (pp. 46–77). Cambridge: Cambridge Univ. Press.
- Wasserloos, Y. (2004). *Das Leipziger Konservatorium der Musik im 19. Jahrhundert: Anziehungs- und Ausstrahlungskraft eines musikpädagogischen Modells auf das internationale Musikleben*. Hildesheim; New York: G. Olms.
- Wasserloos, Y. (2010). Alt(und)ehrwürdig? Historisches, Traditionelles und Konservatives am Leipziger Konservatorium im 19. Jahrhundert. In A. Hartinger (Ed.), *Verhandlungen mit der (Musik-)Geschichte* (pp. 117–132). Winterthur: Amadeus.
- Watson, G. (1988). *Phantasia in classical thought*. Galway: Galway University Press.
- Watson, J. B. (1913). Psychology as the behaviorist views it. *Psychological Review*, 20(2), 158–177.
- Weber, M. (1958). *The Rational and Social Foundations of Music*. (D. Martindale, J. Riedel, & G. Neuwirth, Trans.). Carbondale: Southern Illinois University Press (Die rationalen und soziologischen Grundlagen der Musik, 1921).
- Weber, W. (1994). The Intellectual Origins of Musical Canon in Eighteenth-Century England. *Journal of the American Musicological Society*, 47(3), 488–520.
- Webster, F. (Ed.). (2004). *The Information Society Reader*. London; New York: Routledge.
- Webster, F. (2006). *Theories of the Information Society* (3rd ed). New York: Routledge.
- Weijs, W., Widdershoven, G., Kok, G., & Tomlow, P. (1993). Patients' Information-Seeking Actions and Physicians' Responses in Gynecological Consultations. *Qualitative Health Research*, 3(4), 398–429.
- Weizsäcker, C. F. von (Ed.). (1973). Information und Imagination. In *Information und Imagination* (pp.11-32). München: Piper.
- Welch, L. (1935). *Imagination and Human Nature*. London: Kegan Paul, Tranch, Trubner & Co.
- Werner, H. (1957). *Comparative Psychology of Mental Development (revised edition)*. New York: International University Press.
- Wheelahan, L. (2010). *Why Knowledge Matters in the Curriculum: a social realist argument*. Abingdon, Oxon; New York, NY: Routledge.
- Wheelahan, L. (2015). Not just skills: what a focus on knowledge means for vocational education. *Journal of Curriculum Studies*, 47(6), 750–762.
- Whewell, W. (1837). *History of the Inductive Sciences, from the Earliest to the Present Times*. J. and J.J. Deighton.
- Whewell, W. (1840). *The Philosophy of the Inductive Sciences: founded upon their history* (Vols. 1–volume 2). London: J.W. Parker.
- White, A. R. (1990). *The Language of Imagination*. Oxford, UK; Cambridge, Mass., USA: B. Blackwell.
- Whitney, E. (1990). Paradise Restored. The Mechanical Arts from Antiquity through the Thirteenth Century. *Transactions of the American Philosophical Society*, 80(1), 1–169.
- Wiener, N. (1985). *Cybernetics or control and communication in the animal and the machine* (2. ed.). Cambridge, Mass: MIT Press. (Work originally published, 1948)
- Williamon, A. (Ed.). (2004). *Musical Excellence: Strategies and Techniques to Enhance Performance*. Oxford: Oxford University Press.
- Williamon, A. (Ed.). (2013). *Proceedings of the International Symposium on Performance Science 2013*. Association Européenne des Conservatoires.

- Williamon, A., Edwards, D., & Bartel, L. (Eds.). (2011). *Proceedings of the International Symposium on Performance Science 2011*. Utrecht: Ass. Européenne des Conservatoires, Académies de Musique et Musikhochschulen (AEC).
- Wilson, A. D., & Golonka, S. (2013). Embodied Cognition is Not What You Think It Is. *Frontiers in Psychology*, 4(58), 1-13.
- Wilson, E. O. (1975). *Sociobiology: the New Synthesis*. Cambridge, Mass: Belknap Press of Harvard University Press.
- Wilson, E. O. (1998). *Consilience: The Unity of Knowledge*. New York: Knopf.
- Wilson, M. (2002). Six views of embodied cognition. *Psychonomic Bulletin & Review*, 9(4), 625–636.
- Wilson, T. D. (1981). On user studies and information needs. *Journal of Documentation*, 37(1), 3–15.
- Wilson, T. D. (2000). Human information behavior. *Informing Science*, 3(2), 49–56.
- Winner, E., Goldstein, T., & Vincent-Lancrin, S. (2013). Art for Art's Sake? Overview. OECD Publishing.
- Winspur, I., & Wynn Parry, C. B. (Eds.). (1998). *The musician's hand: a clinical guide*. London: Malden, Mass: M. Dunitz ; Distributed in the United States by Blackwell Science Inc.
- Witek, M. A. G., Clarke, E. F., Wallentin, M., Kringelbach, M. L., & Vuust, P. (2014). Syncopation, Body-Movement and Pleasure in Groove Music. *PLoS ONE*, 9(4), e94446.
- Wittgenstein, L. (1969). *On certainty*. (G. E. M. Anscombe & G. H. von Wright, Eds., D. Paul & G. E. M. Anscombe, Trans.). Oxford: Basil Blackwell (Über Gewißheit, 1951).
- Wray, A. (1998). Protolanguage as a holistic system for social interaction. *Language & Communication*, 18(1), 47–67.
- Wray, A. (2000). Holistic Utterances in Protolanguage: The Link from Primates to Humans. In C. Knight, M. Studdert-Kennedy, & J. R. Hurford (Eds.), *The Evolutionary emergence of language: social function and the origins of linguistic form* (pp. 285–302). Cambridge; New York: Cambridge University Press.
- Zlatev, J. (Ed.). (2008). *The Shared Mind: Perspectives on Intersubjectivity*. Amsterdam; Philadelphia: John Benjamins Pub. Co.

Samenvatting

Dit proefschrift is gericht op het zorgvuldig en systematisch evalueren van muzikantschap in een tijdperk van informatie-overvloed en een verregaande verbondenheid via diezelfde informatie, alsook op manieren om te komen tot een herschikking van de epistemische basis van dat muzikantschap en tot hernieuwde informatie-systemen die, middels een toetsende praktijk, artistieke ontwikkeling, verrijking en/of bevrijding mogelijk maken. De *Informatiemaatschappij* met haar kenmerkende (r)evolutie op technologisch vlak en het hertekende onderwijslandschap zijn tijdsgebonden omstandigheden die zeer ingrijpend bijdragen aan het toegankelijk maken van een genereuze hoeveelheid aan informatie; niettemin kan vastgesteld worden dat de muzikale praktijk nog steeds zeer weigerachtig staat (of niet in staat is) toenadering te zoeken tot kennis en inzichten die hun oorsprong vinden in een uitgebreid veld van praktische, academische en para-academische vorsing. De redenen daarvoor lijken zowel van een ideologisch-epistemische als van een meer praktische en operationele aard te zijn. In voorliggend proefschrift wordt vanuit meta-praktisch perspectief een conceptuele en contextuele ruimte gecreëerd met betrekking tot de notie van een 'geïnformeerde uitvoerder' en worden de systemische flessenhalzen besproken met daarop volgend het voorstel om te komen tot een *bio-cultureel geïnformeerde uitvoerderspraktijk* van westerse kunstmuziek.

De primaire bijdragen tot dit algemene kaderwerk zijn: 1/ een discipline-specifieke semantische benadering van de notie 'informatie' binnen een praktijk die zich vooral uitdrukt in termen van 'verbeelding' en 'vrijheid'; 2/ het specificeren van een geïnformeerd uitvoerderschap door het in verbinding te stellen met een actieve, onderzoekende en systematische belangstelling voor informatie waarvan de oorsprong zich situeert in kennis- en onderzoeksdomeinen die zich buiten de artistieke praktijk bevinden (extra-disciplinariteit); 3/ het situeren van de *geïnformeerde uitvoerder* binnen een algemene socio-culturele context die ondersteunend is m.b.t. het uitwisselen van kennis via informatie, het integreren van theoretische, praktische en productieve oriëntaties binnen de muziek en het ontwikkelen van een specifieke onderzoeksruimte voor *Artistic Information Researchers*; 4/ het introduceren van *persoonlijke theorieën* als op ervaring gebaseerde entiteiten die procesgewijs mediëren tussen theorie en praktijk; 5/ het begrijpen van 'uitvoerderspraktijk' als een sociale praktijk die zowel meta-praktische begripsvorming als praktijk-gebonden activiteiten omvat; 6/ het introduceren van een bio-culturele benadering van muziek waarbij 'ervaring', 'actie' en 'interactie' steunpunten worden voor een dialoog tussen artistieke praktijk en *academia*; en 7/ een *topical attractor model* dat fungeert als een informatiesysteem dat bemiddelt tussen de interesses van muzikanten en een overvloed aan beschikbare informatie.

De impact van een bio-cultureel geïnformeerde uitvoerderspraktijk op het functioneren van muzikale uitvoerders wordt toegelicht aan de hand van twee uitvoerings-georiënteerde instrumenten die de

meerwaarde van het pragmatisch samengaan van informatie uit diverse extra-disciplinaire informatie illustreren. Op het gebied van 'actie' wordt de *kwadrant-techniek* voorgesteld als een kaderwerk waarbinnen nagedacht kan worden over de basis-aanslag(en) in piano-gerichte instrumentale techniek. Binnen het veld van 'interactie' wordt het concept van een *interactionele* en *bio-topische performatieve analyse* voorgesteld als een op ervaring en interactie-gebaseerd instrument dat bijdraagt tot de vitalisering van het muzikaal aanvoelen.

Het voorstel om te komen tot een bio-cultureel geïnformeerde uitvoerderspraktijk wordt tot slot gesitueerd binnen een ruimere epistemische categorie van een *geïnformeerd pluralistisch* en *creatief pragmatisme*.

Curriculum Vitae

Joost Vanmaele (° October 15, 1971, Bruges) is a Belgian pianist, researcher and pedagogue who studied at the Bruges Municipal Conservatory (with Eliane Van Leuffel), the Royal Flemish Conservatory of Antwerp (with Levente Kende), the Staatliche Musikhochschule Freiburg (with Michel Béroff) and the Orpheus Institute Ghent; he obtained second cycle degrees in piano, chamber music, counterpoint, fugue, and pedagogy. He additionally participated actively in masterclasses by Rudolf Kehrner, Karl-Heinz Kämmerling, Boris Berman and Lazar Berman.

Joost Vanmaele is a prize winner at various youth competitions, played concerts in several European countries and recorded with soprano Sylvie De Pauw for the labels *Globe* and *Radio 3*.

Following the personal confrontation with a chronic neuro-motor deficit in 1995, Joost Vanmaele's career took a new and decisive turn in the direction of instrumental didactics and research, leading to meta-practical questions about the impact of extra-disciplinary information on musical practice in general and the performance of composed music in particular.

Joost Vanmaele has been artistic staff member at the Orpheus Institute in Ghent from 2006 to 2010 and the first research coordinator of the Orpheus Research Centre in Music (2007-2010). He currently teaches at the Conservatory of his hometown where he is president of the piano-department.

Joost Vanmaele is a docARTES-promovendus at the *Academy of Creative and Performing Arts* at Leiden University, chairs the docARTES-module *Crossing Borders: Extra-Disciplinary Explorations*, is a member of the *Advisory Reading Committee in the Arts* at the Artesis Plantijn University College and member of the Advisory Editorial board of *Forum+ for Research in the Arts*, the peer-reviewed journal for research and arts in the Lowlands.

Appendices

Appendix 1: The information-imagination cluster in early (pre-1600) French (Dubois, Mitterand, & Dauzat, 2011)⁴²¹

<i>Idée</i>	<i>Forme des choses, image</i> [the form of things]. 1119 <i>Représentation dans la pensée</i> [representation in thought]. 1265
<i>-idé</i>	<i>Forme; au pluriel, famille d'animaux et des plantes</i> [family of animals and plants] ('les cervidés', 'les orchidées'); <i>au singulier, 'membre de l'espèce' ('un cervidé')</i>
<i>Forme</i>	'Forma' dans les divers sens. Fin XI Lat
<i>Inform</i>	(<i>Enformer</i>); <i>donner une forme</i> [giving form]. 1190 <i>Instruire de quelque chose</i> [teaching]. 1265 <i>Soit infourmer'; s'enquérir de</i> ⁴²² [to inquire]. 1286 <i>Mettre au courant</i> [to inform, notify, update]. 1360
<i>Information</i>	(Domaine judiciaire). 1274 <i>Renseignement donné au public</i> . 1867
<i>Fantasme</i>	<i>Illusion</i> . Fin XIIe S.
<i>Fantaisie</i>	<i>Vision</i> . XIIIe S. <i>Imagination</i> . 1361 <i>Caprice</i> . 1538
<i>Image</i>	1050 <i>Statue de saint</i> . 1160 <i>Symbole</i> . 1550
<i>Imaginer</i>	<i>Peindre</i> [to paint]. 1290 <i>Combiner habilement</i> [to combine skilfully]. 1460 <i>Concevoir</i> [to conceive, to design]. 1528
<i>Imagination</i>	<i>Hallucination</i> . 1160 <i>Vision, image rêvée</i> [dream image]. XIIe S. <i>Faculté d'inventer des représentations d'êtres ou d'objets concrets</i> [faculty that invents representations of creatures or material objects]. XIIIe S. <i>Faculté de créer en combinant des idées et des images</i> . XIVe S. <i>Vision</i> . XVe S.

⁴²¹ This is an abbreviated rendition; post-1600 meanings have been omitted are listed in grey in case their pre-1600 absence is relevant or remarkable.

⁴²² This entry is not listed in the Larousse Etymological dictionary but mentioned in the *Französisches Etymologisches Wörterbuch [FEW]* (Wartburg & Buchi, 2003).

Appendix 2: The information-imagination cluster in early (pre-1600) German (Pfeifer, 1993)

<i>Idee</i>	<i>Unveränderlichen Urbilder der Dinge’ dargestellt werden, in die übrigen europ. Sprachen und ist seit dem 17. Jh. in der eingedeutschten Form Idee (Leibniz, Thomasius) nachzuweisen.</i>
<i>Form</i>	<i>Gestalt, Vorbild, Muster, Art und Weise’ wird um die Mitte des 13. Jhs. aus lat. forma ‘Gestalt, Figur, Äußeres’ (wazu lat. formāre ‘formen, gestalten’) entlehnt und anfangs nur auf die menschliche Gestalt bezogen.</i>
<i>Informieren</i>	<i>Unterrichten. 14. Jh.; durch Unterweisung bilden, befähigen.</i>
<i>Information</i>	<i>Auskunft, Benachrichtigung. 15. Jh.</i>
<i>Phantasie</i>	<i>Einbildungskraft, Vorstellungsvermögen, Erfindungsgabe, nicht der Wirklichkeit entsprechende Vorstellung.</i>
<i>Phantasieren</i>	<i>In der Musik ‘frei aus dem Stegreif spielen, improvisieren.</i>
<i>Fantasieren</i>	<i>15. Jh.</i>
<i>Phantastisch Adj.</i>	<i>Nur in der Phantasie bestehend, unwirklich, ungewöhnlich. 16. Jh.</i>
<i>(Imagination)</i>	<i>‘Einbildungskraft’ (19. Jh.)⁴²³</i>
<i>Bild</i>	<i>Nur in der Vorstellung wahrgenommene Erscheinung. 8. Jh.</i>
<i>Einbildungskraft</i>	<i>Phantasie. 1. Hälfte 17. Jh., vereinzelt [rare] im 16. Jh.</i>

⁴²³ post-1600 meanings are indicated in grey.

Appendix 3: 'idea, n.' in early (pre-1600) English [OED]⁴²⁴

Idea, n.	
I. Senses relating to or derived from the Platonic concept of general or ideal form as distinguished from its realization in individual instances.	
1.	a/ In Platonic philosophy: an abstract or eternally existing pattern or archetype of any kind of thing, in relation to which particular things are conceived as imperfect copies or approximations, and often as deriving their existence from it; a nature or essence considered as existing separately from the particular things which exemplify it. Also in Theol.: a thought or notion existing, esp. as an archetype, in the mind of God. 1398-2004 b/ In Kantian thought: an a priori concept of reason denoting an object beyond the bounds of possible experience or empirical knowledge (e.g., the soul, the world, God), esp. as distinguished from the categories of the understanding (see category n. 1b); an object corresponding to such a concept. 1797 c. In Hegelian thought: the absolute truth of which all phenomenal existence is the expression. Freq. in the Idea. 1838
2.	The conception of a standard or principle to be realized or aimed at; a conception of what is desirable or ought to be; a governing conception or principle; the plan or design according to which something is created or constructed. 1586-2005
3.	a/ The conception of anything in its highest perfection or supreme development; a standard of perfection; an ideal. 1586-1891 b/ A person or thing regarded as perfect in its kind; the ideal realized in an individual. 1590-1651
4.	A conception or notion of something to be done or carried out; an intention, plan of action. 1617-2005
5.	A pattern, type; the original of which something else is a copy; a preliminary sketch or draft; something in an undeveloped state. 1648-1798
6.	Music. A musical theme, phrase, or figure as conceived or sketched before being worked up in a composition. 1771-2005
II. Senses denoting a perceptible form or figure.	
7.	A representation, likeness, image, symbol (of something). 1531-1714
8.	An inherent form; configuration, shape. Also: a defining characteristic; aspect, nature, character. 1594-1799
III. Senses relating to the mind without necessarily implying an external manifestation.	
10.	The mental image or notion of something previously seen or known, recalled by the memory. 1579-2001
11.	a/ Usually with of: a picture or notion of something formed in the mind independently of direct memory; a conception. 1585-1999 b/ depreciative. A conception to which no reality corresponds; something merely imagined or fancied. Usually with modifying word, as mere. 1593-2003 c/ A notion or thought that is more or less implausible, indefinite, or fanciful; a vague belief, opinion, or estimate; a supposition, impression, fancy. 1660-2004
13.	After a possessive and with of: a person's conception of an ideal, typical, or adequate example of the person or thing specified. 1664-2002

⁴²⁴ This is an abbreviated rendition; post-1600 meanings are indicated in grey.

Appendix 4: 'form, n.' in early (pre-1600) English [OED]⁴²⁵

Form, n	
I. Shape, arrangement of parts.	
1.	a. The visible aspect of a thing. 1297-1875
2.	An image, representation, or likeness (of a body). 1225-1610
4.	Philos.
	a/ In the Scholastic philosophy: The essential determinant principle of a thing; that which makes anything (matter) a determinate species or kind of being; the essential creative quality. 1385-1690
	c/ In Bacon's modification of the Scholastic use: The real or objective conditions on which a sensible quality or body depends for its existence, and the knowledge of which enables it to be freely produced. 1605
	d/ In the usage of Kant and Kantians: That factor of knowledge which gives reality and objectivity to the thing known, and which Kant regards as due to mind, or as (in his sense) subjective; the formative principle which holds together the several elements of a thing. 1803-1889
5.	a/ The particular character, nature, structure, or constitution of a thing; 1300-1875
	b/ One of the different modes in which a thing exists or manifests itself; a species, kind, or variety. 1543-1855
7.	A model, type, pattern, or example. Obs. 1382-1690
9.	Style of expressing the thoughts and ideas in literary or musical composition, including the arrangement and order of the different parts of the whole. Also, method of arranging the ideas in logical reasoning; good or just order (of ideas, etc.). 1551-1889

⁴²⁵ This is an abbreviated rendition; post-1600 meanings are indicated in grey.

Appendix 5: 'inform, v.' in early (pre-1600) English [OED]⁴²⁶

Inform, v	
I. To shape the mind, character, etc.; to instruct, teach, train; to provide with knowledge.	
1.	a/ To give instruction to (a person, the mind, etc.); to educate, teach, train; (later more generally) to impart knowledge or learning to (cf. sense 2). 1350-1993 b/ To train or instruct (a person) in a particular course of action; to educate or give information about some subject, doctrine, etc.; to teach or apprise how to do something. 1384-2003 c. To give (a person) instructions or directions for action; to instruct, direct, tell to do something. 1387-2002 d. To direct, guide. Now rare (chiefly poet.). 1637-1903
2.	To impart knowledge of some particular fact, occurrence, situation, etc. a/ With the party informed as object: to tell (a person or group) something; to acquaint with; to apprise of. 1384-2006 b/ With the information given as object and the party informed as indirect object: to tell a person (something); to report, relate (a piece of information, account, etc.) to another party. Now rare. 1425-1960 c/ With the information given (in later use, chiefly a subordinate clause) as object: to report or recount (a piece of information, etc.); to relate (something) to another party. 1533-1996 d/ To give information; to report, relate. 1569-1997 e/ To send information or data about a situation or action to (something inanimate or impersonal). 1868-2008
3.	To impart knowledge of (a subject, doctrine, method of action, etc.); to give instruction in, to teach. a/ With the thing taught as object and the party instructed as indirect object: to teach a person (something); to instruct in (a subject, etc.). Obs. 1393-1687 b/ Without indirect object. Obs. 1400-1605
4.	a/ To provide (a magistrate or other person in authority) with accusatory or incriminatory information against a person or group. 1526-2003 b/ To give accusatory or incriminatory information about a person, their actions, etc. esp. to a person in authority; to bring a charge or complaint. 1588-2000; 5. trans. (refl.). To gain knowledge, instruction, or information; to acquaint oneself with something; to get to know, to learn. 1548-2007
II. To give form to, put into form or shape.	
6.	a/ To put into (material) form or shape; to form, shape, mould, fashion, create; (also) to put into proper form or order. Now rare (chiefly poet. in later use). 1382-1964
III. To give form or determinant character to: see form n. 4.	
8.	a/ Originally: to give determinant character to (see form n. 4). Hence: to imbue, or impregnate with a specific quality or attribute; to impart some pervading quality or spirit to; (also) to fill or affect (the mind or heart) with a feeling, thought, etc.; to inspire. 1398-1999 b/ Of a quality, principle, etc.: to be the determinant principle of; to give a thing its essential quality or character; to inspire, animate; to pervade. In later use more generally: (of an experience, etc.) to influence, to affect. 1398-2001 c/ spec. Of a soul, life, etc.: to impart life or spirit to; to inspire, animate. 1594-2007

⁴²⁶ This is an abbreviated rendition; post-1600 meanings are indicated in grey.

Appendix 6: ‘information, n.’ in early (pre-1600) English [OED]⁴²⁷

Information, n.	
I. The imparting of knowledge in general.	
1.	a/ The shaping of the mind or character; communication of instructive knowledge; education, training. 1387-1901 b/ As a count noun: a teaching; an instruction; a piece of advice. 1405-1760 c/ Chiefly Christian Church. Divine influence or direction; inspiration. 1450-2000
2.	a/ Knowledge communicated concerning some particular fact. 1390-2003 b/ As a count noun: a fact or circumstance of which a person is told. 1527-1959 c/ As a mathematically defined quantity divorced from any concept of news or meaning. 1925- d/ Separated from, or without the implication of, reference to a person informed: that which inheres in one of two or more alternative sequences, arrangements, etc., that produce different responses in something, and which is capable of being stored in, transmitted by, and communicated to inanimate things. 1937- e/ Contrasted with data: that which is obtained by the processing of data. 1970-
3.	a/ The action or fact of imparting the knowledge of a fact or occurrence. 1393-2001
II. The imparting of incriminating knowledge.	
	a/ A charge, an accusation. 1387-1660
III. The giving of form.	
7.	The giving of form or essential character to something; the action of imbuing with a particular quality; animation (esp. of the body by the soul). 1630-2002

Appendix 7: ‘fantasy/phantasy/(fancy)’ in early (pre-1600) English [OED]⁴²⁸

fantasy/phantasy/(fancy), n. ⁴²⁹	
1.	In scholastic psychology: a/ Mental apprehension of an object of perception; the faculty by which this is performed. 1382-1669 b/ The image impressed on the mind by an object of sense. 1340-1594
2.	A spectral apparition, phantom; an illusory appearance. 1325-1583
3.	a/ Delusive imagination, hallucination. 1340-1753
4.	a/ Imagination; the process or the faculty of forming mental representations of things not actually present. 1589-1870 c/ A product of imagination, fiction, figment. 1362-1688 d/ An ingenious, tasteful, or fantastic invention or design. 1440-1820 e/ Esp. in Music; a fantasia. 1597-1654
5.	a/ A supposition resting on no solid grounds. 1440-1878 b/ In my fantasy: = ‘as I imagine’; modestly used for ‘in my opinion’. 1561-1576
6.	Caprice, changeful mood; an instance of this; a caprice, whim. 1450-1883

⁴²⁷ This is an abbreviated rendition; post-1600 meanings are indicated in grey.

⁴²⁸ This is an abbreviated rendition.

⁴²⁹ The semantic field ‘fancy’ is analogue to the one of ‘fantasy’.

Appendix 8: 'image, n.' in early (pre-1600) English [OED]

image, n.

1. An artificial imitation or representation of something, esp. of a person or the bust of a person. 1225-1998
2. a/ The aspect, appearance, or form of someone or something; semblance, likeness. Now only in allusions to, or uses derived from, biblical language, esp. Genesis 1:26, 27. 1340-1991
b/ A visible appearance; a manifestation of a figure; an apparition. 1350-1995
3. a/ A visual representation or counterpart of an object or scene, formed through the interaction of rays of light with a mirror, lens, etc., usually by reflection or refraction. 1350-2001
4. A thing or (now esp.) person in which the aspect, form, or character of another is reproduced; an exact likeness; a counterpart, copy. 1384-2005
5. a/ A mental representation of something (esp. a visible object) created not by direct perception but by memory or imagination; a mental picture or impression; an idea, conception. Also: (with modifying adjective) a mental representation due to any of the senses (not only sight) or to organic sensations. 1393-2004
6. a/ A representation of something to the mind by speech or writing; a vivid or graphic description. 1522-1999
7. a/ A thing that stands for or is taken to stand for something else; a symbol, emblem. 1531-2007
b/ A thing or person in which some quality is vividly exhibited, so as to make it or the person a natural representative of the quality; a type, typical example, embodiment. 1534-2003

Appendix 9: 'imagination, n.' in early (pre-1600) English [OED]

Imagination, n.

1. a/ The power or capacity to form internal images or ideas of objects and situations not actually present to the senses, including remembered objects and situations, and those constructed by mentally combining or projecting images of previously experienced qualities, objects, and situations. 1340-2000
b/ An inner image or idea of an object or objects not actually present to the senses; often with the implication that the idea does not correspond to the reality of things. 1340-2002
2. The mind considered as engaged in imagining; the place where images, ideas, and thoughts are produced and stored, or in which they are contained. Formerly also: the inner operations of the mind in general. 1393-2007
3. The mental consideration of future or potential actions or events.
a/ The scheming or devising of something; a plan, scheme, plot. 1393-1801
b/ A person's impression as to what is likely; expectation, anticipation. 1582-1654
4. The tendency to form ideas which do not correspond to reality; deluded thinking. 1393-2007
5. The mind's creativity and resourcefulness in using and inventing images, analogies, etc.; poetic or artistic genius or talent. 1509-2006

Appendix 10: The Information Age, post-war developments

Date	Publication	Author(s)	Key contribution(s)	Field	Term(s)
1947	Transistor (Bell Labs: John Bardeen/Walter Brattain/William Shockley)				
1948	<i>Cybernetics or control and communication in the animal and the machine.</i> (see also: <i>The human use of human beings: cybernetics and society</i> , 1950)	Norbert Wiener	- General control and communication theory (machine + living tissue) -> supra-disciplinarity - Entropy (degree of disorganization) and information (degree of organization/choice between alternatives/decision) - Increasing order through the use of feedback to alter behaviour (cybernetics) - The brain-computer parallel - Brain & subjective experience - Phylogenetic learning and ontogenetic learning - Information and its role in society	Mathematics	- Communication of information / the age of communication and control
1949	<i>The Mathematical theory of communication</i>	Claude Shannon & Warren Weaver	- Three levels of communication: technical, semantic, effective (Weaver). - Model of communication: Information source - transmitter (encoder) channel – Receiver (decoder) – destination (Shannon) - Entropy or uncertainty - Information is data that reduces uncertainty	Mathematics	- Communication of information
1953	<i>A Structure for Deoxyribose Nucleic Acid</i>	Francis Crick & James Watson	- DNA: 'copying mechanism for the genetic material'	Biology	- No explicit mentioning of 'information' in this publication. 'information' is on <i>protein synthesis</i> (Crick, 1958)
1956	<i>The magical number seven plus or minus two: Some limits on our capacity for processing information.</i>	George Miller	- Short term memory in a one-dimensional absolute-judgment task - Memory span: the longest list of items that a person can repeat in correct order immediately after presentation	Psychology (cognitive)	- Information processing
1956	<i>Emotion and meaning in music</i>	Leonard Meyer	- Musical styles as probability systems - Redundancy, noise, feedback, expectation	Aesthetics	- Information theory
1958	<i>Personal Knowledge: Towards a Post-Critical Philosophy</i>	Michael Polanyi	- critical of objectivity - expanding to realm of knowledge to tacit and personal dimension	(Philosophy)	
1958	Integrated Circuit [chip] (Jack Kilby/ Robert Noyce)				
1962	<i>The production and distribution of knowledge</i>	Fritz Machlup	- Knowledge as a product (thing) and as an acquired state ('the known and the knowing') - To inform (= conveying knowledge) vs to know (= being in-formed). - Information activities as occupation. - Knowledge production as part of the Gross National Product. - Knowledge industry.	Economics	- Knowledge - Information services
1962	<i>The Gutenberg Galaxy: the making of typographic man</i>	Marshall McLuhan	- Four epochs: Oral tribe culture (The village) – Manuscript culture – Gutenberg galaxy (Movable type) – Electronic age (The global village).	Media & communication	
1968-1970	<i>Johoka Shakai</i> - The Information Society- (several publications)	Yoneji Masuda, Konichi Kohyama,	- Organic society (Masuda). - Information access in function of human intellectual creativity.	Sociology	- Information society (coining the term)

		Yujiro Hayashi			
1969	<i>The age of discontinuity</i>	Peter Drucker	- Universe of learning and knowledge.	Business management	- Knowledge society - Knowledge workers
1973	<i>The coming of the post-industrial society (theoretical knowledge as the director of social change)</i>	Daniel Bell	- Technical decision-making vs ideology.	Sociology	- Post-industrial society
1977-	Personal computers (Apple II)				
1980	<i>The third wave</i>	Alvin Toffler	Three waves: agricultural revolution – the rise of industrial civilization – information age.	Futurism	- Information society - Information age - Super-industrial society - New age of synthesis
1983	<i>The reflective practitioner</i>	Donald Schön	- Critical of technical rationality - Reflection-in-action	Philosophy	
1992	World Wide Web				
1994	<i>Knowledge Societies</i>	Nico Stehr	Knowledge as a capacity to act.	Sociology/ cultural studies	- Knowledge society
1995	<i>Theories of the Information Society</i>	Frank Webster	The multifacetedness of the information society.	Sociology	- Information society
1995	<i>The knowledge-creating company</i>	Ikujiro Nonaka & Hirotaka Takeuchi	- Tacit knowledge / explicit knowledge / cultural knowledge. - Knowledge creation: socialization, externalization, combination, and internalization.	Economics	
1996-1998	<i>The Information Age: Economy, Society and Culture (3 vol.)</i>	Manuel Castells	- Network society. - Technological, economic and social transformations -> information age. - “I think, therefore I produce”.	Sociology	- Information age - Network society
2005	<i>Towards knowledge societies</i>	UNESCO	- Differentiation information society vs knowledge society.	Public policy	- Knowledge society
2006	<i>After the information age</i>	James Marcum	- Participatory, dynamic, and social learning by individuals, groups, organizations, networks, and societies as an alternative to the information-paradigm.	Library sciences	- Learning society
2009	<i>The information society: critical concepts in sociology (four volumes)</i>	Robin Mansell	Comprehensive reference work.	Media/ Communication	- Information society

Appendix 11: Sample survey of the conservatoire curricula for score-based instrumental training [piano]. Academic year 2016-2017.

[Koninklijk Conservatorium, Den Haag; Conservatorium van Amsterdam; Lemmens Instituut, Leuven; Koninklijk Conservatorium, Antwerpen; Guildhall School of Music & Drama, London; Royal College of Music, London; Conservatoire National Supérieur de Musique et de Danse de Paris; Hochschule für Musik und Tanz, Köln; Mozarteum, Salzburg; Sibelius Academy, Helsinki; The Juilliard School, New York]

CONSERVATOIRE CURRICULUM: ‘practice’	
Instrument	Principal Instrument/ <i>Klavier mit didactischer Transparenz</i> (Mozarteum)
	Chamber music/ensemble playing/choir
	Keyboard skills (Juilliard) – sight reading, harmonizing, scales –
	Learning to practice (Lemmens), study skills (RCM)
	Sight-reading
	Improvisation
	Transposition (Mozarteum)
	Basso continuo – figured bass
	Piano performance class (Juilliard)
	Early music
	Contemporary music
	Repertoire studies
Professional skills	The entrepreneurial artist (A’dam/Antwerp/Juilliard)
	Building a successful musical practice (A’dam)
	External professional projects (Koncon)
	Communication skills (Guildhall)
Project	Creative project (Antwerp, RCM)
Body	The musical body (A’dam)
	Body consciousness (Antwerp)
	Physiology of the hand (Juilliard)
	Performing Arts Medicine (Köln)
	Psychology of performance (RCM/Guildhall)
	Alexandre-technique (RCM)
	Health and wellbeing (RCM)
	<i>Körperbewusstsein</i> (Köln)
CONSERVATOIRE CURRICULUM: ‘theory’	
Music	Ear-training/aural skills
	‘Solfège’
	‘Formenlehre’ (Mozarteum)
	Analysis
	Harmony
	Counterpoint
	Acoustics/psycho-acoustics
	Organology/piano-construction and service (Mozarteum)/historical development
	Fortepiano (Koncon)
‘Humanities’	History: music, art, literature (Mozarteum)
	Liberal Arts: ethics, society, politics and culture (Juilliard)

	Philosophy/aesthetics
	Study of literature (Lemmens/Mozarteum)
	Cultural currents (Antwerp)
Other	Music Psychology (Lemmens), The Musical Mind: Issues in Music Psychology (A'dam)
	Musical Texture (A'dam)
	Music therapy (Guildhall)
	Colloquium (Juilliard)
	Electives
Research	Research (in the arts)
	Research methodology
	Bachelor- and masterthesis
	Team-directed research (Lemmens)
	Playing with Treatises (A'dam)
	Sources and Resources: From Manuscript to Edition (A'dam)
	Programme notes (Koncon)
	<i>Développement d'une pratique artistique réfléchie et autonome</i> (Paris); reflective formation (Lemmens)
	<i>Technik wissenschaftlichen Arbeitens</i> (Mozarteum)
Pedagogy	Educational skills (Koncon)/didactics of artistic learning (Antwerp)
	Grundlagen Neue Medien (Mozarteum)
	Musicianship methodology (Koncon)

Appendix 12: A short history of the EHEA

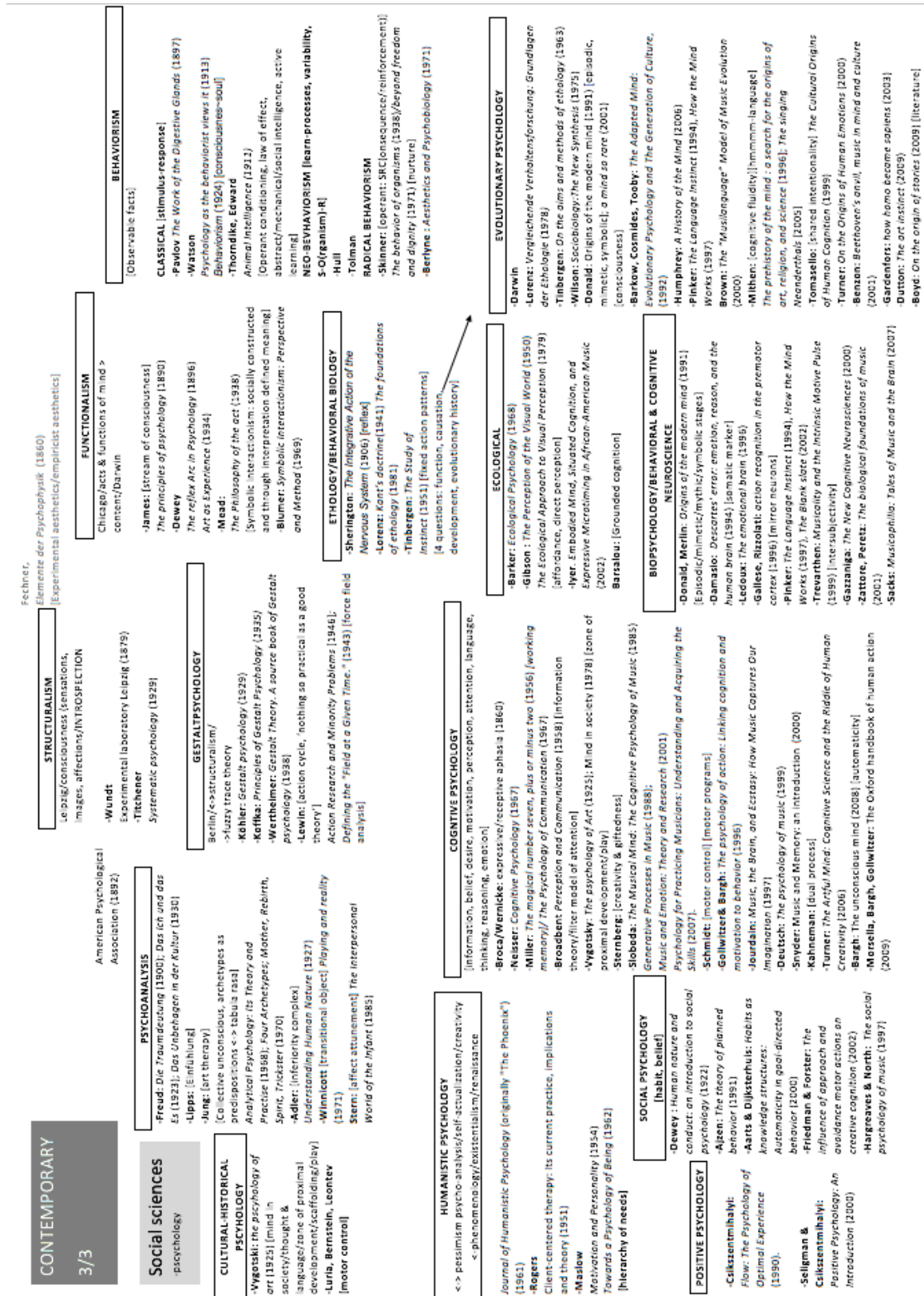
European Higher Education Area [EHEA]: overview	
1998: Sorbonne Joint Declaration	- Joint declaration on harmonisation of the architecture of the European higher education system (France, Germany, Italy, United Kingdom). - A common frame of reference, aimed at improving external recognition and facilitating student mobility as well as employability.
1999: Bologna Declaration	- A Europe of Knowledge as an irreplaceable factor for social and human growth. - Common social & cultural space; - Vision for a 'European Higher Education Area'. - o easy readable & comparable degrees - o two main cycles (bachelor & master) - o credits - o mobility
2000: Lisbon Strategy (+ 'towards a European Research Area [ERA]) ⁴³⁰	- <i>Towards a Europe of Innovation and Knowledge.</i> - Europe: most competitive economy in the world. - The transition to a competitive, dynamic, knowledge-based economy - Boost research & development.
2001: Prague Communiqué	- Lifelong learning.
2003: Berlin Communiqué	- Synergies with the European Research Area. - Preserve Europe's cultural richness. - Importance of research as an integral part of higher education. - To include the doctoral level as the third cycle in the Bologna Process. - The importance of research and research training and the promotion of interdisciplinarity.
2005: Bergen Communiqué	- National action plans. - We urge universities to ensure that their doctoral programmes promote interdisciplinary training. - Commitment to national frameworks for qualifications compatible with the overarching framework for qualifications.
2007: London Communiqué	- Building on our rich and diverse European cultural heritage. - the European Higher education Area in a global setting.
2008	- European Qualifications Framework [EQF].
2009: Leuven Communiqué	- A Europe of knowledge that is highly creative and innovative. - Opportunities of globalisation and accelerated technological developments with new providers, new learners and new types of learning; student-centred learning. - Integration between education and research at all levels.
2010: Budapest-Vienna Declaration	- Launch European Higher Education Area.
2012: Bucharest Communiqué	- Strong and accountable higher education systems provide the foundations for thriving knowledge societies. - Fair academic and professional recognition, including recognition of non-formal and informal learning, is at the core of the EHEA.
2015: Yerevan Communiqué	- EHEA key-role in addressing challenges such as: continuing economic and social crisis, dramatic levels of unemployment, increasing marginalization of young people, demographic changes, new migration patterns, and conflicts within and between countries, as well as extremism and radicalization.

⁴³⁰ Separate document but implicit in the Lisbon Strategy: <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=URISERV%3Ai23010>.

Appendix 13: Screenshot of a personal database

	A	B	C	D	E	F	G	H
	INFORMATION SOURCE	IMPACT a(lpha)=seminal/landmark b(eta)=good gamma)=marginal o(versiv)=overview e(xample)=example p(rietary)=primary sources r(eview)	topic	discipline	domain	copy	TYPE	remarks/abstract/table of contents/quotations
1	Cardoso de Araújo, R., Antunes Teixeira dos Santos, R., & Hentschke, L. (2009). The development of piano teachers' knowledge: Three case studies from Brazil. Visions of Research in Music Education, 13. Retrieved from http://www.usr.rider.edu/~vrme/ .							
3829	Ross, A. (2004, 19 April). The sonata seminar. The New Yorker, p. 23.	e	practical knowledge	education	bc	d	a	The results of the study showed that the number of years of teaching experience was fundamental to developing teaching principles and broadening the scopes of their careers as musicians. Analyses of the three cases show that the contextualized experience of being a piano teacher throughout the length of a career functions as an existential dimension for improving teachers' knowledge, in agreement with the research literature. The pragmatic dimension within the construction of professional knowledge in music was found in the cases of the two more experienced teachers.
3830	Ricoeur, P. (2004). The rule of metaphor the creation of meaning in language. London; [New York]: Routledge ; Taylor & Francis e-Library. (La Métaphore vive , 1975).	a	metaphor	musical practice	action interaction	d	a	reporting on an Fleisher masterclass
3831	Ashby, A. (2010). Absolute Music, Mechanical Reproduction. University of California Press. Retrieved from http://california.universitypressscholarship.com/view/10.1525/california/9780520264793.001.0001/upso-9780520264793	b	text (musical) music (absolute)	philosophy	interaction	d	m	rhetoric, poetics, semantics
3832	Novitz, David (1999). Creativity and constraint. Australasian Journal of Philosophy 77 (1):67 – 82.	b	creativity	musicology	bc	d	m	absolute music schubert's rationalism, gould's pragmatism recording
3833	Novitz, D. (2001). The boundaries of art: a philosophical inquiry into the place of art in everyday life. Christchurch, N.Z.: Cybereditions.	b	art	philosophy of art aesthetics	action	d	a	V. the recombination theory of creativity reference to Margaret Boden
3834	Niedderer, K. & Roworth-Stokes, S. (2007). The role and use of creative practice in research and its contribution to knowledge. IASDR International Conference 2007. Hong Kong Polytechnic University, Hong Kong.	o	method. research (PAR)	artistic research	bc	d	a	two approaches: art separated from life vs art as life
3835	Hoyle, E. and John, P. (1995). Professional Knowledge and Professional Practice. London: Cassell.	b	knowledge (professional)	education	bc	L	m	review bradshaw
3836	Sternberg R. & J. A. Horvath (Ed.) (1999). Tacit knowledge in professional practice: Researcher and practitioner perspectives . Mahwah, NJ: Lawrence	b	knowledge (tacit)	psychology	bc	d	eb	epilogue: what do we know about tacit knowledge? Making the tacit become explicit.

Appendix 14: Disciplinary knowledge map of psychology (unedited work document)



Appendix 15: Topics in 18th century music (Ratner, 1980, pp. 9–29)

I. TOPICS related to the free & galant style (Theatre, chamber music) <i>Elaboration of the melody, breaks and pauses, changes in the rhythmic elements.</i> <i>Less interwoven harmony.</i> <i>Remaining voices accompany main voice and do not take part in the expression of the sentiment of the piece.</i>		
TYPES Dances	Minuet & related types	<i>Elegant, noble, charming, lively, moderate cheerfulness.</i> <i>Expression: humorous to pathetic.</i> <i>Quick triple time.</i>
	Polonaise	<i>Serious, deliberate.</i> <i>Triple meter.</i> <i>Momentary pause within the measure.</i>
	Bourrée	<i>Lively, lightness.</i> <i>Duple meter.</i>
	Contredanse	<i>Brilliant, gay, simple.</i> <i>Duple time.</i>
	Gavotte	<i>Lively, elegance, poise, self-containment.</i> <i>Duple time.</i> <i>Cesura after second quarter-note of the measure.</i>
	Gigue	<i>Quick, gay, lively.</i> <i>6/8</i>
	Siciliano	<i>Slow, gentle, languishing.</i> <i>6/8</i>
	March	<i>Entrée, opening, bold.</i> <i>Natural habitats: parade ground, battlefield.</i> <i>Quick duple meter.</i> <i>Dotted rhythms.</i>
STYLES	Military and Hunt Music	<i>Fanfares, hunting signals, horn figure.</i>
	Singing Style	<i>Lyric, slow notes, narrow range.</i>
	Brilliant Style	<i>Rapid, virtuoso.</i>
	French Overture	<i>Slow, heavy, march tempo, dotted rhythmic figures.</i>
	Musette, pastoral	<i>Rustic, bourdon, pastoral tune, melodic flourish.</i>
	Turkish Music	<i>March, colourful.</i>
	Storm and Stress/ <i>Sturm und Drang</i>	<i>Intense personal feelings, driving rhythms, full texture, minor mode harmonies, chromaticism, sharp dissonances, declamation.</i>
	Sensibility, <i>Empfindsamkeit</i>	<i>Intimate, personal.</i> <i>Intense personal involvement: rapid changes in mood, broken figures, interrupted continuity, elaborate ornamentation, pregnant pauses, shifting harmony.</i>
II. TOPICS related to the strict style, learned style, fugal bound style (Church) <i>Serious conduct of melody, few elaborations, closely-bound progressions.</i> <i>Bound dissonances (suspensions).</i> <i>Main subject is never lost sight of.</i>		
III. Fantasia (supernatural, <i>ombra</i> – ghosts, gods, values, awe, terror) <i>Elaborate figuration, shifting harmonies, chromatic bass lines, sudden contrasts, full textures, disembodied melodic figures, improvisation, loose structural links between figures and phrases.</i>		

IV. Pictorialism, word-painting.

Imitate or symbolize specific ideas from poetry or other types of literature.

Conveys some idea of an action or scene.

Tone painting: inanimate nature, rolling of thunder, tumult of the sea, the rustle of the wind.