The polyphonic touch : coarticulation and polyphonic expression in the performance of piano and organ music

Wright, A.J.

The Polyphonic Touch

Coarticulation and polyphonic expression in the performance of piano and organ music

Proefschrift

ter verkrijging van

de graad van Doctor aan de Universiteit Leiden

op gezag van Rector Magnificus prof.mr. C.J.J.M. Stolker,

volgens besluit van het College voor Promoties

te verdedigen op woensdag 22 juni 2016

klokke 15.00 uur

door

Andrew Wright

geboren te Poughkeepsie (VS)

in 1983

Prof. Frans de Ruiter	promotor	Universiteit Leiden
Dr. Vincent Meelberg	co-promotor	Radboud Universiteit Nijmegen / docARTES, Universiteit Leiden

Promotiecommissie

Ellen Corver	Koninklijk Conservatorium/ docARTES, Universiteit Leiden
Dr. Darla Crispin	Norwegian Academy of Music
Dr. Alessandro Cervino	KU Leuven
Prof.dr. Mine Dogantan-Dack	University of Oxford
Prof.dr. Ton van Haaften	Universiteit Leiden
Dr. Anna Scott	Koninklijk Conservatorium/ docARTES, Universiteit Leiden

Dit proefschrift is geschreven als een gedeeltelijke vervulling van de vereisten voor het doctoraatsprogramma docARTES. De overblijvende vereiste bestaat uit een demonstratie van de onderzoeksresultaten in de vorm van een artistieke presentatie.

Het docARTES programma is georganiseerd door het Orpheus Instituut te Gent.

In samenwerking met de Universiteit Leiden, de Hogeschool der Kunsten Den Haag, het Conservatorium van Amsterdam, de Katholieke Universiteit Leuven en het Lemmensinstituut.

Table of Contents

List of Figures, Examples and Tables

Preface

For a time during the period leading up to my second masters degree, I began to be quite simply bored with the solo recitals I was playing. Each successive concert seemed to have less meaning, and though I knew what was required to make the performance adequately expressive, my own inspiration was at a low point. In an effort to regain the spirit and liveliness in music making, I looked to the "system" of actor and director Konstantin Stanislavski (after a journey of thought stemming from the famous question of music theorist Edward Cone (1982: 1): "If music is a language, who is speaking?") which helped to map the inner territory and processes by which inspiration could be regained. In Stanislavski's "system" I found a pathway to a certain kind of authenticity which connected music making much more deeply and personally to my life experiences, not only through "emotional memory" (an idea appropriated and modified by American Method Acting, see Hull 1985) but also through his idea of "muscle memory." The orientation of actors promoted by Stanislavsky towards engaging authentically and personally with the action onstage (which is overheard, as it were, by the audience) contrasted the traditional "ham-bone" acting where actors focus on a repertoire of pre-planned techniques to represent and communicate the emotions of the character to the audience. This choice of inner orientation and the "system" to achieve it seemed to be particularly applicable to performing music[1].

In *chamber music*, this focus on the immediacy of interaction is natural, though with predictable partners it can dissipate through excessive rehearsal or too many performances of the same piece. My goal was to find the "cast of characters" hiding within *solo music* and

[1] How can one summarise Stanislavski in one paragraph? His system in a sense is a moving target, since it evolved throughout the course of his work. His own books (*An Actor Prepares* (1989a) and *Building a*

orient myself as a performer towards the interaction between the voices of these characters. Such an orientation invites the audience onto the stage where they "overhear" this communication, a model of communication different from the projection of the music towards the audience by the performer.

Can these voices hold surprises for each other that might come out in the moment of performance, considering they are all played by one person? With the "authenticity-towards-self" inspired by Stanislavski, the fact that the embodiment of each voice is localised in a different combination of body movements is meaningful and has the potential to give each voice its own subjectivity. If we allow the embodiment to shape the music at the moment of performance, each voice speaks with unique subjectivity under its own "given conditions."[2]

Developing expression and imagination through the body is thus a central topic in this effort, and the particular focus of this dissertation is on not only the expression resulting from divergence between voices, but also on the embodied experience of creating such textures. This embodied experience is itself a form of musical thinking, the theoretical foundation for which is far from self-evident. As I wrestled with the topic, it became apparent that this foundation (beginning with embodied cognition at the base, proceeding to establish the centrality of gesture in expression, and then characterising the structure of gesture through coarticulation) was a necessary prelude without which the central topic of embodied polyphonic expression could easily slither away.

Writing about this topic, because of its embodiment focus, requires the first person perspective of a performer, a feature in common with other artistic research projects. It is

[2] In Stanislavski's "system," "given conditions" represent the circumstances amidst which a character finds itself in a play. An actor acts always as him or herself, under the "given conditions" imposed by the character (Stanislavski 1989).

distinctly unnerving to be faced with the task of trying to verbalise the tacit[3] knowledges that underlie the practice of making music, and it has to be recognised that in such a project as this dissertation, the process of verbalisation lags far behind the artistic work. A sympathetic reader is needed, both to read between the lines and to reflect following the direction towards which the ideas point. The full flowering of this artistic research project can best be heard when the written text is taken in combination with a live concert.

Who does artistic research serve? While I applaud cutting-edge projects that centre on specific works, composers or style periods on the one hand, and projects that seek to radically break with traditional practice on the other, the goal of this research is to describe and support the lifelong learning process with which musicians engage through the specific example of polyphonic expression. My own practice as a musician has become quite broad, with piano and organ playing and piano teaching forming the centre of my activities. As a church musician I interact continuously with musicians and singers of all levels, and my class of students spans an enormously wide spread of ability levels. Perhaps for this reason, I have consciously chosen a topic that can be useful for musicians of all levels, not just the top percentage. The groundwork leading up to the final specific chapter on polyphonic expression is built upon a inter-disciplinary raft of sources, many of which contain insights that can be used in any stage of development, from the first piano lesson onwards. The research can also be useful at a meta-level in exemplifying an approach to writing about embodiment and solutions to problems that such an endeavour calls forth.

[3] See (Polanyi 1958)

Introduction

Polyphony is one of music's most exported concepts, having been appropriated as a metaphor in a wide spectrum of disciplines. Because of its wide web of metaphorical connections, many find polyphony to be a nexus of meaning in music. While polyphony exists in the musics of cultures in many parts of the world, it is a deeply-rooted feature of Western art music, where its development was enabled by the advent of mensural notation (Weber 1958). The history of polyphony, then, is connected to the score-based artistic practices of composition, and the handling of polyphony in musicology, music theory and even music pedagogy has been predominantly score-based.[4] With this research I aim to draw attention to performance aspects of polyphony such as expression, agency and embodiment, showing that polyphony can be employed as an *expressive feature of performance* in a wide range of keyboard music. I will focus on the embodied aspects of single-player experience of polyphony in piano and organ music while also considering the larger context of how polyphony is used as a metaphor, a context which not only motivates and influences the study but also gives it meaning.

The relationship of voices in a polyphonic texture has been described by Pierre Boulez as a relationship of responsibility whereby voices are responsive or respond to each other in creating contrapuntal linear relations and in forming vertical sonorities or

[4] These disciplines tend to focus on what is written by composers more than the various performance options for any given passage. As such, they are more score-based than performer- or performance-based. (For a discussion of the predominantly text-based orientation of musicology in the 20th century, see Cook 2001; Cook 2014; Doğantan-Dack 2015: 173)

harmonies (Boulez 1971). These vertical sonorities can be described as consonant or dissonant, and the mutual attuning of voices assures a balance of consonance and dissonance (de Groot 2010; Taruskin 2005). Often this responsibility is thought of in terms of compositional practices - contrapuntal considerations of parallel, oblique or contrary motion, consonance and dissonance, and rhythmic convergence or divergence - in other words practices that show up in musical scores and which are taught as part of a general musical education[5]. In performance, voices may just as well diverge in expressive features such as dynamic contour, timing and articulation - features that show up to a limited extent in scores but which form the centre of the art of musical performance. Voices in a performed polyphonic texture, then, are responsible to each other in expression. Just as the compositional practice of counterpoint favours contrary motion over parallel motion, musical performance can favour divergent expression in order to intensify or highlight the polyphonic or contrapuntal affordances[6] of the music.

In the famous species counterpoint method of Johann Joseph Fux (1971[1725]), a balance of consonance and dissonance is enforced by strict rules and it is the responsibility of voices added to the given cantus firmus to coordinate this balance. In the free counterpoint found in tonal music without a given cantus firmus, voices are responsible to each other in creating such a balance. In performing practice, a balance of divergence and convergence of expression in the context of each individual work is likewise desirable and entails a negotiation between the expressive possibilities of individual voices (as seen by

[5] *Gradus ad Parnassum* (1725), the method of species counterpoint devised by late-Baroque composer and theorist Johann Joseph Fux, has been widely used for teaching counterpoint since it was written. Through study of species counterpoint in this method, the student becomes familiar with the ideas of vertical consonance and dissonance, and the horizontal considerations of voice leading, and parallel oblique and contrary motion. Certain rules and principles balance these elements in the practice of writing counterpoint, and this balance can be analysed directly from the score.

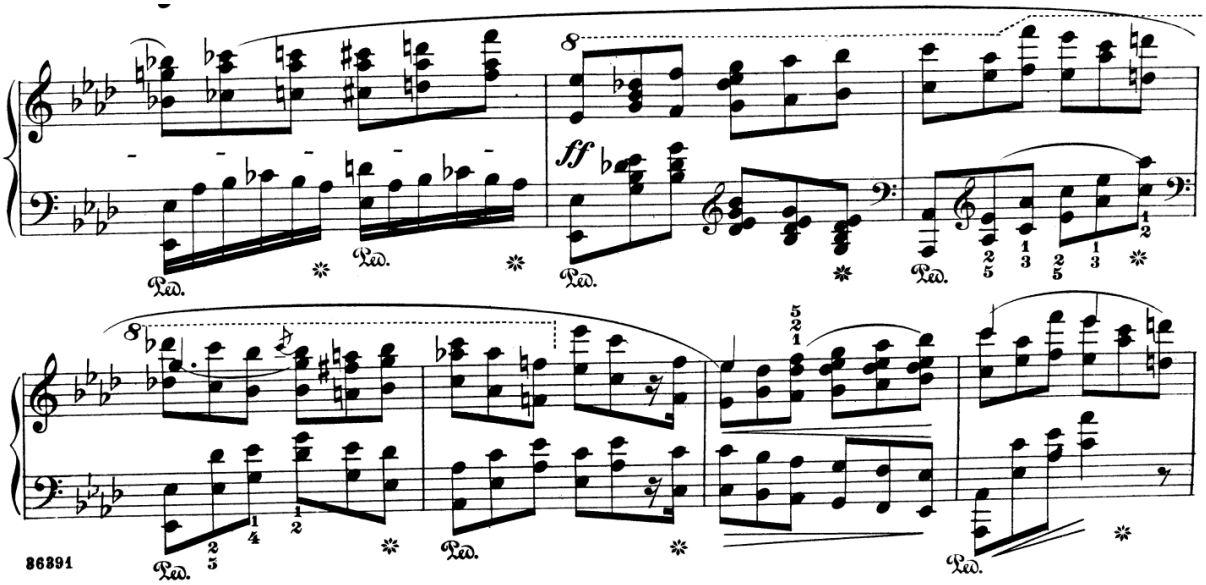
[6] I use the word "affordance" in the Gibsonian sense of a possibility of some action existing between an organism and its environment (Gibson 1979). The use of the word affordance has gained currency in describing musical structure, particularly in performance studies. Musicologist Nicholas Cook (2014), for example, writes of the structural affordance of scores to highlight the fact that scores do not have one fixed structure, but afford several structural possibilities. See Part IV for a more detailed discussion of how scores afford polyphonic performances.

the performer in their contours and rhythms) and the resulting texture and shape as they combine. The aesthetic preferences underlying this sense of balance are neither universal nor fixed, and a taste for expressive divergence can develop with practice (as I will show in Part IV).

In keyboard playing a single player must create this divergence in expression if it indeed is to be made audible. This has a horizontal component, that is, it is extended over simultaneously occurring groups of notes rather than in one vertical moment. The practice of creating this kind of expressive divergence is the subject of this dissertation. As I will argue later, both imagination and body movement are involved in creating simultaneous divergence since musical expression emanates from gesture, which itself bridges the divide between mind and body. Teaching expressive divergence is to a certain degree a normal part of pedagogy, insofar as it is easy point out at a *conceptual* level when it is actually written in scores, but it remains difficult for students to actually *use* it as a normal part of their pre-reflective understanding of music, since its embodiment must be habituated before it overcomes the unifying tendency of a single body and single mind. With the many things a teacher must accomplish in a lesson (correcting notes, rhythms and dynamics, suggesting fingerings, discussing history and style) it would be no surprise if divergent expression were to be mentioned but not followed up with the persistence that it demands. It is my hope that this dissertation will not only provide a rigorous presentation of one specific aspect of embodied divergent expression (defined precisely in Part IV), but also that it will be useful to students at various phases of development.

The relative difficulty of achieving audible divergence is apparent in recordings of passages where the composer actually wrote such divergence. For example, in Frédéric Chopin's third *Ballade*, the clearly-notated simultaneous divergence between the left and right hand is not clearly audible in most recordings (look to the third measure of the

second line of Example I.1). Of eleven that I examined (picked randomly from famous pianists) only three clearly achieved this divergence of expression to the degree that I was sure I could actually hear it. Several were unclear, often with one voice creating a shape (either the crescendo in the right hand or the diminuendo in the left hand) while the other hand remained passive, the expressive parallel of oblique motion instead of contrary motion. Keep in mind that these are some of the most famous, artistically successful pianists of recent times, and imagine how much lower the success rate is among conservatory students! It should be noted that divergence between two hands - like that in this example - is also much easier to execute than divergence within one hand.



Example I.1: Chopin Ballade no. 3, op. 47 in A-flat (Schirmer, Mikuli, 1894)

No divergence	**Unclear**	**Clear divergence**
Rachmaninoff[7]	Horowitz[8]	Rubinstein[9]
Zimmerman[10] (video recording)	Zimmerman (audio recording)[11]	Kissin[12]
Lang-Lang[13]	Richter[14]	Arrau[15]
	Cortot[16]	
	Ashkenazy[17]	

Table I.1: My perceptions of recordings of Example I.1

In broader terms, one can postulate that pianists may not execute this sort of divergence because they: a) failed to notice it in the score; b) did not want to; c) imagined it but could not manage to make it audible, whether or not they were aware of this failure. With this research, it is my hope to address all three scenarios - to: a) raise the level of awareness of possibilities of polyphonic expression; b) to argue for the value and importance of polyphonic expression by situating it in the broader context of social and cultural metaphoric relevance; c) to provide tools and observations which can help pianists to develop the embodied knowledge that will make such expressive divergence an easy and natural part of their musicality.

[7] Reissued by Naxos. Recorded April 13, 1925 for Matrices. CVE-352510-1.
[8] From CD *Scarlatti, Beethoven, Chopin.* RCA Red Seal, 1993.
[9] From CD *Rubinstein Plays Chopin Ballades and Scherzi.* BMG Entertainment, 1999.
[10] DVD Recorded for Deutsche Grammaphon. Released July 1, 2008.
[11] CD Recorded for Duetsche Grammaphon. Released 1988.
[12] Recorded for RCA Victor Red Seal, 1999.
[13] From DVD *Lang-Lang at Royal Albert Hall.* Sony Classical, 2014.
[14] From CD *Sviatoslav Richter: In Memoriam.* Deutsche Grammaphon, 1998.
[15] Re-released by Decca, 2013.
[16] Recorded 1928, re-released by Naxos in series *Cortot: 78 RPM Recordings* vol. 5.
[17] Decca, 1997.

In the example above, the expressive divergence was actually written by the composer, but there are many possibilities to use such expressive divergence in any keyboard music, even where it is not explicitly notated. Since expressive details are relatively sparsely notated (compared to actual notes) they are filled in by performers to make the music come alive. Without the written imperative of expressive divergence, performers are less likely to practice it or use it in performance. One way to bring expressive divergence into centre of the technique of performers is to first bring it into conscious awareness and then to provide a series of exercises whereby performers can acquire a specific embodied feeling and integrate it into their practice. It is my experience that once this awareness and embodied knowledge has been well practiced, possibilities for its employment are readily seen in scores of music from all time periods. Rather than an exception, it becomes a standard part of playing.

Overview of dissertation

The relation between the inner world of the musician, how he embodies or feels the music, the musical score and the structure, habits and tendencies of the performing body represent a complex web of interacting artistic impulses which must be approached together. No less complicated is the web of research both from other disciplines and from within music-related disciplines and institutions, ranging from performers to teachers, theorists, musicologists, critics and many more each with their own language and well-established research paradigm. In this introduction, I will present a discussion of the methods used in this research and the audience to which it is addressed.

In Part I I will give a preliminary look at polyphony, starting from the wider context of how it resonates in the world through its use as metaphor and then defining as a compositional texture and as an expressive texture. I will briefly discuss how single-player

polyphony is different from multi-player polyphony and characterise embodiment as a central feature in single-player polyphonic expression. Next, I will discuss how polyphonic expression is a sort of artistic turn that represents a certain ethical viewpoint towards music that is different from (though not incompatible with) historically informed performance and more mainstream ideas of "following the composers intentions" or "being faithful to the work," all of which have their adherents among performers. (Though it is suggested in this chapter, I will save an ethical justification for this artistic turn for the conclusions of this dissertation).

In Part II, I will begin a discussion of embodiment by answering some valid objections against conscious interventions in movement at the instrument (brought to me by performers), and I will discuss how I intend to overcome the problems to which these objections refer. Then I will present an introduction to musical gesture, beginning with the wider context of embodied cognition, connecting body movement and sound, discussing how gesture is a concept that adds meaning to body movement, and then presenting several perspectives or concepts with which to analyse gesture. I will discuss gesture and musically expressive details and show that notation is read not only with the eyes and with the ear but also with the body, and how this embodied understanding is foundational to a performer's experience.

In Part III, I will present the term "coarticulation" and describe how hierarchically nested gestures allow the whole body to take part in the shaping of music, active at several hierarchically nested levels in the musical structure. In order to describe coarticulation and its relation to expression and structure, I will use examples from the Chopin Etudes. While a direct one-to-one mapping between musical structure and the body is impossible and unnecessary, I will show how the movement possibilities of the lived performing body

present a structure of their own which provides an embodied understanding of structure that occurs before conscious analysis.

Having argued that musical gesture is foundational to expression and musical cognition (Part II) and that such musical gesture is structured by coarticulation (Part III), I build Part IV on the hypothesis that developing embodied knowledge of divergent expression is the foundation for a pre-reflective understanding of the structural affordances of polyphony in musical scores. I will use the concept of coarticulation to show how musical gestures combine during the performance of expressive divergence and in order to examine the topic, I will present a series of artistic experiments as well as some exercises. Finally, I will turn to musical examples and show how expressive divergence can be used in the actual case of playing a recital. In the conclusions, I will return to polyphony as a metaphor to discuss the meaning of this research and, based on this meaning, to advocate for an increased awareness of the embodied expression of polyphony and to situate such awareness in a wider cultural context.

Research context and audience

Some artistic research aims to open up already existing artistic practice through conceptualisation, verbalisation, and theorisation, while other artistic research aims to found new practices. Of course this division is somewhat arbitrary, since research that aims to explain tacit practices will inevitably result in the modification, stabilisation or development of those practices. In any case, this dissertation spans both categories by first explaining a central part of technique and expression (coarticulation and divergent expression) and then by showing through examples and exercises how to develop this technique in a specialised direction through its application to *all keyboard music*, not just the most obviously contrapuntal. Admittedly the artistic end result has less shock value than

many other artistic research outcomes which depart radically and creatively from the traditional concert-hall performance practice[18], but the subtle, audible changes in the musical examples presented in this dissertation are at once loaded with metaphorical meaning and at the same time fit in normal concert settings.

Since I am both a pianist and an organist, I will use examples from both instruments. In fact they provide a useful comparison to each other, since each instrument has its own unique possibilities for creating polyphonic expression. The idea of coarticulation will be more familiar to pianists, since the nature of touch-sensitivity on the piano leads inevitably to an awareness of the use of the body in creating sound. Organists on the other hand have more contact points with which to play notes - instead of only ten fingers, they have fourteen contact points including the toes and heels of both feet - and mobilising the whole body to navigate the pedal keys, the swell pedal(s), different manuals, and the various tools for changing registration lends a unique and complicated physicality to the experience of playing. Because of the difference in how the body is used, and the (arguably) more sensitive gradations in how the body is heard at the piano, I will focus the discussion of coarticulation on the piano and use the organ examples as a kind of counterpoint. Through my personal experience with both instruments, I am convinced that playing the organ helps pianists to expand their polyphonic imagination and that playing the piano helps organists to develop their technique and expression, a point which I will briefly discuss in Part IV.

Writing research about piano playing is similar to teaching piano in this respect: the level of playing and musical understanding of the audience determines how basic or advanced the explanations can be. Certainly the embodied experience underlying the ideas about gesture and coarticulation in Part II and Part III are not new, but the fact remains

[18] One prominent example is the Music Experiment 21 project led by Paolo de Assis at the Orpheus Institute. For more information see <musicexperiment21.eu>.

that many talented pianists lack the conscious awareness - by which I mean also the framework of language - from which to consciously develop such techniques in their own performing and teaching practices. I expect that many of my pianist colleagues will recognise the phenomena that I try to explain, whether they agree or disagree with the appropriateness of their employment. Divergent expression, the central topic of Part IV, is also not a new idea for professional pianists, but it is an idea that has potential for far-reaching development. I hope that reading the chapter, playing the examples and doing the exercises will open up new sorts of awareness for pianists of all levels, leading to a more frequent employment of divergent expression in performing and teaching practices.

Teaching the practice of music is largely a one-to-one affair, since the teacher continuously adjusts his comments to the reaction of the student. For one student, a mere gesture might suffice, while another student might miss the point of an extended explanation completely and the teacher must rephrase or re-show what he wants to communicate in several different ways. What is obvious to one can be incomprehensible to another. Such is the problem with writing about musical practice - too many words for some and not enough for others. I have tried to write to an audience of both pianists and researchers, aiming for the average in both groups. The fact that some points will be self-evident to most pianists does not mean they are superfluous, since the language used to communicate these points enables a dialogue about the underlying issues. Opening such issues from the practice to dialogue - to refinement or refutation - is an important goal of artistic research.

It is my view that due to the focus on pianistic embodiment, understanding this research is dependent on *actually trying out the ideas at the instrument*! I have made the effort to write in such a way as to be understandable (at a conceptual level at least) to non-pianists, but the very core of this research lies in the actual exploration at the instrument

that I hope to encourage. Only by actually playing the examples and trying the exercises will the research be fully understood.

Language and structure

The conflicting of jargons resulting from an interdisciplinary source-set can be confusing, and this has motivated me to prune away expensive words in favour of, where possible, the kind of language one might encounter in a piano lesson or at a university class. In order to do so, I need to give some commonly-used words a more precise meaning. This will take place in the course of the text, but I have also assembled a glossary, which is presented in an additive manner at the end of each part. Each gloss summarises my usage of the word, while referencing the section where the usage was introduced. The sections and subsections have therefore been numbered for easy reference. Because of these divisions, the part/section/subsection hierarchy has many layers, and while it was not my intention at the outset to create such a byzantine structure, the benefit is clarity for the purpose of self-references in what is often a complicated field of thought. In the PDF version of this dissertation, the part/section/subsection hierarchy is coded into the document structure and can be accessed by the bookmarks tab to the left of the screen. I highly recommend that the reader review the glossary preceding each chapter before proceeding to read the chapter, without which step untold misunderstandings might occur. I also recommend that the reader remain aware of the part/section/subsection structure (by collapsing and expanding it in the bookmarks tab) in order to take each section in its appropriate context in the dissertation. If at any moment the reader wonders how any particular section relates to the whole dissertation, a traversal of the first paragraphs of each part should supplement the overview given above in providing reorientation.

Self-references are made with the section symbol (§). Musical editions are referenced in-line with the system (publisher, editor, year). My own markings in musical examples are shown in green. The issue of gender parity in the use of pronouns was carefully considered, and the inclusive use of "she or he" or "his or her" is intended throughout. Because of the frequency of their use, such inclusive constructions would make the text difficult to read. In order to avoid confusion, the choice between "he" or "she" was settled by the gender of the author. In the conclusion, both pronouns are used to reaffirm the spirit of inclusiveness hereby expressed.

Methods

Certain aspects of this dissertation - such as inclusion of sources from empirical musicology and the fact that I use the word "experiment" in Part IV - might suggest that this dissertation aims to be build scientific, objective or empirical knowledge of some kind. Without rehearsing the problems inherent in any such claim, let me hurry to explain that this dissertation can best be read as an essay that is partly descriptive, partly instructive and partly speculative. In choosing methods for this research, I found it is useful to weigh the benefits of empirical research - the kind found for example in the discipline of empirical musicology - with practitioner literature - the books or essays written by musicians themselves outside of academia. Empirical research benefits from defined research methods and objective results, but its focus is limited to the short span of time during which the subject(s) are connected to motion sensors or otherwise part of the experiment. Practitioner literature, on the other hand, builds conclusions from a whole lifetime of experience, but the methods are not always defined. Both kinds of research have their advantages, and I will use both types of sources.

One problem with artistic research that relies only on the experiences of the researcher can be described as the anti-intellectualist problem. This philosophical position of anti-intellectualism argues that knowledge-how and knowledge-that are not reducible to each other. A person with know-how of a certain skill cannot necessarily describe how they do that skill, or might describe it incorrectly. Knowing how surfing is done from having carefully observed surfers or from reading books about surfing is different from having the ability to surf. Additionally, the experienced surfer, asked how to surf, might give inaccurate descriptions or advice (Fantl 2014; Bengson & Moffett 2011). In order to increase the credibility of artistic research, then, it is my opinion that insights delved from the experience of the practitioner should be connected outward to insights from other kinds of research. The resulting web of interconnectedness prevents solipsism and allows conclusions to be drawn which are more meaningful than those limited by a single method. In the centre of this web is the experience and awareness of my artistic practice, and I use sources external to my practice that resonate with my experience. This resonance can be the resonance of familiarity or recognition, but it also results in changing my experience by offering language, concepts and insights that can subsequently feature in my conscious awareness. The circularity of the artistic research process, like artistry itself, is thus opened to outside influence. It is true that by using sources from outside of the field of music I run the risk of misunderstanding those sources. Though I have done my best to understand each source in the context of its discipline, no one can be an expert in as many fields as are represented in this dissertation, so it is possible that coming from my viewpoint as an artistic researcher I have created my own take on the issues at hand.

The possibility of interdisciplinary interaction has been described as "multi-directionality." Following a long philosophical tradition critiquing scientific knowledge, some artistic researchers have described multi-directionality by showing that every

discipline of research has its own vantage point and thus cannot be complete in itself. "Multi-directionality gives artistic research not only the opportunity to emphatically question the practices of art and research but also the obligation to follow and hear the substantiated critiques of other scientific fields and life forms. This implies that introversion becomes impossible" (Hannula 2005). Thus, they argue for a plurality of research methods within each artistic research project, even going so far as to call for an "anarchy" of methods.

My research is characterised by many methods. At some moments, my gaze will turn inward and I will try to describe the contents of my awareness - at such moments my research method is a kind of phenomenological method. At other moments I will tell a story to describe an experience, at which moments my method is auto-ethnographic. I will connect insights from my own awareness and experiences to empirical evidence found in other disciplines such as empirical musicology and cognitive science. I will sometimes describe musical phenomena and interpret them in relation to meaning, metaphor and cultural context, which is an approach more akin to musicology. In formulating experiments, I will use an action method of research appropriated from sociology.

With this polyphony of research methods, the common thread is the focus, at least in peripheral vision, on the practice of playing and the aesthetic qualities and meaning of the artistic result. For the practicing musician, successful artistic research should be useful. Parallel to the practitioner literature on piano playing such as the famous books written by, for example, Gyorgy Sandor, Boris Berman and Heinrich Neuhaus and the books of exercises from, for example, Liszt and Brahms, all of which stand on my bookshelf, useful research creates as a pathway towards a particular kind of musical development the success of which cannot be measured, since it depends on the user. Standing behind the usefulness of the dissertation is my own practice both in teaching and in performing,

where I have extensively tried out the ideas I present here. In the focus on aesthetic qualities of the artistic result, the currency is inspiration and the creation of meaning. I have found the issues central to this research to be inspiring and motivational, both for me and my students, and I hope readers will share my enthusiasm.

Part I: A preliminary look at polyphony in performance

To begin with, it is important to define the word polyphony, since it is a word used widely with different meanings. Polyphony as a metaphor has become increasingly popular in extra-musical disciplines, and this wider question of what polyphony can mean in social and literary contexts adds resonance to this research. Moreover, as musicologist Lawrence Kramer notes "as a communicative act, metaphor opens the possibility of two-way transfers of meaning between its constituent terms, each of which appropriates elements from the other's characteristic spheres of discourse" (Kramer 1995: 70). The wider context of how polyphony is used as a metaphor, then, can influence how we see the music itself. My starting point will be this wider context, after which I will examine how the word polyphony is used to describe compositional practices. From there I will approach my own definition of polyphony as a kind of divergence in expression, and introduce the various constitutive elements of a practice of embodied polyphonic expression in single-player piano and organ music. Since it is polyphony *in performance* rather than polyphony *as a score-based practice* that is the subject of this dissertation, I will end with a short discussion of what elements in the performance-based practice come to the fore.

1 Polyphony as metaphor

Polyphony is used as a metaphor in many disciplines. Some examples of extensive use of polyphony as a metaphor can be found in theology (Ginn 2007: 157, van Hecke 2005, Biddle 1996), literature criticism (Waugh 2006: 225, Teranishi 2008, Nikolajeva 1996), cultural studies (Harshav 2007, Perianova 2013), philosophy (Ihde 2012, Wallgren 2006, Currie 2013: 171), politics (Koensler 2015: 108, Gjerstad 2013, Schapiro 2009), law (Waldron 1999), education (Lorda & Zabalbeascoa 2012, Schmitt 2011: 322) and many other disciplines. For the purposes of this paper, I will focus on how polyphony is used as a metaphor in the writings of literary critic Mikhail Bakhtin and cultural theorist Edward Said. The writings of Bakhtin, a literary critic, are significant because his conception of polyphony as multiple voices and multiple consciousnesses has been widely appropriated by other writers (who may or may not know anything about the musical origins of the word). It should be noted that he was not the first writer to use polyphony as a concept in literature criticism as it had been used before by literary critics such as Otto Ludwig before 1865 and Vladimir Kormarovich and Leonid Grossman in the 1920s (Poole 2001). Bakhtin's ideas about polyphony have in turn come full circle to be applied in music research (see McKay 2013, McKay 2007, Korsyn 1999, Dixon 2007, Hirschkop 1989, Fairclough 2004, Korsyn 1993, Gritten 1999, Hibberd 2005, Fairclough 2006). Said's discussion of polyphony is interesting because of his extensive knowledge of and sensitivity to music, and because of his connection between polyphony and the pressing cultural and political issues of his time. His belief in the social relevance of music was not only theoretical, but was followed through with action in the project of the East-West Divan orchestra, which he cofounded with conductor and pianist Daniel Barenboim.

Bakhtin used the word polyphony famously in *Problems of Dostoevsky's Poetics* (originally published in Russian in 1929) formulating a philosophy of language and

discourse in literature criticism, an effort whose effects has rippled through literature criticism various fields in the social sciences. His use of polyphony as a metaphor has often been misunderstood since he does not explicitly define what he means by polyphony. In the first chapter, he uses the word extensively in articulating responses to existing literature about Fyodor Dostoevsky, giving an impression by context of what the idea means to him, and in later chapter he elaborates on a polyphonic or dialogic understanding of truth (Bakhtin 1984, Morson & Emerson 1990).

> A plurality of independent and unmerged voices and consciousnesses, a genuine polyphony of fully valid voices is in fact the chief characteristic of Dostoevsky's novels. What unfolds in his works is not a multitude of characters and fates in a single objective world, illuminated by a single authorial consciousness; rather a plurality of consciousnesses, with equal rights and each with its own world, combine but are not merged in the unity of the event. (Bakhtin 1984: 6)

Bakhtin's idea of the polyphony of voices in Dostoevsky involves a few key ideas. First was that individuals (or characters) retain an individual freedom or agency and resist complete definition or finalisation by the author. This "unfinalisability" is in a sense related to an idea of soul, and stands in contrast to what Bakhtin finds in previous novelists, where the characters serve as vessels into which the author pours his own consciousness. In this latter situation, the characters are describable, objectified and predictable, but in the case of Dostoevsky they retain their own personal consciousness, their own surprises. "It is above all due to the freedom and independence characters possess, in the very structure of the novel, vis-a-vis the author-or, more accurately, their freedom vis-a-vis the usual externalizing and finalizing authorial definitions."(Bakhtin 1984: 13)

This unfinalisability of individuals allows the individual characters to subvert or interrupt the narrative. Individuals are of course created by the author but allowed their own agency whereby they may even "revolt" against the author (Zhongwen 1997: 779).

"Dostoevsky, like Goethe's Prometheus, creates not voiceless slaves (as does Zeus), but free people, capable of standing alongside their creator, capable of not agreeing with him and even of rebelling against him." (Bakhtin 1984: 6)

Bakhtin also highlights the nature of interaction between the individuals and others, whereby the otherness of each is felt as another consciousness without objectification. Bakhtin describes this relationship as "the affirmation of someone else's 'I' not as an object but as another subject," (Bakhtin 1984: 14).

> Consciousness never gravitates toward itself but is always found in intense relationship with another consciousness. Every experience, every thought of a character is internally dialogic, adorned with polemic, filled with struggle, or is on the contrary open to inspiration from outside itself- but it is not in any case concentrated simply on its own object; it is accompanied by a continual sideways glance at another person. It could be said that Dostoevsky offers, in artistic form, something like a sociology of consciousnesses -to be sure, only on the level of coexistence. But even so, Dostoevsky as an artist does arrive at an objective mode for visualizing the life of consciousnesses and the forms of their living coexistence, and thus offers material that is valuable for the sociologist as well. (Bakhtin 1984: 32)

According to Bakhtin, thus, Dostoevsky's novel is organised not from a dominant single (authorial) consciousness but as an unresolvable mixture of the consciousnesses of its individual characters, each with its own viewpoint and voice, above which the author does not rise. In the creative process, the author creates the characters but cannot foresee their reactions to various situations, so he must allow them to speak during the writing process. Bakhtin uses the word polyphony as a metaphor which refers not merely to multiple voices (which exist in monologic novels) but to multiple viewpoints and multiple consciousnesses, each with their own sense of agency (Morson & Emerson 1990: 239-240). Bakhtin highlights this distinction in disputing the analysis of Kormarovich, who writes:

> The teleological coordination of elements (that is, plots) which are, from a pragmatic viewpoint, disunified parts, is the source of artistic unity in a Dostoevskian novel. And in this sense it can be compared to the artistic whole in polyphonic music: the five voices of a fugue, entering one by one and developing in contrapuntal harmony, remind one of the 'harmonization of voices' in a Dostoevskian novel (quoted in Bakhtin 1984: 21).

While Kormarovich sees the (imitative) form of fugue as a form of cooperation between voices which are coordinated by the author - a counterpoint of cooperation - Bakhtin on the other hand highlights "combination of fully valid consciousnesses, together with their worlds" - a counterpoint of friction (Bakhtin 1984: 21, McKay 2013: 19). Kormarovich and Bakhtin, then, see two opposite forces within counterpoint - one of cooperation and one of friction. The former represents a unified control, as if looking at the musical score and seeing the regimented patterns and as if this "counterpoint could represent the unified efforts of a population" (Yearsley 2002: 233) whereas the latter highlights the individuality of each voice and the frictions between the voices. These two perspectives will have their correlates in two fundamentally opposed approaches to performing counterpoint discussed in Part IV of this dissertation.

In Bakhtin's view, Dostoevsky's polyphonic conception was not only reflected in the interaction between different consciousnesses, but also in how this interaction resulted in multiple languages and viewpoints within the individual characters themselves. The oft-cited "sideways-glance" refers to the anticipation of a response that is evident within an individual's utterance, and the idea of heteroglossia refers to the different kinds of language used depending on the situation. Thus the individual consciousness is not an isolated entity but is rather formed by interaction with other consciousnesses and the polyphony of interactive space is constitutive of and mirrored in the individual. In this way, Bakhtin introduces a dialogic understanding of truth whereby coexisting (and perhaps disagreeing) viewpoints taken together form a dialogical truth. Contrary to

monologic thinking (in the Hegelian and Marxist tradition) this dialogic thinking depends on the plurality of consciousness from which a single truth cannot be abstracted and repeated. The viewpoints or consciousnesses themselves are integral to the unfinalisability of the dialogical truth itself.

Edward Said's writing about polyphony was consistent with his increasing tendency towards writing about music in the last decades of his life. Polyphony (or counterpoint, a word he used almost interchangeably) provided an attractive alternative to totalising thought (de Groot 2010). He lamented the lack of polyphony in Arabic music, remembering how shocked he was as a child when he attended a concert of Umm Khaltoum, whose music lacked counterpoint (de Groot 2005). Said criticized the idea of absolute autonomy of musical works, instead constantly relating music to its social context (Magome 2006). He applied the idea of counterpoint to his post-colonial thinking, reading novels such as Joseph Conrad's *Heart of Darkness* and Rudyard Kipling's *Kim* in such a way as to give voice to the suppressed counterpoint of the colonised without discounting or devaluing the works because of their imperial viewpoint (Said 1993: 19-31 and 160-161). Central to his cultural and political thinking was the idea that the function of a secular intellectual is to provide alternatives - "alternative readings, alternative sources, and alternative presentations of evidence" - alternatives which are to coexist without the need for reconciliation. He writes "we must be able to think through and interpret together experiences that are discrepant, each with its particular agenda and pace of development, its own internal formations, its internal coherence and system of external relationships, all of them coexisting and interacting with others." (Said 1993: 32)

Similar to Dostoevsky's characters in Bakhtin's reading, Said felt the polyphonic nature of coexisting alternatives reflected within himself. Speaking of his own inner experience, Said writes:

> I occasionally experience myself as a cluster of flowing currents. I prefer this to the idea of a solid self, the identity to which so many attach so much significance. These currents, like the themes of one's life, flow along during the waking hours, and at their best, they require no reconciling, no harmonizing. They are "off " and may be out of place, but at least they are always in motion, in time, in place, in the form of all kinds of strange combinations moving about, not necessarily forward, sometimes against each other, contrapuntally yet without one central theme. A form of freedom, I'd like to think, even if I am far from being totally convinced that it is. […] With so many dissonances in my life I have learned actually to prefer being not quite right and out of place. (quoted in Stevenson 2003: 65)

Bakhtin and Said's views of polyphony emphasise responsiveness or "responsibility" of characters, viewpoints or ideas in such a way that they may harmonise or clash, but that in any case they are not reducible to one authorial point of view or one subjective sense of personal identity or agency. For both, polyphony is found in alternate voices and viewpoints in dialogue with one another which taken together form truth. The polyphonic nature of the world exterior to the subject is reflected in the subject's own polyphonic currents of consciousness, and the apprehension of "other" points of view or consciousnesses does not objectify or flatten them, but rather affirms their subjectivity. The metaphor of polyphony has gained tremendous currency in many disciplines due to the ideal of democracy it conjures, where ideas or individuals coexist, sometimes in harmony with each other and sometimes with irreconcilable difference. Having studied Western classical music (he played the piano), Said was intimately familiar with the musical phenomenon upon which the metaphor was based. The same cannot be said for all of those who use the term, and an in-depth look at the musical phenomenon lends the metaphor more meaning.

2 Polyphony as a compositional texture

Music theorists, musicologists and musicians also use the word polyphony with differing meanings. These meanings differ in what they address, depending on the historical and practical context. These generally fall into two categories which coincide with two distinctions made by music theorist Heinrich Koch in the early nineteenth-century. Koch made the practical distinction between *monophony* and *polyphony* to contrast music with one voice and music with more than one voice and the stylistic distinction between *polyphony* and *homophony* to distinguish music *with a contrapuntal layering of independent voices* from *melody with accompaniment*. Thus polyphony can be understood with either a practical (broader) definition or a stylistic (narrower) definition.

The practical definition is an inclusive one which looks to the etymology of the word: poly- + *phōnōs* (many + sounds, voices). *Polyphōnos* ('many-voiced') and *polyphonia* were used in ancient Greece to refer simply to music with more than one voice, without any technical explanation (Cooke, Grove Online s.a.). In this context, polyphony refers to any music with simultaneously sounding notes, thus *polyphony* versus *monophony*. In the technical specifications for digital instruments, for example, polyphony is used as a technical measurement for how many notes can be played at once. Such a definition as the one proposed by music theorist Joseph Swain's (2002) emphasises that among multiple melodies "no degree of independence is implied" by the term polyphony, in contrast to the term contrapuntal polyphony which requires such independence.

Counterpoint, a term stemming from the practice of writing notes (*punctus contra punctum*) which coincided with the development of Western polyphonic music, is generally used to imply a greater degree of equality between voices in the sense that each voice has a degree of autonomy in rhythm and contour. Counterpoint is a defining feature in the

narrower definition of polyphony, and makes the stylistic distinction between *polyphony* and *homophony*.

With all respect to Swain, the connotations of the word polyphony in its usage within musical practice often indicate a certain degree of autonomy between voices whereby the contours or rhythms of simultaneous sounding voices are at least somewhat independent, in other words, counterpoint. The use of the word polyphony as a metaphor (or the word counterpoint for that matter, which is often used interchangeably) reflects both this independence and the harmonisation or mutual attunement of voices. For the rest of this dissertation I use this narrower definition of polyphony, which emphasises its stylistic quality of independence between voices. In my use, the word *polyphony* therefore includes counterpoint as a defining feature. I choose the word polyphony instead of counterpoint since it does not call forth the rather formalised or rule-bound training found in counterpoint classes, and because it refers to sounds rather than notes ("points") on the page.

3 Polyphony as an expressive texture

When examining scores, the dividing line between polyphony and homophony is not always clear. Much of the music that is at the centre of contemporary pianists' repertoire, from the Classical and Romantic periods especially, is situated somewhere on a spectrum between homophony and polyphony. Pianist and musicologist Charles Rosen (1995) convincingly showed the contrapuntal nature of early Romantic composers in implicit response to the idea held by many and articulated by Glenn Gould that such composers "were mostly interested in vertical composition" (Said 2008: 199). By doing so, Rosen advocated a more polyphonic reading of these composers based on what he found in the scores. I argue that the performer can advocate for the polyphonic under-layers of the music through use of polyphonic expression, which makes these polyphonic tendencies more audible. In the Chopin *Ballade* above (Example I.1) the divergence in expression constitutes an example of this polyphonic expression, which is clearly notated in the score. Performers can bring out polyphonic expression that follows the contours or rhythms of notes in the score, but which is not explicitly notated with such clear dynamic markings. More radically, the performer can use polyphonic expression as a superimposed layer on music that on paper does not have an obvious polyphonic dimension. This superimposed layer, while not *contained* in the score, also does not necessarily go *against* the score and due to the fact that the score is under-specified with regards to expressive features, it represents an alternative to the fleshing out that a performance anyway provides. This alternative is justified by the metaphorical resonance of polyphony, an idea that I explore in the conclusions of this dissertation.

The precise definition of polyphonic expression that I will propose depends on the ideas presented in the first three chapters of this dissertation, so I will only introduce that more precise definition in Part IV. At this point it is enough to roughly define polyphonic

expression as divergence in expressive change (in articulation, dynamics, and timing) between two or more simultaneous voices over a specific timescale[19] - in other words the expressive parallel of contrary motion. Parts of this definition - such as expression and voices - require their own definition, which I will provide later. For now, it is important to emphasise that the polyphonic expression I am writing about occurs in performance, and not often in the expressive markings in musical scores. It depends, thus, on the initiative of the performer. As I have explained, Kormarovich and Bakhtin saw two opposite functions in a fugue. Kormarovich highlighted the imitation between voices, a comparison made by taking the voices out of time, while Bakhtin highlighted the friction and interaction between voices as they unfold in time. By introducing polyphonic expression into the performance of a musical work, the performer invests each voice with its own individual agency and thus emphasises the friction inherent in Bakhtin's view. While this might be obvious in the case of highly polyphonic forms such as the fugue, it is also true of works that are more towards the homophony side of the homophony - polyphony spectrum, which can be *given* a polyphonic character by the performer.

On the other hand, the performer can downplay this polyphonic friction even when performing works that on paper are very polyphonic. In order to develop what Neuhaus calls "polyphonic technique" (1973), it is easy to recommend studying Bach's *Das wohltemperierte Klavier,* the practising of which in any sort of way will develop the basic polyphonic technical skills (like fingering, memory, development of the ear) which lead to being able to play the notes. The performer might then decide to bring out a voice (for example the top voice, or the subject whenever it occurs). The performer might create oblique divergences by, for example, making a dynamic shape in one voice while the others remain flat. But all of this does not reach what I consider to be polyphonic

[19] A unit of musical time measured in the score, such as one beat or one measure.

expression, which occurs when voices actively diverge, when, for example, one voice makes a crescendo simultaneous to a diminuendo in another voice as shown in the Chopin example above.

4 Single player polyphonic expression

Bakhtin's idea of multiple consciousnesses coexisting without merging is evident in the performance of, for example, a string quartet where each voice is embodied by an individual player. In such multi-player polyphony, the focus of the rehearsal process is often one of mutually attuning the expression of each player so that the parts fit together in expression. The process mostly begins with too much divergence and the players have to find ways to converge or come together. Each player is an advocate for his or her own voice in the musical texture.

In single-player polyphony, exactly the opposite is the case. The performer most often begins with convergence in expression due to the fact that the reflexes of the body (such as bimanual interference, which is the tendency of muscle activity in one hand or arm to be mirrored in the other hand or arm) and the fact that he is one person trying to advocate for all the voices at once. While the string quartet must work to converge in order to make a balance of converging and diverging expression, the keyboardist must work to make voices diverge to achieve the individuality of each voice.

If polyphony of expression is to occur, then the divergent expression must be simultaneously embodied. If expression is viewed as an utterance from a human agent, then the co-creation of divergent expression indicates the dividing of expressive agency within the self of the performer. In a non-divergent expressive texture, the imagination and body work as one in shaping the music. The distinction between mind and body is not problematic because both play a part in the expressive shaping. The inner process of creating expressive divergence feels somewhat different, however. In my own experience, while I do shape each voice intentionally by planning ahead, and I do follow each voice with my ear, it seems like my conscious or analytical mind jumps back and forth between the shaping of individual voices, viewing the shapes of phrases or sections in one glance

rather than in real time. The simultaneity of divergence in real time (whereby each voice displays a continuity of gesture) is sustained by the continuity of embodiment in gesture and its connection to the ear.

At this moment, it is useful to step back and reflect in a sort of phenomenological way about the properties of musical ideas in their mental or physical sublimations. For me, a physical musical idea is a musical gesture, or the embodiment of a musical shape that is characterised by a sense of continuity and direction. As musicologist Rolf-Inge Godøy explains, a prefix gesture is characterised by an intensification towards a point of arrival, and a suffix gesture is characterised by a relaxation after an arrival (Godøy 2011a: 240).

As Husserl noted in his account of phenomenological time, to grasp a melody in its extension over time, we must be able to step out of the continuity of time and grasp the melody in one instant (Husserl 1991; Brough 1991). In its conscious mental abstraction, a musical gesture is represented by goal points or snapshots, which represent salient moments during the trajectory of movement (Godøy 2011b: 69). It is thus like a movie, with frames that might be closer together or farther apart, but still remain snapshots. The mental image of gesture thus can be grasped in one moment and is not necessarily played out over time and space in the way that its physical correlate is. It can be played back mentally, however, using the same motor imagery that might enact it in physical movement.

The abstraction of a physical movement into a mental experience represents both an advantage and a disadvantage. The advantage is that since it can be grasped as one chunk, and perhaps as one piece of a larger chunk, it leads to a possibility for structural thinking. The disadvantage is that because it is an abstraction composed of goal moment snapshots, it dries out the fluidity and expansion over time of an embodied gesture,

without which it can seem angular and unnatural. Of course, notated music itself represents yet another layer of abstraction.

Because of the fact that I can step out of the continuity of time while playing to grasp musical shapes in an instant while the continuity of gesture continues in my body, I am able to shape or plan phrases. In a polyphonic texture, I can plan different shapes for different voices, all out of time, but in order for those shapes actually to be executed I need to have the embodied knowledge of how it feels to execute such divergence, without which the divergence will remain only an imaginary experience that is inaudible. Certain kinds of divergence are quite easy, like divergence where the length of the divergent phrases can be expressed in a whole integer relationship that is not 1:1 (so, for example, 2:1, 3:1 etc.). Also easy to execute is oblique divergence, where one voice remains flat while the other one takes a specific shape. (In fact most pianists when imagining divergence will achieve only oblique divergence. Listen to their fugues where the subject is shaped and the countersubject is flat.) True divergence of the kind that I will specify in Part IV can certainly be achieved through imagination, willpower, an accurate ear, and repetition but practicing and mastering the embodied experience makes it far easier to employ and opens the imagination for its many possible uses.

Such a description gives a fleeting preview of some issues in the relationship between imagination, conceptualisation, embodiment and expression in performance. If simultaneously embodied divergent expressions rely on the body for continuity and shape, then the body features as an essential locus of agency for individual voices in a polyphonic texture, and musical shapes and expressions can be offloaded onto their constitutive physical gestures.

5 Polyphonic expression as a performative turn

It is important to note the difference between a score-based study of polyphony and a performance-based study. In other disciplines, there has been a "performative turn" beginning roughly in the 1970s. In theatre, for example, plays came to be considered as traces of theatrical productions (where the theatrical combines with the anthropological perspective of ritual and its social context) rather than exclusively as literary texts (Cook 2014). This focus on performance studies has penetrated many disciplines but has still failed to adequately challenge the notation-based orientation of musicology and music theory. Despite books such as musicologist Lydia Goehr's *The Imaginary Museum of Musical Works* (1992) which have challenged the work-concept of musical ontology and despite some advances in performance study, much musicology and music theory is still based on a text-based analysis, an orientation which marginalises the role of the performer as merely executing the intentions of the composer or worse as merely translating the analysis of the theorist into sound (Cook 2014: 14). Performers have encouraged such marginalisation by insisting that they are merely following the intentions of the composer or playing what's in the score. In describing the role of the performer, Schoenberg did not mince words: "The performer, for all his intolerable arrogance, is totally unnecessary except as his interpretations make the music understandable to an audience unfortunate enough not to be able to read it in print" (quoted in Newlin 1980: 164). As musicologist Nicholas Cook points out when comparing historically informed performance, which claims to come closer to the composer's intentions, with mainstream performance: "the rhetoric of composers' intentions is equally characteristic of mainstream performance, which has the curious consequence that nobody is in greater denial of the creativity of performance than performers." (Cook 2014: 15)

What are we to make of a situation where two pianists, such as Sviatoslav Richter and Daniel Barenboim, both claim to play only what is in the score but end up having such incredibly different results? First, this position of humble servitude to the composer is a sort of ethical claim that many performers make - even such flamboyant personalities as Leonard Bernstein (Cook 2014). Even if the performers actually believe that to be a full description of their interpretive process, their conscious intentions form only part of their agency and creativity as performers. Their physical disposition and adjustment to the instrument, training, embodied knowledge, unconscious feelings and habits are of course equally present in the performance. Their conceptual processes of examining and making decisions about the how to perform the score can be described by the word *interpretation* - and it is in this realm of the inner experience that such a ethical claim of humble servitude to the composer operates. The non-conceptual and partly unconscious or semi-conscious aspects of performance, including but not limited to unconscious feelings, sensations, physique, body schemata[20], habits and training form what can be called *understanding*. Thus a performer approaches a score through conceptual *interpretation* and non-conceptual and embodied *understanding*. Interpretation and understanding are related to each other in phases since conscious interpretive decisions become part of understanding through repetition. An idea that must be executed consciously can be repeated enough that it becomes an embodied habit, after which it functions automatically. But it is important to note that understanding is not only (and not primarily) a result of conscious decisions since bodily habits are formed unconsciously from birth on through interactions with the environment, and in musical study through imitation at a pre-reflective level.

[20] As philosopher Richard Shusterman explains, body schemata "involve entrenched habits, dispositional mechanisms, or tendencies of movement, feeling or attitude that are incorporated in our bodies and enable us to act skilfully and intelligently without having to think about what we are doing with our limbs" (Shusterman 2012: 333)

Since conscious *interpretation* and embodied *understanding* are both parts of the performing process, even the performer who consciously tries only to play what's written is doing a creative act. The role of the performer is one that entails creative freedom because even when conscious freedom is restricted by an imaginary adherence to the intentions of the composer, unconscious and physical habits are necessary to reconstitute pages with the ink-marks into music. Let us not forget that the intentions of dead composers passed on through documents are also more-or-less inaccessible, because these documents are intelligible only by their embeddedness in practices that have changed over time.

In a situation where many of the fetishes that performers cling to are being deconstructed - the work concept, the adherence to composer intentions, the ethical attitude of servitude to the composer - performers are faced with the chance to use research to explore their newly found creative freedom. For some performer-researchers this has involved using historical recordings as inspiration (see for example Scott 2014) and for others this has involved a conceptual reworking of the performance experience through the addition of audio-visual materials or through changing the basic parameters of performance (see for example the experimental approaches of the "Music Experiment 21" project led by Paolo de Assis)[21].

For me, polyphonic expression in performance is both an embodied understanding that can be developed through practice and an orienting performative attitude. This performative attitude is characterised neither by a faithfulness to composers' intentions nor a deliberate negation of these intentions (I neither know whether they would approve or not, nor do I lose any sleep over it, but of course I am aware that my decades of training influence what I find to be appropriate or beautiful). It is also not justified by faithfulness

[21] Details of the individual experiments that constitute this on-going project can be found at http://musicexperiment21.eu/projects/ (Accessed 12/2/2016).

to the work-concept or what Stravinsky called the "law imposed on [the performer] by the work" (quoted in Mitchell 2000: 29). Rather, it is an interpretive stance that I find meaningful and ethically justified because of the metaphorical resonance that polyphony has in an interdisciplinary and social context. The decision to advocate for polyphonic expression is what can be described as an "artistic turn"[22] - in other words a step which I make as an artist after which I can use a research process to describe the issues that such a turn causes me to face and how I face them. This "artistic turn" is only one of many artistic turns that could be taken from the perspective of performer creativity. To be quite clear it:

1. Is not in the score, though it does not wilfully go against the score.

2. Does not originate from a desire to follow the composer's intentions, though it does not wilfully go against the composer.

3. Does not originate from historical understanding, though it is also not anti-historical and historical information is certainly not excluded.

4. Is audible, explicable, disseminable, imitable but not universal - it is not the only way to play. It is a feature that I am working out in my musical practice through this research, and one that I share for others to use as they wish.

5. Balances what "sounds good" and what "feels right" and what "works" for the individual performer in communication with the audience with challenging those very aesthetic judgments. Because of differences in instrument, acoustic, audience and the aesthetic development of the performer, every performance will be different.

6. Operates in one phase in the realm of interpretation as it is mapped to affordances within musical scores and, more significantly, in the pre-reflective realm of

[22] The notion of an "artistic turn" here is taken from the monograph with the same title by Kathleen Coessens, Darla Crispin and Anne Douglas (2009)

embodied understanding as the feelings and embodied practices that it entails become ingrained in the performer's experience.

Glossary for Part I

Affordance - the possibility of some action existing between an organism and its environment (Gibson 1979; see footnote to Introduction).

Body schemata - learned motor patterns, habits, or dispositions that require little mental effort to carry out (§5).

Interpretation - the act of making conscious decisions in shaping a musical performance (§5).

Polyphonic expression - a performative texture characterised by simultaneous divergence in expression (§3). An example of divergence in expression is found in Example I.1. A more precise definition of polyphonic expression will be given in Part IV (§17.5).

Polyphony - a stylistic description of musical texture with counterpoint as a defining feature, characterised by its distinction from homophony (§2).

Timescale - a unit of musical time measured in the score, such as one beat or one measure.

Understanding - a non-conceptual and primarily pre-reflective embodied reaction, depending on the body schemata of the performer (§5).

Part II: Thinking with and about the body

Having introduced the role of embodiment in polyphonic expression, I will now turn to a presentation of some general issues fundamental for research in-and-through practice that have an embodiment focus. When discussing my research proposal with other pianists, I found any mention of the body to be surprisingly controversial. Being a pianist myself, I could understand the objections clearly, and to some degree they are valid and must be addressed. In order to explain the role of the embodiment in shaping musical imagination, it is important to contextualise this research within the wider interdisciplinary field of embodied cognition, and the short primer I present of the claims of embodied cognition can provide a lens through which musicians can understand the role of the body in musical thought. Without yet getting into a discussion of musical gesture, I will present a sampling of research connecting body movement to sounding result in musical performance.

In the following section, musical gesture is the main focus, which is distinguished from body movement in that it is not strictly a physical experience but rather one which operates across a continuum between the body and mind. I will present some descriptors and analytical perspectives that will frame the discussion throughout the rest of this

dissertation. In the last section I will concentrate on the relationship between musical gesture, expressive details and notation, showing how embodied experience is central to musical understanding.

6 The subject/object divide

It is obvious that musicians are relatively good at involving the body in imagination and the mind in embodiment, however the Cartesian paradigm of separation between mind and body persists to a surprising degree in the field of music instruction. This state of affairs reflects a separation between the act of music making and talking about music at a verbal or conceptual level. In pitching my research idea, for example, the most common feedback I got from my pianist colleagues could be given such a voice: "The idea of polyphony of expression is interesting but why must you talk about the performing body?" Such comments expose an underlying presumption that in musical performance, the imagination is a purely mental phenomenon, an autonomous mental category of the Platonic variety, and the body is the obedient slave which executes such ideas. Perhaps the fact that the fingers touch the keys of the instrument leads us to think of the body as an intermediary between the mind and the instrument. Perhaps the disciplining of the body that young musicians undergo at the hands of teachers promotes this idea. In any case, this view is reflected in the separation of technique and musicality in the training of musicians, a separation that is sometimes maintained even at a professional level - at the annual Johannes Brahms Wettbewerb in Poertschach, for example, jurors publicly hold up scorecards with one score for technique and one score for musicianship. Surely separation of technique and musicality is sometimes useful in teaching, but it must be a very temporary separation with a reintegration always in sight. For example, even technical exercises can be played with musical shape, whether or not it is written, and the benefits will be substantially greater.

I think that musicians are reluctant to think about the role of the body for several main reasons, and I will try to give voice to them. To begin with, it can seem that granting the body some part in the process of shaping the music is tantamount to admitting that the

music is not one hundred per cent under conscious control. Further, the influence of bodily factors in the imagination can be viewed as encroaching on the freedom of the imagination rather than an additional avenue that actually expands the imagination. Finally, and most significantly, conscious meddling in movement tends to make the movement self-conscious and stiff. Perhaps these reasons account for the advice given to me by a former teacher, when I introduced my research proposal to him: "But Andrew, there are things that you *shouldn't* think about too much!"

Before taking a bite, like Eve, from the magic apple, it seems necessary to provide a preliminary response. First I will show that the conscious mind has an objectifying tendency to the detriment of artistic and embodied practices - a problem that is fundamental for the integration of artistic research in expressive artistic practice. I will then show that this is not an insurmountable problem, since the conscious control and the artistic practice can be clearly separated through a conscious process which I call framing, allowing conscious ideas to influence the artistic experience from the periphery of awareness without objectification.

6.1 Objectification of the body

Thinking about the body *at the moment of performance* can lead to exactly the kind of Cartesian subject/object divide that body awareness aims to overcome. Simply stated, the problem with studying the body - or with studying any artistic practice, for that matter - is that when the body is examined, it is objectified in the mind (Legrand & Ravn 2009). In this process originates a subject/object divide where the body and its habits become the object of focus of the "eye" of observational conscious awareness. Because of conscious interference, the quality of movement becomes more granular and less fluid. Rather than enhancing movement and coordination, direct conscious attention interferes to the

detriment bodily coordination. Musicians often call this negative "self-consciousness" which is opposed to being "free."

Philosopher Dorothee Legrand has proposed a categorisation of body self-consciousness in the form of a) the "invisible body" which is "absent from experience"; b) the "opaque body" which is "taken as an intentional object of consciousness"; and between these two c) the "performative body" which is the "pre-reflective experience of the body itself"; and d) the "transparent body" which is the "pre-reflective bodily experience of the world" (Legrand 2007). What this scheme posits is a scale from total bodily unconsciousness ("invisible body") to bodily self-consciousness ("opaque body"), where the body is squarely at the centre of attention. Between these extremes lie modes of pre-reflective bodily self-consciousness where the body is in peripheral awareness. The distinction between the body at the centre or at the periphery is key in differentiating between observational reflective self-consciousness and pre-reflective or non-reflective self-consciousness. Such a distinction has been differently articulated by contrasting consciousness of self-as-subject and consciousness of self-as-object (Pinku & Tzelgov 2006) and has been appropriated in mapping the inner experiences of musicians in performance (Schacher 2014, McGuinness 2013).

Allowing for self-awareness without reflective observation may seem obvious to musicians (and others that rely on bodily expertise, such as dancers), but it is not universally agreed upon. Philosopher, cognitive neuroscientist and psychologist Antti Revonsuo, for example, holds that, "by reflective consciousness we mean such states in which the subject not only experiences something but, in addition, can take this experience as an object of further thought... Self-awareness, voluntary control and planning require reflective consciousness" (Revonsuo 2000: 343). Since it is precisely this conscious observational awareness and reflection that is key to artistic research, the effect of such

observation on bodily experience is highly relevant. If we assume the idea that normal experience of musical practice is built primarily on the "transparent body" which is "pre-reflectively experienced as the bodily mode of givenness of objects in the external world" (Legrand 2007: 493) and which conditions how musicians perceive such objects as the musical score and the instrument, and that in the development of musical practice an explicit focus on the body takes place through the "performative body" which is a pre-reflective experience of the body itself, then reflection, being the characteristic of the "opaque body," puts the body in the centre of observational consciousness. As Legrand herself recognises, even though the possibility of the "performative body" modality is universal, its development represents a certain expertise, which she examines in dancers (Legrand 2007, Legrand & Ravn 2009).

Placing movement at the centre of observational attention alters such movement, since conscious thought processes tend to take over the activity of movement, and these conscious processes are slower relative to the normal goal-directed movement that is performed pre-reflectively (Hermans 2003, Castiello & Jeannerod 1991, Jeannerod 2002). Body movements, then, are fragile with respect to conscious interference. As a consequence, research into embodied experiences such as emotions, aesthetic choices, and gestures in the performing practice must have a built-in protection against the objectification of the body. In the study of instrumental music, the body is already subject to examination and instruction in service of building technique. Becoming conscious of technique is an important educational goal, though it can lead to difficulties. As pianist Claudio Arrau said, in the process of growing up, the period during which a young artist must become conscious is "one of the most difficult periods of his life" (quoted in Horowitz 1982: 241). While such formative experience lead musicians to be sensitive to the different apprehensions of bodily experience, the allergic reaction to any mention of the word

"body" that I encountered in discussing my research with colleagues leads me to believe that an explicit formulation of the inner skill or technique of switching between these modes of self-consciousness is necessary.

The separation in time between reflection and practice is part of many artistic research projects, and it reflects a separation of phases in the artistic process. Reflection about the body may happen during the practice or preparation phase leading up to the performance, according to this model, but by the time of the performance the bodily experiences are sufficiently ingrained so as to happen without this conscious intervention. This separation of the preparation phase and the performance phase takes significant time and rehearsal, and in the profession things sometimes have to be done immediately or very quickly. Specific strategies can be employed to both consciously control movement and insulate it from objectification at the same time; indeed, body movement can be called forth with conceptual or symbolic triggers without reification, even in the moment of performance. Fingering can serve as one such symbolic trigger and different fingerings can result in markedly different body movement, as the research of pianist Jon Verbalis (2012) in topological fingering shows. Rather than a movement, the fingering is what is willed by the conscious mind, but the fingering calls forth a movement that the conscious mind might well predict. Pianist Luigi Bonpensiere describes a technique for creating and anchoring other kinds of mental symbols as triggers. The symbol is combined with a conscious focus on "release" which keeps the conscious mind out of the actual "doing" of movement, while the symbol still allows the conscious mind to direct the movement (Bonpensiere 1953). Of course the symbol is only the conscious part - in order to be realised the underlying embodied knowledge needs to be present.

6.2 Framing

The use of symbols with the simultaneous inhibition of conscious "doing" (and thereby of objectification) of movement is an example of a conscious strategy which I call "framing." It seems likely that this idea will resonate with all performing musicians, and for that reason it may seem rather obvious. On the other hand, it also seems necessary to elaborate since explicitly formulating such an approach is the only response to those in the profession who still resist research because of its objectifying tendency. Simply stated, framing is the conscious process by which I *separate* or *insulate* a part of my *pre-reflective* experience to protect it from being objectified by the conscious mind.

One experience where framing can be useful is in thinking about memory, specifically in the experience of recall. In my own experience, memory, rather than being merely *conceptual*, is distributed throughout the self. The *kinaesthetic* memory of a sequence of actions is one part, which is inextricably linked to sound memory whereby the sound and the movement trigger each other. The *haptic* sensation of the keys is another part - at the end of one phrase, for example, my hand feels the next note which is perhaps a neighbouring note or the same note, and the feeling of the key surface and edges verifies that my hand is in the right place. The *proprioceptive* feeling of the forming of my hand prepares groups of notes in advance, which are felt as hand shapes. The *emotional* feeling helps to distinguish structural branching moments like the difference between the first and second theme in the exposition and recapitulation in the sonata form, because those moments *feel* different. Of course, what I conceptually know can help at certain moments, but it cannot completely replace these other kinds of memory. However, trying to "work on" memory tends to orient the mind towards the cerebral, whereby the conceptual activity can easily override these other forms of memory. If during a performance I think, "what is the next note?" my conscious mind will search for a conceptual answer, for

example F#, but if I have *framed* these other kinds of memory, then my conscious answer would be to let my ear and hand remember.

As this shows, when I place memory under conscious observation, the conceptual form of memory takes over and suppresses other ways of remembering. In order to reserve a function for these other kinds of memory even under such reflective scrutiny, they need to have a sort of placeholder or symbol in the conscious mind which insulates them from conscious intrusion. This placeholder can be observed, reflected upon, and held squarely in the centre of attention, while the underlying pre-reflective experiences remain at the periphery of awareness. The strategy which I call framing demarcates an inner space of pre-reflective self-consciousness without objectification, with the frame itself representing the conscious placeholder. Somewhat like the function of a "black box," these frames respond to input in the form of images from the conscious mind, thus the conscious mind stays *indirectly* in control. The frames are also porous in the sense that the experienced bodily outcome can be consciously monitored without objectification.

I use the process of framing very often when I want to consciously modify or represent any embodied artistic process without allowing the conscious mind to interfere. Framing allows for the conscious examination of such processes - one can open the frame and make the process conscious and then close it again to allow it to work unconsciously. If conscious exploration of inner experiences and body movements during research causes self-consciousness, stiffness, a lack of fluidity or any such negative consequence of objectification, framing the experience or movement returns it to its free unconscious fluidity and at the same time reserves a place for it in conscious awareness. In subsequent chapters of this dissertation, I will open many aspects of movement to conscious scrutiny, and framing is necessary to return these movements to the fluidity of unconscious movement with the awareness of consciousness.

Framing can be used in many different contexts. First, a specific movement can be framed, such as a jump between two distant notes. The jump normally is simply goal oriented - when I want to play a specific low F#, for example - my arm automatically gets me there. When I want to modify the actual trajectory shape of my arm as it travels through the air, I can make that trajectory by consciously moving my arm. The arm is responsive, but the movement is self-conscious and therefore not continuously fluid in its coordination as one part of a whole responsive body. By framing the movement, however, I focus on the *imagination* of the trajectory shape that I want to employ and I do not do it, but rather frame it off as something I know my arm can do and which I cannot do as efficiently with the conscious mind. I hold the image of what I want vividly in the imagination and send the energy to initiate the movement, but the frame prevents me from actually *consciously* doing it and the movement happens automatically. In this case, the goal of reaching the F# is replaced by the goal of the imagined trajectory shape of movement resulting in the arrival at the F#.

It is important to note that the eyes have a strong tendency to objectify. Perhaps most pianists have had the experience of looking down at the hands during a performance and suddenly becoming conscious of the movements and the black and white keys and realising that they do not know how to continue. Looking at my arm while it is moving, unless the movement is carefully framed, will lead to objectified movement. When I make the jump as described in the previous paragraph, I look at the goal note *before* I initiate movement, specifically not while my arm is moving. Practicing looking at the right hand or the left hand is an important rehearsal of the framing process.

I have found that through conscious framing I can easily demarcate what parts of inner experience I want to leave unconscious. Framing is reflected most obviously in the alternation between practice and reflection in the artistic research context. But framing

can also circumscribe a part of the body, a movement, a span of time, a section or layer of music, or a feeling. I can frame the attack of an entrance in a chamber music context so my body feels from the other player exactly when to play. Framing can also protect me from the objectifying gaze of an audience or a camera. Body movement is an essential enforcer of framing since individual movements - for example of the fingers or the arm - can be framed together by consciously executed overarching trajectory shapes of movement - for example of the torso.

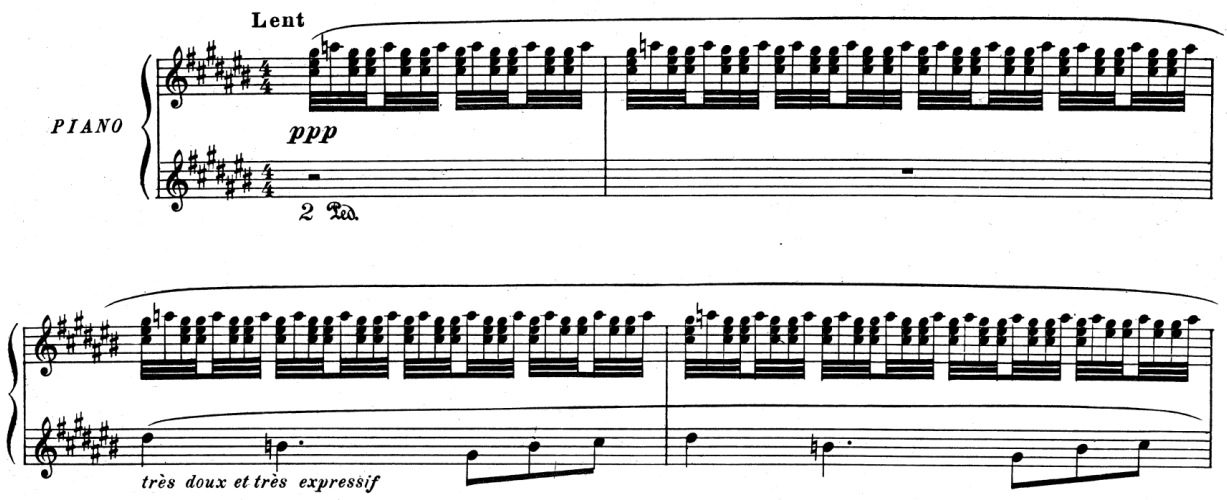
While framing is simply my own word to describe an inner experience common among musicians, I have found several sources from other disciplines that might provide support for the idea in its application to movement. Framing movement suggests that the process of translating desire or decision to move into actual movement can be accomplished: 1) with direct conscious action or 2) indirectly by imagining the movement and allowing the body to accomplish the movement free from conscious intrusion. This view (or a similar view) is found in other practices and it is also supported by recent empirical research. In the practice of Alexander technique, "inhibition" and "direction" form a certain parallel to framing (de Alcantara 1997, Alexander 1932). As Missy Vineyard, an Alexander technique teacher, explains: "this was an entirely new way of moving [….] Astonishment is barely adequate to describe my reaction" (Vineyard 2007). This way of moving is also described in the famous book Zen in the art of Archery by Eugene Herrigel (1953), a book that was recommended to me by my first piano teacher and which was required reading for the students of Arrau[23] (Arx 2014: 75, Horowitz 1982: 97).

From empirical research, the well-documented ideomotor theory (or Carpenter effect) links images and movement (Shin 2010). More significantly, in neuroscience, the

[23] "'Don't think of what you have to do, don't consider how to carry it out!' [the master] exclaimed. "The shot will only go smoothly when it takes the archer himself by surprise.'" (Herrigel 1953)

recent "Two Action Systems" model of movement contrasts a functional ("top-down") pathway of movement with a structural ("bottom-up") pathway of movement. The structural ("bottom-up") pathway is characterised by a continual integration of and adjustment to perceptual information, forming a dynamic model of the body in relation to its surroundings *without conceptualisation*. The functional ("top-down") pathway uses conceptual information to control movement, with minimal constraint from the environment (Buxbaum & Kalénine, 2010).

The contrast between bottom-up and top-down control of movement should resonate with the experience of playing for many musicians. When I first began to study *Ondine* from Ravel's *Gaspard de la nuit*, I found it difficult to play the opening with the evenness and control that I wanted. My teacher at the time gave me an image: "imagine your hand is like a boat riding on the waves of the notes." That image suggests that the waves, not the boat causes the movement. When I focused on that image in mind and stopped consciously doing the movement but rather let my hand take control, my hand could negotiate with each key to find the exact height during the key release from which the repetition was possible, even if the keys were in a bad state of regulation. The frame in this case was specifically localised to my right hand and the input was an image.



Example 6.1: Ravel *Ondine* from *Gaspard de la nuit* (Durand, 1909)

In summary, artistry is fragile and does not withstand the wrong kind of conscious scrutiny, since artistic or aesthetic endeavours are not exclusively (or even primarily) conceptual. When the conceptual mind begins to examine the artistic process, its objectifying power easily overrides the sensitivities and subjectivities that are necessary parts of artistry. Such a conceptual attitude towards music can be heard in some performances, where the empty shell of ideas - perhaps even brilliant ideas - is devoid of fluid and organic movements and feelings. Framing can reclaim the role of unconscious feelings and bodily experiences by providing a conceptual placeholder for them, thereby protecting them from objectification. The fact that many musicians react negatively to the idea of thinking about the body points to their intuitive understanding that movement should remain at the periphery of self-consciousness, an orientation which can be described through the idea of the givenness of the "transparent body" in the apprehension of the world, or the pre-reflective experience of the "performative body." When the body is put into the centre of observational consciousness, as it must be in a reflective artistic research engaging with embodied phenomena, it becomes the "opaque body" and causes a subject/object divide within the researcher. Should the goal of using research to further

artistic practices allow unchecked objectification of those practices, it would be to their detriment for this reason. To repeat the wise words of my former teacher: "there are things that you shouldn't think about too much!" I can both agree and also reply that the inner skill of framing allows movement and subjective experience to be examined and modified by research, disseminated, discussed, disputed and eventually returned to its Eden-like unconscious state of fluidity.

7 Embodied cognition

Framing is a *conscious* experience, and my discussion in the previous section examined how the body, movement and feeling can be represented in the conscious mind without objectification. I have not yet considered how embodiment 1) is foundational to conscious musical thought on a *pre-reflective* level (in the sense of the givenness of the "transparent body" in the apprehension of the world) and 2) represents a certain mode of musical thought *which may be chosen by the performer* and which happens at the periphery of awareness (through the facility of pre-reflective self-consciousness represented by the "performative body"). Research in music in the last decades has increasingly emphasised the role of the body in music making, responding to a broader interdisciplinary trend challenging Cartesian cognitivism.

> In particular, neuroscience has provided compelling arguments that Cartesian division between mind and matter can no longer be maintained and that a disembodied mind as such does not exist [….] From that perspective, the subjective world of mental representation is *not* an autonomous category but a result of an embodied interaction with the physical environment. (Leman 2008: 13)

It is important for musicians to become aware of this broader context, since it can help to show how embodiment is part of musical thinking, and hence can suggest how examining and changing patterns of embodiment can expand the musical imagination.

The kind of knowledge that we can consciously express in words is only a small subset of what we know about music - what philosopher Michael Polanyi calls implicit knowledge (Funk & Coeckelbergh 2013). This knowledge has been described as sensory knowledge that results from an interaction with the world and has no propositional content (Polanyi 1969: 126-133). According to philosopher Alva Noë, this sensory

knowledge is the most basic kind of knowledge, forming the foundation upon which propositional knowledge is built (Noë 2004: 120, Funk & Coeckelbergh 2013: 123).

The assertion (upon which the topic of this dissertation depends) that the bodily experience of shaping music is foundational to musical thinking can best be backgrounded with a short introduction to embodied cognition. The paradigm of embodied cognition, which has been supported by research in many disciplines, argues that there is a continuum between mental cognition and bodily interaction with the world. The embodied thesis has been summarised: "Many features of cognition are embodied in that they are deeply dependent upon characteristics of the physical body of an agent, such that the agent's beyond-the-brain body plays a significant causal role, or a physically constitutive role, in that agent's cognitive processing." (Wilson & Foglia 2011).

One of the historical anchors for embodied cognition is called the enactive approach, which situates cognition in the dynamic interaction of an organism and its environment. "In a nutshell, the enactive approach consists of two points: 1) perception consists of perceptually guided action and 2) cognitive structures emerge from the recurrent sensorimotor patterns that enable action to be perceptually guided" (Varela 1991: 173). Radical enactive cognition takes the enactive approach even further, viewing the hand as an "organ of cognition" (Hutto & Myin 2013: 46). This theory characterises an intertwinement between the hand and the brain, and does not distinguish between cognition that takes place in neural circuitry and cognition that takes place in the actual movement of the hand as it interfaces through gesture with the world.

Another historical support for the embodied thesis comes from an examination of metaphors and their role in cognitive processing. In their classic book *Metaphors we Live By,* linguist George Lakoff and philosopher Mark Johnson (1980) argue that metaphor permeates cognition and that metaphor is grounded in our (bodily) experiences. Later,

Johnson (2007) shows how all meaning-forming contents of inner experience (images, metaphors, emotions, etc.) are grounded in bodily interaction with the world, and that the formation of meaning from these bodily experiences is fundamentally aesthetic.

Other research that led to the embodied paradigm has come from the research in the ecological positioning of perception (Gibson 1979), child development (Thelen & Smith, 1994), robotics and artificial intelligence (Clark 1997, Dreyfus 1979) and phenomenology (Merleau-Ponty 1962). In the last decades, vast amounts of empirical research from cognitive science has supported the paradigm of embodied cognition, though embodied cognition remains controversial. Psychologist Margaret Wilson has written a useful presentation of the core claims of embodied cognition:

> **1. Cognition is situated.** Cognitive activity takes place in the context of a real-world environment, and it inherently involves perception and action.
>
> **2. Cognition is time pressured.** We are "mind on the hoof" and cognition must be understood in terms of how it functions under the pressures of real-time interaction with the environment.
>
> **3. We off-load cognitive work onto the environment.** Because of limits on our information-processing abilities (e.g., limits on attention and working memory), we exploit the environment to reduce the cognitive workload. We make the environment hold or even manipulate information for us, and we harvest that information only on a need-to-know basis.
>
> **4. The environment is part of the cognitive system.** The information flow between mind and world is so dense and continuous that, for scientists studying the nature of cognitive activity, the mind alone is not a meaningful unit of analysis.
>
> **5. Cognition is for action.** The function of the mind is to guide action, and cognitive mechanisms such as perception and memory must be understood in terms of their ultimate contribution to situation-appropriate behavior.
>
> **6. Off-line cognition is body based.** Even when decoupled from the environment, the activity of the mind is grounded in mechanisms that evolved for interaction

> with the environment—that is, mechanisms of sensory processing and motor control. (Wilson 2002: 626)

An interdisciplinary overview of embodied cognition in current research is outside the scope of this dissertation, but such overviews exist elsewhere (Leitan & Chaffey 2014). I would like to emphasise a couple features, however. The first is actually the last of six claims of embodied cognition as described by Wilson: "off-line cognition is body based." This claim (which is supported by much evidence from cognitive science) argues that activity of the mind is grounded in embodied experience through activation of sensorimotor pathways even when the body is not moving (Wilson 2002: 626). Transposing this claim to music, if we accept that the body movement of playing is a constitutive part of musical thinking at the instrument, musical thinking away from the instrument is similarly grounded in body movement even when the body is still.

While I do not have the expertise to critique or affirm any of the conclusions of embodied cognition in general or in its specific varieties, I highlight it here first because it supports the importance of the body in the shaping of music (a point which my research in its practical application will demonstrate) and because it resonates with how I incorporate my body in musical thinking in my own practice. It also provides a framework for showing how the thinking with the body and thinking with the mind form a continuity - an argument of central importance to this dissertation.

While the dispute between pure cognitivism and embodied cognition sometimes seems to have an either/or absolutism in the sources I have examined, and while much of the research examines pre-reflective phenomena, I hold that the embodied cognition paradigm can also be used to inspire an *embodied kind of musical thought* that can be employed to a greater or lesser degree in performance by conscious choice. As a performer, if I am aware of how the body anyway underlies my imagination, I am more likely to value and encourage the kind of dynamic shaping that I can do with my body, the

physical pleasure of movement and the resulting expression. This is what Arrau recognises as "interpreting with the body" and explains: "You reach a stage of development where these things are done automatically by the body. When the music has become part of you, when you have digested it, then these movements don't have to be thought about. At times, I feel very much like a dancer" (Horowitz 1982: 104). Rather than overriding such thinking-through-movement with abstract thought, the performer has the choice to privilege the participation of the body, which itself is inscribed with the embodied knowledge, habits and feelings foundational to aesthetic knowledge. I will save discussion of the structure of such thinking-through-movement for Part III, and this mode of musical thinking will be the foundation for the embodied experience of polyphonic expression described in Part IV.

8 Body movement and sound

The idea that body movement influences musical results is well documented by previous research in many disciplines. Already in 1938 Alexander Truslit discovered that giving performers different movement instructions (whether actual movements or movement images) resulted in measurably different performances (translated in Repp 1993). Linguist Ray Jackendoff (1990: 131) suggests that the movement metaphors we use in talking about music actually come from real physical movements. Musicologists Erik Clarke and Jane Davidson conclude neither "that body movement determines the interpretation of structure, nor that a performer's conception of musical structure determines body movement" but that "gesture and physicality play a much more integral role than has hitherto been recognised in specifying the character of a performance." (Clarke & Davidson 1998: 82, 88-89). Furthermore, the relation between movement and the psychology of the performer is explored by Davidson, who also suggests that the body is the source of musical expression that is then abstracted into musical forms (2002: 145).

More recently, concert pianist and artist-researcher Alessandro Cervino has shown one way that movements can be used to succinctly connect with a cascade of expressive details. He shows several alternatives of movements that can be applied to various passages, and he also shows that certain movements do not work on specific passages. By this analysis, he maps one dimension of the performer's space for creative choice. In his view, presenting these choices of movements through audio-visual means provides a more rigorous description of sound than metaphorical language, the underlying supposition being that gesture at the instrument is both heard and seen, and that changing the gesture influences the sound. He writes that "since there is a link between the sound result one wishes to obtain and the sort of movements one has to perform to that end, a description of the latter could be a valuable way of referring to the former" (Cervino 2013).

In forthcoming research, fortepianist Christina Kobb explores the relationship between body movements and postures described by early nineteenth-century treatises, showing that altering the posture and body movement influences the interpretation of the music. "There's a different physical feeling to playing, as well as a different outcome" (quoted in Nuwer 2015). In order to empirically ratify her findings, she is doing her research together with Godøy, who analyses her movements with techniques from empirical musicology.

While the strategies and goals behind all of these researches differ, they all indicate that body movement directly affects the sounded musical result. This implies that it is inaccurate to suggest, as for example the Taubman Technique does (Golandsky 2003), that the technical aspect of piano playing can be separated from the imaginative or musical conception. Avoiding the objectifying tendency of the conscious mind is a valid reason for a framing in *conscious experience*, but if this leads the performer to the belief that the mind is autonomous from embodied experience, he is blind to the foundational role of embodied knowledge underlying all musical thought.

9 Musical gesture

> Gestural expression is a difficult topic, not because the concept of a gesture is so difficult, but because it looks so obvious that everybody believes to know what it means. This first impression is, however, misleading and it is there that the difficulty arises. The word "gesture" is like "time": If your are not asked what it means, you know, but if you are asked you cannot tell. Saint Augustin's famously articulated this fact when asked about time. We shall not give a precise definition of a gesture. Instead, we want to work with an intuitive understanding. (Mazzola 2010: 115)

Body movement, taken at its face value, refers to the physical aspect of the body moving in time. As the concept of embodied cognition suggests, there is a continuum between this physical body movement and mental experiences, a continuum that bridges the Cartesian divide. The concept of musical gesture is useful here since it handily refers to both body movement and its meaning in inner experience. A definition of gesture has been attempted by many researchers (see for example: the introduction and chapter two of Godøy & Leman 2010, Hatten 2004, Gritten & King 2006, Stam & Ishino 2011). While constructing a precise definition is a tempting exercise, it is not necessary for understanding this chapter. Rather than a precise definition I will use a rather intuitive encyclopaedic or categorical definition that includes any sort of movement that one can conceive of, physical or mental, significant or insignificant, visible or invisible, audible or inaudible etc. The context will make the meaning of the term clear. In my experience, the difficulty of writing about gesture arises from separating from the context in which it is embedded. Building a general definition results in a theoretical scramble for inclusiveness that removes gesture from where it belongs: in actual cases of music making. As I will explain later in this chapter, musical gesture, sound, expressive details and notation hang together in meaning - notation cannot be fully understood without gesture, sound cannot be understood without gesture and musical gesture cannot be fully understood without

sound. The fact that gesture itself may or may not be imagined, physically realised, audible, visible, conscious, sound-producing, willed, and so on makes for a dizzying array of possible connections between inner experience, notation and musical performance through gesture.

There are many possible angles from which to analyse gesture, all yielding their own insights or truths. For the purpose of this dissertation the hierarchical structure of gesture - described with the word coarticulation - and its expression in musical details form the most important focus point, since this coarticulation, itself representing the transparent givenness of body structure and schemata in musical thought, provides the basis for examining polyphonic expression through its embodiment. However, in preparation for a definition and discussion of coarticulation, it is necessary to examine several useful analytical viewpoints that describe gesture. The following subsections contain a series of oppositions that will both delineate the relevant aspects of musical gesture, and provide descriptors that will be used later in this dissertation:

Heard - Seen

Intentional - Extensional

Continuous - Discontinuous

Sound-producing - Concurrent

Contour-based - Rhythm-based

In-time - Out-of-time

9.1 Heard - Seen

Empirical study of musical gesture is a field that has rapidly developed in the last decades with the advent of improved motion-sensor technologies - which in turn

enabled empirical studies conducted within the discipline of empirical musicology. These studies almost exclusively focus on musical gesture as a visual experience - measured visually with motion sensors, videos, photographs etc. - rather than a musical gesture that is heard. In almost every case, the visible aspect of a pianist's performance is scrutinised, sometimes in relation to the musical structure, but the music itself is not heard. Of course such an attitude also tends to reduce gesture to body movement, so any lip service to the monistic qualities of gesture (its quality that bridges the Cartesian divide between mind and body) or to the meaning of gesture is not researchable in this context. Perhaps visual phenomena are preferred due to the medium of writing for printed publications, and perhaps because gesture that are seen seem to be more objective than gestures that are heard.

However, analysing gesture from a visual perspective doesn't give a very complete picture even of body movement. For example, contours of movement seen in space are also characterised by tension, and thus similar trajectory shapes can have very different feeling. In analysing the movement of a conductor, for example, the amplitude of the right arm beat patterns gives information to players or singers about the dynamic: most often bigger means louder, smaller means softer. However, the amount of tension in the movement can also readily be perceived. The conductor could make a very intense fortissimo with a small sudden gesture with great tension, and similarly a very soft pianissimo with big gestures executed with a light, floating arm and a relaxed body. Tension can be readily perceived from a second-person perspective, but is invisible to motion sensors.

It is also important to point out that many of the most significant aspects of gesture in piano playing - such as the onset/offset of weight or contours of embodied tension - are entirely invisible, but can clearly be *heard* in the musical performance. These

can only be measured by other non-visual sensors - measurements of key pressure and of muscle activity, for example. These measurements can confirm that such phenomena take place, but combining the data from visual motion tracking devices and these other data sources to draw meaningful conclusions would be difficult.

Research in the field of neuroscience that confirms that gesture and body schemata are used pre-reflectively to make sense of sound. The working of mirror-neurons, by now a well-researched hypothesis, explains our understanding of observed movement by showing that our brains activate the same pathways for movement when we observe a movement executed as when we actually execute the movement. We grasp movement, then, by its simulation in our own movement-related neural structures. It is interesting to note that mirror-neurons similarly activate in response to sound (Leman 2008: 90; Matyja 2015; Kohler 2002; Keysers 2003). The sound of tearing a piece of paper triggers the same neural circuitry for movement that would actually cause the gesture of tearing (Kohler 2002). The functioning of this auditory mirroring has been connected to empathy (Gazzola 2006; Bråten 2007) and the role of such neural structures has been proposed in music listening (Clarke 2005) and musical emotion (Molnar-Szakacs & Overy 2006). An overview by empirical musicologist Godøy (2003) suggests that the gestures producing the sound (hitting, strumming, bowing, singing) are understood or hypothesised by the listener, though his approach has been criticised for including propositional knowledge, which is not necessary for embodied simulation to occur (Schiavio 2014).

9.2 Intentional - Extensional

Gestures can be realised with actual body movement in real time (extension) or they can be imagined (intention). Intentional gestures can be realised in extensional gestures, but extensional gestures do not in themselves need a conscious mental

representation. Thus there is overlap between the two categories and they form a continuum between the mental and the physical (Leman & Godøy 2010: 5).

9.3 Continuous - Discontinuous

If I make a firm fist and lock my wrist and move my arm first to the left and then to the right, the change of direction can be felt as angular or flowing. In the case of an angular change of direction, a sudden impulse causes the reversal of direction. This impulsive quality can be first felt in the arm but as it is intensified can be felt as an impulse in which the body as a whole participates. The ballistic quality to this movement could be characterised as discontinuous. An alternative sort of discontinuity happens with very little energetic impulse when the arm, if only very momentarily, comes to rest at the end of the left swing before initiating movement to the right. The movement feels much less angular but is nevertheless discontinuous because of the fleeting caesura at the moment of direction change.

On the other hand, the left to right corner can be rounded with a more circular gesture, thereby smoothing the two directions of movement into one continuous movement. Most obviously, this smoothing can take place by making a more circular arc of movement, thus introducing a use of a second dimension, creating a two-dimensional plane of movement. However, this is not the only way to smooth the corner. What is very important to pianists is the smoothing that is allowed by the articulation of the wrist. If I open my fist and allow my wrist to be flexible, then the movement around the left-to-right corner does not involve the momentary discontinuity of either a ballistic impulse or a momentary stasis, since the change of direction of the arm happens first and the wrist momentarily continues to the left while the arm is has already changed directions before sweeping around the corner to follow the arm. In this scenario, there is a sort of

distribution of the moment of change of direction where by the arm changes direction first followed by the hand. What is significant about this is that it avoids either an impulsive, angular change of direction and also a momentary stasis since either the hand or the arm is always in movement.

Such impulsive or angular changes of direction define a clear division between successive gestures. A smoother corner or one that is smoothed by articulation of the wrist has less of a defined division, and may be perceived as continuous. A simple circular movement of the arm, for example, has continuity through all its iterations, and if each iteration were to be viewed as a separate gesture, the exact moment of division between one gesture and the next would be arbitrary. The iterations of smoothly rounded gestures can be described by a time span which describes the length of the iteration without mapping directly to a certain moment in the music, rather than a segment, which defines starting and ending points for each iteration.

Discontinuity can be felt as several different levels in the body. An angular or impulsive change of direction can be felt just in the hand, circumscribed by smooth movement of the arm. Or the change of direction can have an angular or impulsive quality felt only in the arm, whereby only those muscles that move the arm experience this impulsive discontinuity. Or the shock of the impulsive movement can be felt all the way up through the neck and head. Thus overarching continuities can contain or circumscribe discontinuities at a more peripheral level of the body. Separating these levels of movement is a kind of skill, which occurs naturally to some but must be learned by others. Alexander technique is famously good at teaching students to move their arms smoothly without contracting the muscles at the back of the neck. Piano teachers are sensitive to freedom of the wrist and how it relates to overall coordination. In octave playing, for example, a general clumsiness where shocks of angular movement reverberate from the head to the tip

of the fingers can be easily remedied by reminding the student to allow free articulation of the joints, particularly the wrist. The overall angularity or ballistic shocks of movement are thus smoothed above the wrist, while the hand can still experience fast angular movement.

What emerges from the preceding paragraphs is the beginnings of a description of how gesture itself, conditioned by the movement possibilities of the body and its joints, has hierarchical structural properties. These properties as applied to musical examples will be described at length in Part III. For now it is important to note that activation of these structural levels depends on articulation of joints, and that the continuities or discontinuities that carve out individual gestures are features of individual hierarchical levels. It is by far not a given that every pianist uses all of these structural possibilities. Tension in the wrist, elbow, shoulder that result in ballistic shocks through the whole body are found even among advanced pianists, who manage nevertheless to make their way through difficult passages by sheer willpower. The quality of movement, however, is perceived by listeners since the experience of gestures as angular or smooth, impulsive or steady is a universal part of human experience.

These qualities of movement are of fundamental importance to the *sound* of the instrument, since sound in the pianistic sense is a composite of the actual sound waves and the feeling of gesture expressed through the sound waves. It has long been known that the timbral variation of a single note is limited to the velocity of the keystroke and contact noises, so pianists communicate timbral variation as a composite over groups of notes (see Bernays & Troube 2014 for an overview of research). The overarching composite - which will be analysed in detail in Part III - communicates both the temporal unfolding of continuities and discontinuities and the kinaesthetic feel of the gesture (intentional or extensional) from which it is constituted and towards which it reaches. The sound waves and the overarching musical gesture (which is heard and seen) combine in perception in a

process of sensory integration.[24] Details of expression - dynamic, articulation, timing - combine to give the illusion of sound-quality, an illusion which itself points to the givenness of the "transparent body" in perception of sound, a theme which I will further develop in the following chapters.

9.4 Sound-producing - Concurrent

A categorisation of gesture that has gained currency separates gestures into categories of sound-producing gestures (gestures which actually create sound) sound-facilitating gestures (such as the positioning of the hand in the right place on the keyboard) sound-accompanying gestures (movement not directly connected to sound production) and communicative gestures (gestures that communicate through visual signification). Sound-accompanying gestures are sometimes called ancillary gestures (Wanderley 2005) sound-producing gestures are sometimes called effective gestures and communicative gestures are sometimes called figurative gestures (Cadoz & Wanderley 2000).

In some sources (for example Wanderley 2005: 97, Wanderley 2002) sound-accompanying gestures are implied to be subordinate or less important than sound-producing gestures, a prioritization that can be observed in the many studies of musical gesture. Movements of the upper body are sometimes perceived as "extra" or "unnecessary" (Jerde 2006, Jabusch 2006). Godøy (2012) notices and critiques this bias on the grounds that the visual aspect of these gestures contributes to the musical result. I agree with Godøy that sound-accompanying gestures are important, but not only because of their visual aspect.

[24] Sensory integration between audio and visual stimuli has long been known in speech perception through the McGurk effect in which *seeing* lips speaking one syllable while *hearing* a differing syllable results in the perception of a third syllable, which is in fact neither heard nor seen (McGurk and Macdonald 1976).

Musicologist Jennifer MacRitchie distinguishes between technical and non-technical or concurrent gestures, rejecting the term ancillary because it downplays the importance of non-technical gestures (MacRitchie 2013). The separation between technical and non-technical tends to downplay the expressive possibility of sound-producing gestures. The word technical, in my mind, recalls the separation between technique and musicality, which I reject. I will thus use the terms *concurrent* and *sound-producing* to describe opposite ends of a continuum of physical movement from the centre of the body to the tip of the fingers or toes.

Concurrent gestures are a form of imagination for the performer where he can feel the shape of the music as he wants it to sound. Thus they are the realisation or working-out of expressive gesture in body movement, which can then be heard in the sounding result. If used that way, they are indirectly sound-affecting gestures. Furthermore, though they are removed from the site of contact with the instrument by several joints in the body, the kind of muscular activity or tone that coalesces movement across the joints can invite some of the weight onset or offset that these upper body movements can initiate into the actual fingertip itself and thus into the piano key. Concurrent gestures, then, directly and indirectly influence sound-production.

Concurrent and communicative gestures have been found to have various functions, such as visually communicating expressive intention, communicating with other performers, communicating structural information, and aiding memory (MacRitchie 2013). All of these points are valid. However the main function of concurrent gestures is to help with the working-out of timing, phrasing, and shaping of the music. The structuring that can relate sound-producing gestures and their overarching concurrent gestures will be discussed in Part III.

9.5 Contour-based - Rhythm-based

Musical gesture maps to contours of lines in the score and rhythms as represented in the meter and its possibilities of subdivision and grouping. Contour-based gesture quite literally follows the pitch in its spatial layout on the keyboard, which suggests certain shapes of gesture for each given sequence of notes. Rhythm-based gesture is similar to metrical accents in that it operates on metrical, hyper-metrical and subdivisional affordances of the metrical structure, but is distinct from metrical accents in that it emphasises the continuity *between* such metrical accents as smooth gesture. In other words, metrical accents are applied to single notes, but rhythm based gesture occurs over groups of notes.

Contour-based gesture is also analogous to singing, in that the distance between the notes is felt in such a way that leaps have a certain embodied feeling of resistance. Rhythm-based gesture is analogous to conducting since it emphasises meter and the filling of time between beats, which has many possible expressive descriptors - angular, smooth, tense, relaxed, and so on.

9.6 In-time - Out-of-time:

At this moment, we are faced with many descriptors of gesture - intentional, extensional, sound-producing, concurrent, heard, seen, (or inaudible or invisible), contour-based or rhythm-based. These descriptions combine with each other, so a single gesture can be described with many of those words. The oppositions do not indicate mutual exclusiveness since, for example, a gesture can be both heard and seen, and intentional and extensional gestures overlap in many different ways. One way to order the field of thought is by introducing temporal perspectives. Since my research is conducted from the first person perspective, I shall focus on a classification of the various

manifestations of musical gesture from the first person perspective of the "now" moment in performance. This classification can easily be extended to include, for example, listeners - and I will have something to say about perception or audibility in subsequent sections - but for now I will remain focussed primarily on the first person perspective of the performer.

At the moment of performance, performers have three main vantage points from which to view musical gesture with respect to time. When I am performing, at any instant I inhabit three main positions in relation to the exact moment in the musical score: the *imagination perspective* that precedes the sound, the *playing perspective* at the moment of the sound and the *listening perspective* after the sound. My imagination position is ahead of my fingers, and my listening or reacting position is behind my fingers so these perspectives are *out-of-time* and the playing perspective is *in-time*. Each of these positions is characterised by a sense of musical gesture, and each has a different relationship to the body. The perspectives are closely inter-related and influence each other, not the least because of the repetitive nature of the practice process built up over the years of learning the instrument. In the following subsections I will discuss each of the perspectives. As musician and scientific researcher François Delalande observes:

> The instrumentalist's experience is of a sensorimotor type. The performer uses body and gestures not only to produce sounds but also to receive them. The performer perceives with the hands, mouth, breath, ribcage and so forth. Between production and reception, a tight imbrication is established, quite comparable to what can be observed during infancy."(Delalande 2003: 314)

9.6.1 Imagination Perspective

The first perspective is in the imagination. Imaginary gestures can include remembered gestures (experienced directly or by observation) that are unrelated to music (walking or swinging for example) or remembered gestures that are related to music but

not to the instrument in question (the pianist might imagine singing a phrase) or gestures that relate directly to the instrument in question (sound-producing gestures.) The latter category refers to the *imagined* bodily movements that precede the *actual* bodily movements that take place as the body actually moves. Imaginary gestures can mimic human or non-human movement or could be freely imagined. Leman writes of *synaesthetic* gestures that relate to perceptions of distance and time, and are imaginary (Leman 2010: 128).

The first person experience of movement developed through a lifetime of interacting with the world provides the starting point for the imaginative experience of gesture. Many kinds of transformations are possible - transformations of the body ("imagine your hands are like the paws of a lion cub" or "imagine your fingers are little hammers") or of space ("imagine you could reach out and touch the clouds") or of context ("imagine you are swimming in honey".) The possibilities are limitless, but they gain their special meaning from their departure from or difference from normal or habitual bodily interaction with the world. This category of imagination is free, but it is an imagination that calls forth body schemata (habitual sequences of motor function formed through interaction with the world) and departs from or modifies them. It could be considered a body-based imagination.

Objects can similarly trigger unconscious body schemata. The neural pathways for this phenomenon are *canonical mirror-neurons* which respond to the sight of an object and represent possible actions that can be performed on or with the object (for an overview of empirical research, see Sinigaglia & Rizzolatti 2015: 337). This pre-reflective activation of neural sensorimotor pathways can in turn influence the activity of playing. If I imagine a fluffy kitten, for example, my playing will not communicate that image but the physical way of apprehending it - stroking it gently - might indeed be expressed. Similarly, if I imagine an image of a funeral that I attended, the image unconsciously triggers a bodily

response of, perhaps, a certain emotion or posture, or even just a memory of such a response. This response permeates my physical demeanour and colours the expressive qualities of gesture.

Stanislavski's "system" places emphasis on the rehearsal and maintenances of such emotional images from one's own personal past. Remembering and physically feeling such experiences strengthens them and makes them useful for actually embodying the emotion of the character in the play. A similar cross-domain transfer thus takes place - the sadness over remembering the death of his grandmother might allow an actor to feel a character's unrelated sadness in a play. The emulsifier between these two unrelated situations is the body and its ability to feel emotion, which is then expressed by the character's gestures, voice, and behaviour. The main difference between Stanislavski's method acting and the type of acting that was prevalent at his time was the idea of working directly with the inner experiences themselves rather than working on their outer manifestations or technique. (The parallel in music would be working on the inner sense of emotion and and the felt qualities of gesture as an organic unity rather than their outward manifestations in expressive details.)

Limitless transfer is possible between different domains of imaginary gesture. Dancing, swimming, hammering, plucking, walking, bowing, singing - limitless gestures can be used in the imagination while playing the piano. The transfer may be conscious or unconscious.

Piano teaching is often characterised by the use of images of movement. These can be communicated by verbal or metaphorical description or by actual physical movement. Most often it is a combination of both. When pianist and pedagogue Dmitri Bashkirov teaches in Russian, for example, non-Russian speakers can understand much of what he is teaching simply because he conducts, dances, mimes, demonstrates and gesticulates what

he wants to communicate - a physical expression of the language he uses in his explanations. The communication might be received consciously or unconsciously by the student and might come to expression in the student's playing consciously or unconsciously. When a teacher demonstrates a passage with tense shoulders, for example, the student could pick up the habit of playing with tense shoulders without realising it.

My argument in this section is not intended to imply that the only form of imagination is gestural, but only to bring attention to the fact that movement-related, metaphorical, or emotional imagination is inextricably tied to bodily experience. The imagination, even while not consciously imagining bodily movement or experience, often has the innervations of embodied experience as its pre-reflective substrate. The most important mode of imagination for the musician is sound, which is inextricably related to embodied experience both in production and perception, and thus also in imagination because of its the tight imbrication with playing and listening.

9.6.2 Playing perspective

In the previous section, I wrote that sound-producing gestures (as well as other intentional gestures) can be imagined in the moment before the sound is actually played. This imaginative position before the sound is to be distinguished from the playing perspective, which is the actual in-time extensional gesture. This playing perspective thus has actual body movement as its most outstanding feature, although it also has an "inside" insofar as it is available for examination by the conscious mind. As I argued previously, conscious simultaneous interference with this actual physical movement is detrimental in the moment of performance because due to its objectifying tendency it can lead to self-conscious or stiff movement.

It is equally true that the playing perspective is an action-perception cycle that provides rich sensorimotor (or sensory-kinaesthetic) experiences due to the interaction between the body and the instrument. The specific action-related feedback at various points during the keypress, keys that are irregularly voiced, or feel irregular in touch, the acoustic and spatial dimensions of the room, breathing or coughing of the audience, the physical vibrations felt through the fingertips, and many other sensory experiences are pre-reflectively integrated at the playing perspective. The constant pre-reflective interaction with perceptual information is a feature of the bottom-up pathway of movement proposed by neuroscience (Buxbaum & Kalénine 2010), a pathway of movement that can easily be overridden by undue conscious attention (as I have argued in §6.2). Thus the modification of sound-producing gesture should occur from the imagination perspective and not directly from he playing perspective, creating a kind of framing-in-time which insulates the relatively fragile sensorimotor experience of the playing perspective from conscious interference.

This framing-in-time is a normal skill for musicians, and it is one for which there are several practice strategies. One example is practicing with the addition of caesuras or stops in such a way that the stop provides a moment to think ahead. The following chunk of music is then felt as a unity in gesture. Pianist Frank Merrick, in his book *Practising the Piano* (1960), describes such a technique in which the stop is at least as long as the ensuing chunk, allowing at least enough time for the ensuing chunk to be imagined in advance, while musician and Alexander-technique teacher Pedro de Alcantara (1997) argues that the stop should have a definite rhythmic value. In my experience, the stop can be shortened as the material becomes more familiar until it is so short that it is not heard by the audience, but still provides for the performer a sort of handle with which to grasp the music before it happens. Sometimes in performance, due to some kind of distraction the

fingers start to catch up with the mind, and it is in these unusual and stressful situations that such embedded handles can provide easy leverage to regain the separation between the imagination and playing perspectives.

If the bottom-up pathway of movement (§6.2) with its rich sensorimotor integration is allowed to fully control body movement at the playing perspective, it not only best realises the sound-picture or gestural imagination taken from the imagination perspective, but also adapts those to the actual environment (the instrument, the acoustic, the audience and so on). Since this adaptation to the environment can *modify* the audio-kinaesthetic imagery of the imagination perspective, it can substantially contribute to the shaping of the music in the moment of performance. An attitude of firm or dictatorial control whereby the imaginative perspective creates a rigid, inflexible sound-picture allows for little participation of this bottom-up information, and the result is therefore not well adapted to the environment. A balance of mutual participation between the imaginary experience and the unconscious playing experience provides the best results, and this balance can easily be thrown off by external stressors, such as the pressure of a competition setting, microphones or TV cameras. This balance must therefore be brought into conscious awareness and actively managed through framing (§6.2).

9.6.3 Listening perspective

The listening perspective is the vantage point of listening to the notes that have just been played. It happens after the moment of bodily movement that creates the sound. In the listening perspective, both the sound coming out of the instrument and the feel of musical gesture that those sounds communicate are perceived. It is thus both sound-based and gesture-based. Sometimes the sound or the gesture perceived is not the same as the one imagined before playing the phrase, but in listening to the actual sounds and feeling

the musical gesture they suggest, I can react and let this perspective influence my imaginative shape for the next phrase. Listening can be a sort of revelation since I hear the expression of unconscious gestures that lie within me. While I might have imagined the general shape of the phrase, or an image of the feeling that I want to communicate, allowing my body to fill in the shape calls forth bodily and inner resources of which I am not fully conscious. In that way, playing is a sort of dialogue between conscious planning (imagination perspective), embodied experience including the incorporation of unconscious sensorimotor feedback from the environment (playing perspective) and conscious listening to the musical result as both sound-waves and musical gestures (listening perspective).

Since the sound of the piano is rather immediate, it is pre-reflectively incorporated into the sensory feedback at the playing perspective. However, in organ playing it is often the case that the sound from the organ (or sometimes from one manual of the organ) reaches the ears significantly after the fingers depress the key. The vastly differing spatial extension of organs and the types of actions (mechanical, direct-electric, electro-pneumatic and tubular-pneumatic) create an enormous range of "reaction times" between the keypress and the perception of the resulting sound. The most immediate sensory feedback in this case is the kinaesthetic *feeling* of the sound-producing gestures, which is associated with the playing perspective. The listening perspective *in sound* in this case is quite separate from the playing perspective, insofar as the span of time between the perspectives is greater. However, the kinaesthetic feeling of musical gesture also can be evaluated in hindsight, and this evaluation serves as a kind of kinaesthetic listening perspective of its own. This separation highlights the importance of a strong imagined picture of the sound but also of the expressive shaping of extensional gesture in the playing perspective, since

the embodied musicality at the playing perspective allows for the action-perception feedback at a pre-reflective *kinaesthetic* level.

There is a relationship between the imagination and listening perspectives in the communication of those intentional gestures that do not overlap with extensional gestures at the playing perspective. An imagined gesture can be realised as a continuity in sound which does not have a corresponding continuity in gesture. Thus intentional gestures can be communicated in sound - and perceived at the listening perspective - without being extensionally realised. However, these intentional musical gestures are to some degree an abstraction of gesture from its most immediate form in extensional movement, an abstraction that can be compounded by conscious symbolic representation and further through notation. The overlap between extensional and intentional gesture in the moment of performance is highly desirable because the extensional realisation allows for the most immediate and rich sensorimotor experience of the gesture in real-time.

Since practising the piano involves much repetition, the relationship between the three perspectives in time is constantly rehearsed, and the perspectives become inextricably intertwined. However, their relationship can easily become unbalanced or problematic. The listening perspective is often influenced by imaginative experiences, causing faulty sensory awareness - the performer *thinks* he hears something that he imagines because his imaginative ear is so strong that it influences his actual hearing. In the same way, aspects of sound-producing gesture that are readily audible and undesired can be missed by the performer whose hearing is overwhelmed by imaginative experience. A strong conscious imagination can override the "bottom-up" bodily adaptation to the instrument in the playing perspective, leading to a poor control of the instrument. An imbalance between the perspectives is often heard in concerts, even at the highest professional level: the pianist who imagines he is creating a big majestic sound but who

comes across as violent because of angular sound-producing gestures, the strongly imaginative pianist who cannot adapt to the instrument and is frustrated by notes that do not sound or other imperfections, the pianist who has studied technique as an ergonomic rather than musical phenomenon and thus plays easily but without expression, for example. While feedback from a teacher or recording oneself can help to give a more accurate listening experience, I would argue that a conscious awareness of the relationship between these perspectives is a vital tool for the performing musician since it provides a platform for self-evaluation at the meta- level.

9.7 Involuntary - Allowed - Willed - Willed and overt

From the first person perspective, gesture can originate with several gradations of deliberateness. Characterising a gesture as willed or involuntary is conceptually somewhat slippery and depends on a separation of phases, since, for example, what may begin as a willed decision might after some years of repetition become an unconscious habit. However, if we focus on the performance moment, the performance of *this* piece by *this* performer with *these* body schemata in communication with *this* audience represent a sort of "given conditions[25]" within which it is possible to make categories along the spectrum from involuntary to willed. It can be noticed that there are no clear boundaries between these categories, but they approximately map a range of inner experience. Drawing on the work about self-expression from philosopher Mitchell Green (2007), I have loosely adapted his four categorisations for expression to music:

Involuntary gestures are either sound-producing gestures required to execute a passage or pre-reflective movements that originate from the unconscious reflexes of the body and are not subject to conscious control. The sound-producing gestures in this

[25] A term taken from Stanislavski, see preface.

category are involuntary because the contour (§9.5) of notes and fingerings written by the composer demands a certain pattern of movement stemming from the ecological relationship between the pianist's body and the spatial layout of the keyboard. Large leaps are an obvious example, as well as passages that travel laterally on the keyboard over distances beyond the span of the hand. The gestures are involuntary in relation to the fingering employed. In other words, while changing the fingering can substantially and voluntarily modify the gesture, once the fingering is fixed the movement for its execution is by default involuntary, remaining open to conscious intervention. Redistribution of notes between the hands is an obvious technique for modifying these sound-producing gestures, the opening leap of Beethoven's Hammerklavier Sonata op. 106 standing as a famous example. However, any fingering, once chosen, requires at least a minimum of involuntary embodiment, since the keys must go down, and this minimal activity calls forth body schemata that are involuntary. The performer might be aware of involuntary gestures but unable, under the "given conditions," to modify or suppress them, or he might be unaware of these physical reactions.

Gestures that are *allowed without being willed* are suppressible in the sense that the passages in question can be executed without their employment. This category includes, for example, gestures that might be suggested by the contour of the notes but are not essential to the navigation of the distances on the keyboard. In other words, the pianist *could* suppress these gestures and still execute the passage but he chooses to allow them, reflecting some level of conscious awareness. Like *involuntary* gestures, they originate in a pre-reflective sensorimotor reaction to the environment, but in contrast to involuntary gestures they are suppressible.

Willed gestures are superimposed onto the music by the pianist. They may be formed by choosing between or emphasising contour-based or rhythm-based affordances in the musical score, or by any other conscious interpretive process.

Willed and overt gestures are both superimposed on the music by the pianist and consciously intended to be heard or seen by the listener *as being willed* by the pianist. Later in this dissertation, due to the fact that I explain gestures in musical examples, I do intend those gestures to be *consciously* heard and seen by the reader. In normal concert performance, I intend them be heard *pre-reflectively* but not as being *willed and overt*. Many famous pianists (Lang Lang stands as the most obvious example) engage in gestures that are designed to engage the audience *consciously* and to draw *attention* to the gestures. The gestures are exaggerated in order to make a comment about the act of expression. Expression is shown as a trick or a game that is applied to the music, rather than a sincere extension of inner experience. In certain repertoire, this is a performance ethic that might make more traditional[26] performers uncomfortable, but it can be used to great effect in creating musical humour. These self-referring overt levels of expression are built into the social consciousness of our time,[27] and their use in music is therefore unsurprising.

[26] Traditional in the sense of oriented towards the ethic of being "faithful to the work" or "faithful to the composer's intentions."

[27] A social consciousness evolved by the advent of social media

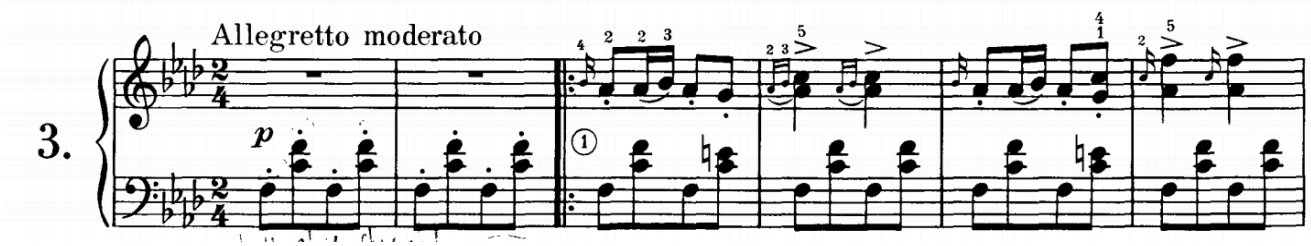
10 Musical gesture and its abstraction

Having related sound and musical gesture in a general way, my goal in this section is to characterise the relationship between gesture and musical expression. I will argue that gesture underlies the expressive features of music, which I will call *musical details*. Musical details represent multiple abstractions of one underlying musical gesture, thus they can only be meaningfully taken together. This abstraction of musical details lends itself to notation, which is a further abstraction. Notation, in turn, is thus best understood not through a process of conscious *interpretation* but rather through a process of embodied *understanding* by performers. Supplementing the reading of notation as written *sounds* which are conditioned by *musical details*, I will argue that notation can also be read through *gesture* and that the gestural reading of notation should be primordial to the reading of each individual note or each individual musical detail.

10.1 Expression of gesture through musical details

Musical gesture is characterised by points of strong emphasis and weak emphasis, and therefore gestures can be separated into prefix and suffix gestures, which lead to a point of emphasis and away from a point of emphasis respectively. Musical gestures are expressed in sound during piano performance with three main types of *details*: dynamic, articulatory and temporal. With the word *details*, I refer to only to the abstracted aspects of sound, or the sounding surface of the music, and not the underlying gestures. Dynamic details refer to changes in loudness or softness of the sound. Temporal details include such considerations as tempo changes, rubato and agogics. Articulatory details refer to the spaces or discontinuities between notes, or patterns thereof (again divorced from their gesture - thus not to be confused with articulation in the sense of bodily movement). Since musical gesture can be expressed in any or any combination of these details, it stands to

reason that gesture can be translated between these different expressive details - translated, that is, in the sense of communicating the same strong and weak points and the energetic shaping of prefix and suffix gestures. The interaction between different kinds of details in perception must be accounted for in ascribing any meaning to their analysis. To make this clear, consider the accents in this example excerpted from Schubert's *Moment musicale* no. 3:



Example 10.1: Schubert Moment Musicale no. 3 D. 780 (Henle, Gieseking, ca. 1948)

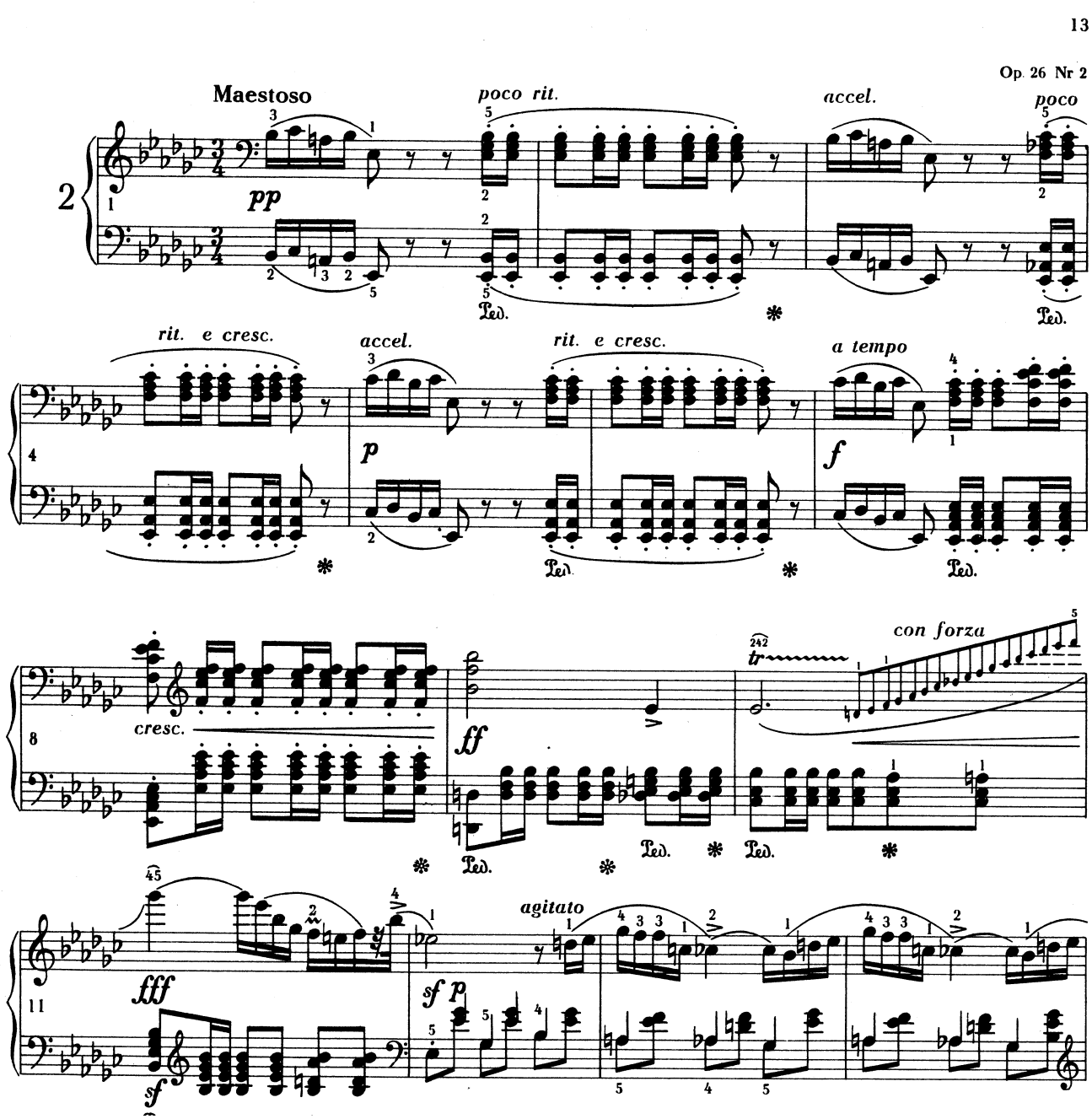
Few pianists would argue that all accents should be *dynamic accents* - that is, louder than the surrounding context - since they can just as well be played as *agogic accents*. Furthermore, these two types of expressive details are related, since how much agogic accent will determine how much dynamic accent can be employed and vice-versa. If I were to play the passage of Schubert with a beautifully proportioned dynamic accent, and then to add an agogic accent on top of it without adjusting the proportion of the dynamic accent, the result would be unmusical. The *combination* of details would be out of proportion. It would be perfectly acceptable, on the other hand, to use only agogic accent and to make the notes in question actually quieter than their surroundings.

Most often, the general patterns of strong/weak emphasis that are expressed in all three details tend to coincide. In the case of the agogic vs. dynamic accents in the Schubert, it is most probable that I will use a combination of the two types. The question is how much. In any case, the relation in perception between these expressive details is indicative of an underlying unity - a unity that points to an underlying gesture.

While this might be extremely obvious to pianists, it is easy to forget in a research context, where empirical evidence as measured by the computer can seem to be the most objective information from which to draw conclusions about a performance. This kind of evidence relies on *separate* measurement of the details of expression, rather than *how they combine* in perception. One researcher who is also a pianist (and who will remain anonymous) recently told me, when discussing the use of beat-tapping software to glean timing information sets from a recording of Chopin played by Arthur Rubinstein, that I would be very surprised with results, since where we *perceive* the rubato has taken place or to what extent does not quite match the timing data results. He said this in order to make the point that our ears are deceiving us, so we need the timing data to make more objective conclusions.

This would be perfectly reasonable if timing, dynamics and articulation were unrelated, but they are not. In our perception, these details coalesces into a felt gestalt - a sense of gesture - which is pre-reflective and underlies any conscious focus that may, subsequently, single out one detail or another. Thus, our senses of the individual kinds of details of expression are influenced by the others, and they can most meaningfully be taken together. Music as a subjective-intersubjective embodied phenomenon has meaning primarily when experienced from first person and second person perspectives since human perception is indispensable for musicality. The givenness of the "transparent body" in perception is felt in the perceptual spillover between types of musical details. The connection between different kinds of musical details, and the underlying connection between musical details and perceived movement, has been tested and confirmed by experimental data (see Eitan & Granot 2006: 237 for a background and experimental data).

There are cases when details taken separately lead to different grouping structures. Consider, for example, this passage from Chopin's Polonaise op. 26 no. 2:



Example 10.2: Chopin Polonaise in E-flat Minor, op. 26 no. 2 (Schirmer, Mikuli, 1894)

In the first line, the marking "rit" seems to have an effect of dissipating energy, corresponding to the stable tonic chord, while in the second line the marking "rit e

crescendo" has the effect of building incredible musical tension leading to the outburst that follows. If only the timing is considered, the rit is likely to be considered a marker of a group final.[28] However, in combination with the crescendo, the passage in question leads forward to the arrival of the forte in bar 9. Thus, *combinations* of different types of details can result in different felt groupings than *individual* types of details, taken alone, might suggest. Phrase-arching, a concept computationally worked out in the kinematic models of Neill Todd (1992) and both summarised and critiqued by Nicholas Cook (2014: 176-180) relates dynamic and temporal profiles in hierarchically nested phrase structures, but his theory, admittedly aimed at the normative, only encompasses the *coincidence* of temporal and dynamic profiles and not how these profiles *interact*. It has been noted (perhaps obviously) that the kind of tempo curves underlying phrase-arching represent only one possible part of musical expression, which is far more complex (Desain & Honing 1993).

While Todd's kinematic model, aimed at creating a normative expressive performance from elementary mechanics, equally weights dynamics and tempo, other researchers have tried to match such kinematic models to actual performances, resulting in a weighting variable across the range of hierarchically nested timescales[29] (Todd 1992, Windsor & Clark 1997). Which details are given *preference* in musical expression depends on the style of the music, the training of the performer, the ability to control the

[28] Grouping rules have been famously theorised by Fred Lerdahl and Ray Jackendoff (1983) in their generative theory, and phrase-final lengthening, the deceleration at the ends of groups, has been explained through much research in the 1980s (Bengtsson and Gabrielsson 1980; Todd 1985; Palmer 1989). Mitchell Ohriner (2012) uses a computer-based temporal analysis to infer performed structure from phrase-final lengthening (which he calls "group-final lengthening"), recognising the interference of lengthenings responding to other parameters, namely meter, melodic contour, and ornamentation, his theory however neglects to consider the combination of temporal lengthening with dynamic change.

[29] Nicholas Cook, in critiquing Neil Todd's kinematic model, mistakenly suggests that Todd's equal weighting of dynamics and tempo result from the physical model and its apprehension by the vestibular system, which would require such equal weighting (Cook 2014: 178, Todd 1992: 3549). This suggestion misunderstands the aim of Todd's kinematic model, which aims at the normative, but the more important point is that both authors fail to recognise the foundational status of the body, not just the vestibular system in its observation of self-movement, but the fact that gesture and kinaesthetic experience is itself structured hierarchically, forming the kinaesthetic basis upon which the hierarchical structure that phrase-arching suggests is built. This concept is developed in Part III of this dissertation.

instrument, tradition, taste, and of course the instrument. Nicholas Cook (2014: 182-215), for example, has written about the historical and geographical situatedness of the practice of phrase-arching.

Instrumental differences in the expression of musical gesture through details can be shown by comparing articulation in piano and organ playing. In Baroque organ playing, a small articulatory silence is used before a note to give it an accent (Cyr 1992: 103). This in fact separates the prefix gesture from its point of arrival, a technique that is not strictly necessary on the piano, where the accent can be shown with a dynamic shape forming the prefix and a dynamic accent on the point of arrival due to the touch sensitive dynamics of the piano. Especially on Baroque organs, the attack of the note after such a small silence is heard much more clearly, giving the sense of a point of arrival. This same point of arrival can be emphasised by a mini temporal curve, a version that would sound different but still communicate the same prefix, suffix and point of arrival. Thus the same shape of prefix and suffix gestures, the weak and strong emphases and their gestural filling, are translatable between different kinds of expressive details. Changing the kind of expressive details employed affects the felt expressive quality of the gesture, but the structure of the gesture as it maps to the musical score remains the same.

For this reason, the study of organ, which I undertook after I already completed my formal education as a pianist, gave me a very useful perspective on musical details, gesture and musical expression. My musicianship was so adjusted to the touch-sensitive dynamics of the piano that at the beginning of my organ study, I felt unable to express my musical intentions fully. My teacher, Ben van Oosten, tapped into my musicianship by insisting that I hear the motives and phrases dynamically, and activation of this shaped sound-image, inextricably connected to musical gesture, helped me to shape with more temporal and articulatory inflection. Experimenting with playing the same pieces on organ

and on piano to explore the difference in expressive details has reinforced my conclusion that gesture underlies musical details and that expression of gesture can occur in any combination of available details, and thus that gesture is translatable between those different details of expression.

10.2 Notation and gesture

> The true reproduction is the mimicry of a non-existent original. (...) But this mimicry of the non-existent original is at the same time nothing else but the X-ray photography of the text. (...) Its challenge is to make evident all relations, transitions, contrasts, tension and relaxation fields, and whatever there is that builds the construction, all of that being hidden under the mensural notation and the sensorial surface of sounds. (Adorno, quoted and translated in Mazzola 2010: 119)

In the preceding section, I discussed how gesture is expressed in details. In the first place, gesture is expressed in *sound* through these details, but it is also true that they can be expressed through *notation* with expressive and technical markings in musical scores. These expressions hang together and are inseparable from the practice of playing the instrument, since as soon as they are removed from this kind of bodily understanding, they seem like just ink-marks on the page in need of interpretation. To be clear, there is a pathway for translation of notation into sound, much in the way a computer translates a midi-file into sound. But musicians approach scores with their own gestural expertise, and this gestural reading leads to an individual and much more lively sounding result. Supporting the claim that notation can be read with gesture, there is empirical evidence that shows that the mirror neuron system of motor function is activated when professional musicians merely look at a piece of sheet music (Behmer & Jantzen 2011). Thus musicians see groups of notes as objects with gestural affordances, in much the same way humans

perceive objects with gestural affordances such as grasping. This underlies and colours conscious experience.

In the musical examples which follow, I will argue that an understanding of notation can be built on specific embodied meanings that correspond to the experience of gesture through use of legato, slurs, ties, rests, fingerings and accents. Such an argument explains a reading of notation with the body, a reading that considers the ecological knowledge of how the body and its own particular schemata relates to the instruments. With this orientation, gestures are suggested by many forms of notation in scores of different composers. A reading of these composers' notation is predicated on an understanding of style and a comparative view of their other works, but it is equally dependent on continuously evolving traditions of music making. The passing down from generation to generation of the instructions for such a phenomenon as "legato," for example, include not only verbal formulations but also performed demonstrations for how legato should sound, an unconscious transference. The word written word "legato" is thus an empty instruction devoid of semantic meaning that must be filled with these interpretations and understandings. As Maria Joao Pires once said: "What is in the score? It's not even two percent of the music!"[30]

While expressive details marked in scores have direct effect on the sounding result, affording a direct translation to sound that can be achieved, for example, by a computer, they can also be read through gesture. In the latter case, the performer's own action-oriented perception makes sense of the score as a sequence of possible actions, a process which happens pre-reflectively anyway (Behmer & Jantzen 2011, Leman 2008: 90), but can be made magnified to result in actual movement. As musicologist Marc Leman states, "if perception is covert action, then there may be tricks or techniques to turn

[30] In a masterclass that can be found on YouTube: https://www.youtube.com/watch?v=Wt44_q73SGs (accessed 29/1/2016)

this covert action into overt action" (Leman 2008: 90). The order or priority is important, so in other words the sequence of reading is better understood as:

[score -> gesture -> sound]

rather than:

[score -> sound -> gesture]

While this dichotomy is far too simplistic (in the practice of music, these perspectives mix) it does represent two kinds of perspectives of music reading, perspectives that lead to markedly different sounding results. These different perspectives are also reflected in the practice process - does the pianist aim to execute the score based on its interpretation as a sequence of symbols representing sounds, or does he aim for an embodied understanding of it[31]? That pianists disagree over whether these expressive markings *should* be read as embodied meanings can be indicated by a simple test. Ask several pianists the question: what does legato mean? A certain percentage will respond with a formal definition that comes from a conceptual understanding of the word (much like a dictionary definition) while others will respond with some kind of description of gesture. In the latter category, many will convey this gestural information below the level of words - they will enact or mimic the gestural meaning of legato with their hands as they talk. Thus some will tend to think at the level of the rule or instruction - at a verbal or symbolic level - while others might tend to think of legato as an embodied experience, an understanding which bridges the gulf between the instruction (notation) and its performance. In both cases, the pianists' pre-reflective apprehension of the score involves

[31] In support of the distinction between interpretation and understanding, consider the following paragraph from Leman: "Corporeal intentionality can be distinguished from cerebral intentionality - which, in music, explores the speculative pursuit of potential interpretations. The essence of cerebral intentionality is interpreting the source of intentions attributed to music. The essence of corporeal intentionality is the articulation of moving sonic forms, the emphasis on movement in relation to behavioural resonances of the human body. Corporeal intentionality can be seen as an emerging effect of the coupling of action and perception. If action and perception are indeed tightly coupled (probably due to overlapping neuronal codes), then it should be possible to derive action sequences from perception in order to see how intentionality is reflected in the action sequences" (Leman 2008: 84-85).

activation of the aforementioned neuronal action pathways, so the difference between the two attitudes amounts to whether a conscious ratification of this underlying perception-action coupling takes place and whether this activation is allowed to be expressed through overt action.

In performance theory, such differences in the translation of notation have been recognised. For example, in his book *Musical Performance*, music theorist Guerino Mazzola writes:

> Performance can now be defined as a transformation of the mental level of the score into a set of sounding/physical events, and this is the type of performance we want to deal with in this book. It is crucial to understand this concept as excluding other types of performance not because they are not relevant, but because the chosen type is the perspective that has undergone the most intense and elaborate scientific investigations as revealed in our historical sketch. However, performance involves all [ontological] dimensions of music. Above all, the intermediate gestural realization of score symbols, their "thawing to gestures" that act on the instrumental interface and thus generate sounds, plays a major role, but this is—unfortunately—not yet a relevant topic of performance theory. (Mazzola 2010: 28)

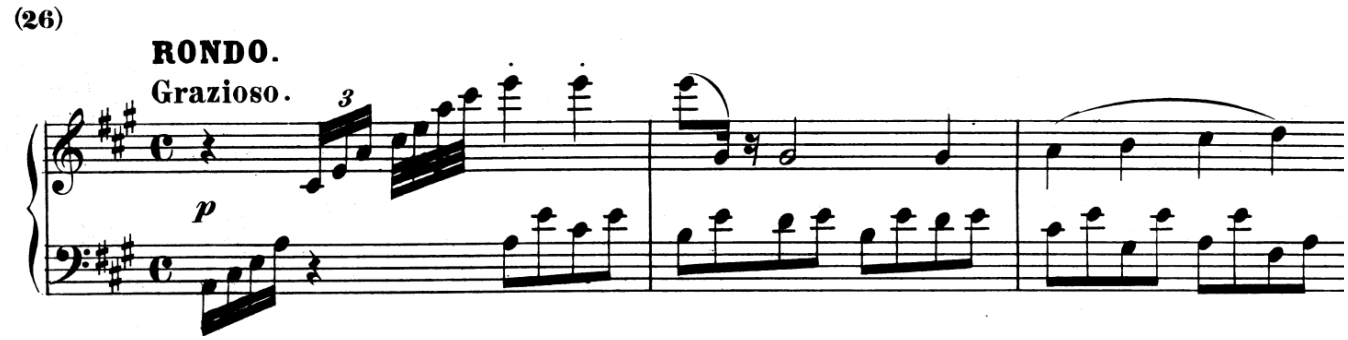
It could be noted, at this moment, that early neumatic music notation was more or less the visual representation of gestures - it had a spatial quality. Tablature notation is also an indication first of where to put the fingers - which is a gesture then translated into sound. Staff notation has come to seem like abstract notation of pitches and rhythms, but in fact developed from or out of these early notations, and it can also be read through gesture.

So what could the transformation of score into gesture - "thawing to gestures"[32] - look like? What elements of the score could be read as gestures, and by whom? In the

[32] The word "thawing" is unfortunate since it suggests that gestures are frozen in the notation itself and that anyone thawing them might thaw the same gestures. On the contrary, the performer's gestures are his means of reading the score, and each individual performer brings his own gestures to bear on the gestural

first place, gestures are not found in the score by an act of *interpretation*, but they are rather *understood* from the score through embodiment. Since they relate to the very specific embodied knowledge of how to play an instrument, they will be read differently by pianists than by theorists, musicologists or any other reader who does not play the piano, because of the difference in embodied knowledges. While a pianist responds to the sight of the score with pre-reflective activation of sensorimotor neural pathways reflecting the habitual action sequences employed in its execution, a non-pianist would not have a similar reaction. A pianist may choose to override or ignore such reaction through conscious activity.

Gesture, however, need not necessarily be specifically pianistic. Consider the opening ascending passage from the following except:



Example 10.3: Beethoven Sonata op. 2 no. 2, Movement IV (Breitkopf, 1862 [Kalmus reprint 1933])

A literal *interpretation* from score to sound (like a computer play-back) would result in audible transitions between the speed of the opening sixteenth notes, the triplet sixteenth notes and the thirty-second notes. In gesture, this performance would feel discontinuous because the audible transitions would feel like subdivisions. However if this

affordances presented by the notation. Because the difference in body schemata between individual performers meaningfully affects what gestures they see in the score, it pays to be very clear about this point.

is to be *understood* from an embodied perspective, it is a kind of notation of one sweeping upward gesture in which the notes at the bottom are slower than the notes at the top. In such an understanding, the distribution of notes is approximately similar to what is written but the transitions are smoothed so the acceleration is seamless. The charm of this swinging gesture gives the music its *grazioso* quality - a quality that is noticeably absent from a literal score to sound interpretation. While at the level of sound-producing gestures this is a pianistic understanding, there is a more general layer of gestural meaning - the sweeping *grazioso* quality - which reflects universal kinaesthetic experience.

The result of literal interpretation, then, is different from what results from an act of embodied understanding. The overarching goal in this dissertation is to show how this embodied understanding can be developed in the direction of polyphonic expression, and that a result of this changes the both how the performer reads the score and the sounding musical result. One's appraisal of this aspect of score-reading is dependent on the quality of one's embodied knowledge of the instrument, as well as one's body schemata in general. Even a theorist or musicologist who is sympathetic to the idea cannot access this knowledge very easily - it takes years to learn to play the piano, and among professional pianists the level of ability varies widely - and it is precisely this adjustment to the instrument that is necessary. Though it is high, this hurdle is not insurmountable: anyone who really wants can study the piano for however many years it takes with a good teacher and thus learn one of the varying traditions of how to view notation pianistically, and how embodiment colours their reading. They are thus instilled with a culture of pianism - a tradition of how to understand the music, and this tradition is the principal content of a performance - a content that is then further shaped by pre-reflective reaction to the affordances of the notated musical score.

It is unsurprising, then, that pianists often speak of "schools" of piano playing such as the "Russian school" or the school of "Viennese finger technique." Similarities of touch can be noticed among students of a particular teacher, for example, and these "family trees" of study are of great interest. While these traditions comprise many facets - cultural/historical understanding, stories, ethics, ideals - the primary content is the embodied knowledge - which is at once practical and aesthetic - of how the piano is played, and thus the embodied knowledge of how to read the score. When a pianist speaks of the "Russian sound" he speaks not of sound waves, but of a certain kind of touch and a certain attitude towards music. That touch, in fact, could sound quite different from one instrument to the next, but it remains recognisable.

While "faithfulness to the score" is a predominant orientation in pedagogical settings, it should be noted that in music making the score never comes first. Scores did not precede music making in history and they do not proceed music making in the development of young musicians. The desire to make music, perhaps the special feeling expected of a certain concert, the acoustical and instrumental qualities available, the pianist's own capabilities and many other given factors precede and condition even the choice of what repertoire to play. The order mentioned above:

[score -> gesture -> sound]

could better be filled out from the performer's perspective as:

[motivation + feeling + embodied knowledge + tradition -> score -> gesture -> sound]

Similarly, the perspective of the composer does not begin with the score. It is only in the relatively more cerebral world of musicology, music philosophy and music theory that engagement with music often begins with a specific score, and this abstraction of the score from its embeddedness in musical practice both compounds the ontological

difficulties of defining a musical work and confounds attempts to make conclusions about musical performance since those conclusions will easily be taken as pertaining to the corresponding musical score or else as pertaining to its imaginary "ideal" performance which, in Rosen's definition of a musical work, is not the simple sum of all performances but "the limit to which all performances tend" (Rosen 2001: 10).

A score is like a set of instructions or rules. As philosopher Ludwig Wittgenstein points out, there is an unbridgeable gulf between rules and their execution if rules must be interpreted, since every such interpretation must again be interpreted, leading to a regress. In his words, "any interpretation still hangs in the air along with what it interprets, and cannot give it any support. Interpretations by themselves do not determine meaning" (Wittgenstein 2009: §198a). As he points out, "This was our paradox: no course of action could be determined by a rule, because any course of action can be made out to accord with the rule" (Wittgenstein 2009: §201a). His solution to this problem is to reject the notion that rules are sounds or ink-marks on the page that need interpretation, but rather to argue that we have a feeling in actual cases for what goes against or follows the rules. The only reason we would be confronted with the problem of having to interpret the rules or instructions is when we take them out of their context in the "weave of life." When we approach the rules with our own experiences in this weave of life, we can *understand* them directly without having to *interpret* them. As philosopher John McDowell (1984) points out in explaining this theme from Wittgenstein, we understand rules or instructions because we are inculcated in a practice or custom. This aspect of Wittgenstein's thought rhymes with his view of the meaning of language as being determined by how it is used ("language games") rather than what it represents. Applying this to music would mean that rather than seeing scores as ink-marks in need of

interpretation, we make sense of them within our own artistic practices, which in turn give the scores meaning.

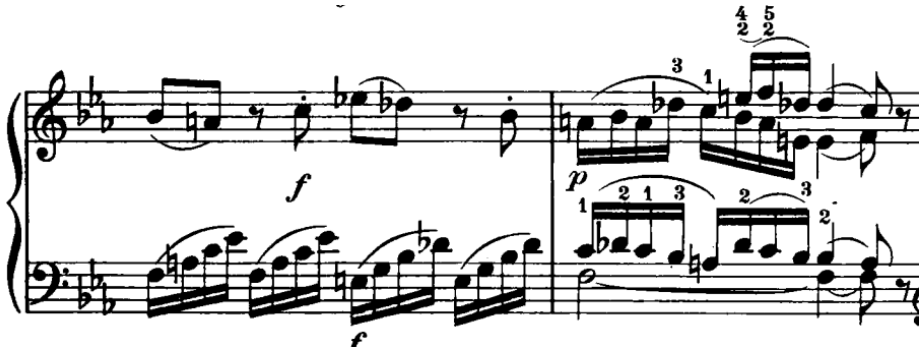
To demonstrate this, I will now focus on a few examples of how scores present gestural affordances when taken within this context of practise. This practice is of course my practice, and other pianists, especially with different training, will read the scores slightly differently. These gestural affordances do not require interpretive justification, in the sense that they simply rise into awareness when the score is performed at the instrument, beginning pre-reflectively and transformed through kinaesthetic experience into objects for reflection. On the contrary, interpretation can override these understandings, and "literal readings" based on dictionary knowledge of the features involved lead to a much more conceptual but musically impoverished result. I will present four examples of gestural reading of scores: fingering, the staccato dot, tenuto and visual shapes.

10.2.1 Fingering

One clear way that scores represent gestural affordance is through fingering. If fingering has an influence on the embodied continuity of gesture in playing, then it has influence on the musical outcome in a performance. It seems that in the twentieth century, fingering was viewed by music publishers as a means to the end of simply getting out the notes. This view was reflected in the decision to grant editors freedom to add and change fingerings to new editions of works. While a tendency towards "urtext" editions led to self restraint in changing or adding expressive markings, editors continued to add fingerings as if the fingerings were neutral to expressive content - editors who were not always good pianists. It was thought that if a fingering worked, it was good enough.

Nothing could be farther from the truth. In the first place, obeying a written fingering overrides the natural bottom-up gestural response to the music that would otherwise happen pre-reflectively. If the sensorimotor system is activated when musicians see a score, the embodied patterns that come up naturally should be tried first, and only modified if there is a problem. This has the advantage that the musicality of a rich sensorimotor engagement with the passage is allowed to determine the fingering. Also, the fingering is thus customised to the individual hands of the player and to his specific embodied knowledge of how to play.

Fingering, when undertaken as a conceptual task, can also include faulty premises. One common faulty premise, as I have mentioned, is that the fingering itself is purely technical and does not have musical meaning. Other premises are certain conceptual rules, which may have their use in some cases, but which are applied without discrimination. Examples include the principle of no thumb on black notes, or the idea that the fingering should always be maximally legato. The fingerings of certain editors (Hans-Martin Theopold for the Henle editions is one example, or the editors of Example 10.4 below) are musically problematic. In Example 10.4 below (taken from the Edition Peters Urtext), notice that the editor does not generally group fingerings in sympathy with the rhythm or contour of the music, but rather tries to make legato fingerings at all cost. These fingerings are unmusical in the sense that avoiding the appropriate (and clearly notated) grouping articulations results in gestures that segment the music in highly unmusical ways, placing small but significant strain on the hand while seeming to try to connect everything as much as possible with contiguous fingers. In this case, such a "connect-everything" approach even includes a black key to white key slide (in the second measure shown in Example 10.4).



Example 10.4: Mozart Sonata in E-flat K. 282, Movement I (Peters Urtext, Martienssen & Wiesman, ca. 1938)

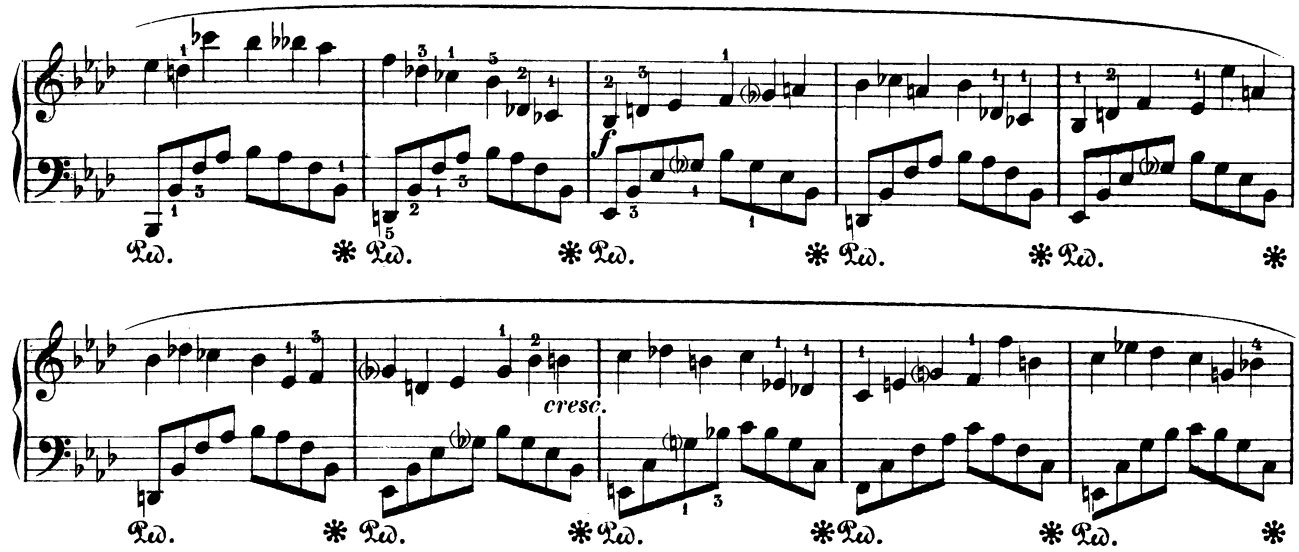
The thumb is used on the last sixteenth note in the first right-hand slur of the second bar in Example 10.4, in order to connect this note to the next one. Of course this connection is quite superfluous since the structure of slurs clearly indicates an articulation between the groups of notes. Worse, the thumb is quite a heavy to use on the last note of this group, a note that really should be light. As piano pedagogue Edna Golandsky (2003) explains, the thumb often plays as a unit with the arm in rotation since independent downwards movement of the thumb (that is without the help of rotation) uses the abduction/adduction muscles around the thumb - muscles which are slow and generally unsuitable for taking the key drop in its entirety. The thumb, either played by rotation as a unit with the arm or played independently, is heavy, and care has to be taken to avoid causing an unwanted accent. In summary, this fingering can work, and it is not difficult to execute, but it is not aligned with the phrasing marked by Mozart, and even though a pianist *can* make it sound good, a better fingering would be immediately in alignment with the movement of the music, in this case honouring the segmentation notated by Mozart's slurs as well as the rhythmic gesture. This overlap between musical and technical gesture

would result from a bottom-up process beginning with the gesture rather than with a conceptual calculation of fingering.

The fingering discussed above contains gestural information in the context of the artistic practice of a pianist, just as much as the contours of notes contain gestural information in this practice. In this case, the fingering added is ill-considered since the gestural information the fingering suggests is at odds with both the rhythm and the phrasing of the music as notated by Mozart. If the notation of Mozart is understood gesturally, or from the perspective of how to group the notes (shown with slurs,) then this fingering clearly goes against that instruction. It is perhaps considered by the publisher/editor to be a "sufficient" or perhaps even "efficient" fingering. Underlying this attitude toward fingering is again the idea of separation between musicality and technique - a reflection of the Cartesian divide between mind and body.

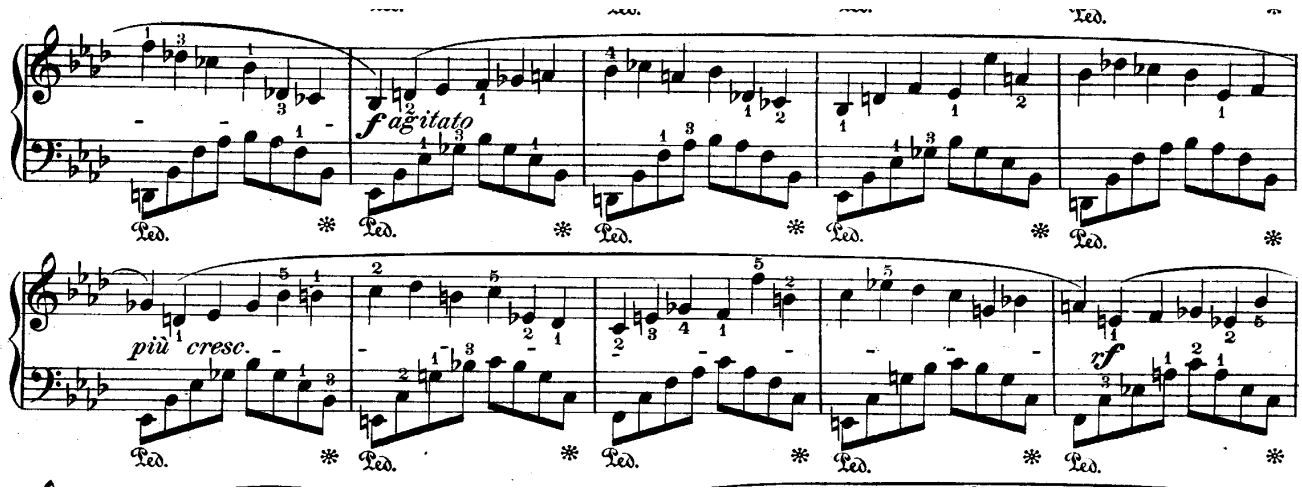
There are many editions, on the other hand, that contain very musical fingerings, which cause the hands to move in sympathy with the music. Schnabel's Beethoven, Gieseking's Schubert, Cortot's Chopin - in these examples the pianistic mastery can be understood simply by trying the fingerings. Editions such as Arrau's Beethoven Sonatas and E. Robert Schmitz's Chopin Etudes explore alternative embodiments through systematised experimentation with fingering. In all these cases, the gestural and musical meaning of the fingering overlaps.

Pianist-composers, too, have a musical-expressive view of fingering. Consider this example of Chopin, a passage from the Nouvelle Etude in F minor:



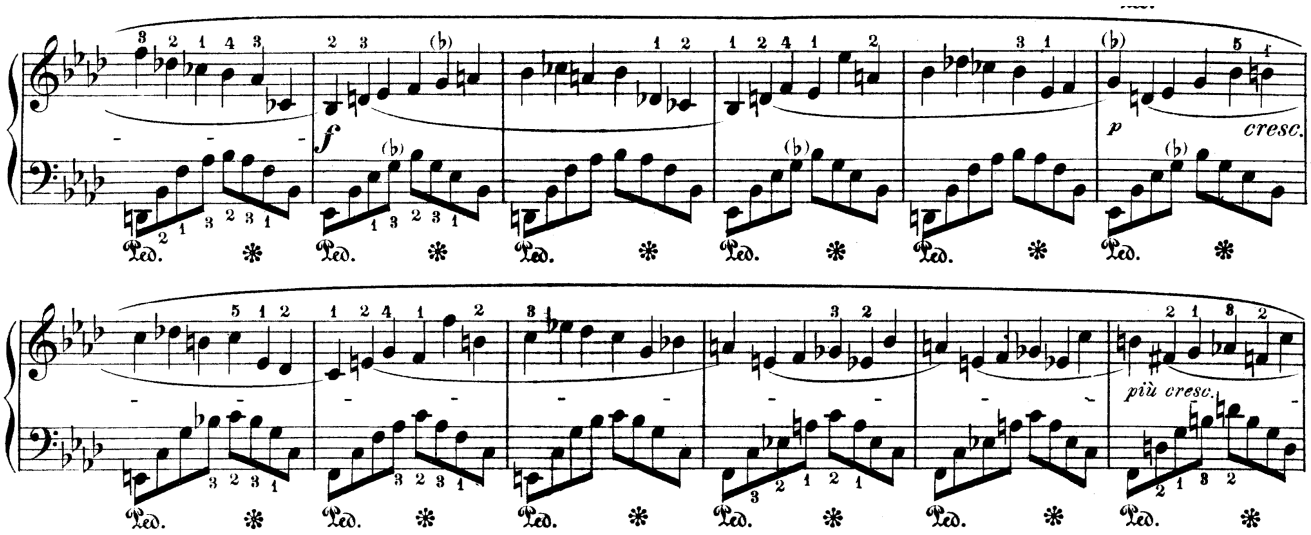
Example 10.5: Chopin Nouvelle Etude in F minor op. Posth. (Breitkopf, Reinecke, 1879)

The repetition of the same finger (1-1-1 at the end of the fourth measure and again in the parallel passage of the second line) activates a pulse of the arm for each of those notes and serves as a kind of emphasis. It is neither the first fingering that would come to mind in that passage nor is it the most efficient fingering. If fingering is considered as simply a means by which to get out the notes, then this specific Chopin fingering must be corrected, as it is in this edition:



Example 10.6: Chopin Nouvelle Etude in F minor op. Posth. (Bote & Bock, Klindworth, 1880)

And in this edition:



Example 10.7: Chopin Nouvelle Etude in F minor op. Posth. (Schlesinger, Kullak, 1883)

However, the choice of fingering by Chopin is absolutely significant and most certainly influences both the gesture of how the notes are embodied and their sounding result. It cannot be considered a mere technical solution, but it is rather a musically significant part of the score.

It might be added, on the other hand, that practicing alternative fingerings gives rise to alternative experiences of the music. For passages that have no marked fingering, or for composers who were not great pianists, this process allows for a consideration of different embodiments and expressions. If I play the left hand part of a piece with the right hand, a common practice technique that involves alternate fingering, the expression might be different since the embodiment from the playing perspective influences how I hear the passage from a listening perspective, which in turn influences the imaginative perspective of how I hear or feel the music. When I return to playing the left hand part with just my left hand, I can re-use that imaginative experience - my imagination has been thus

enhanced by the alternative embodiment in a way that simply *imagining* playing the left hand part with the right hand cannot accomplish with as much immediacy. If the music has a different feeling of gesture, I can use that from the imaginative perspective in a normal performance. I don't have to consciously call forth the memory of playing with the wrong hand in order for it to affect the normal performance - its trace is sedimented deeply in my unconscious apprehension of the music and thus opens new dimension in my imagination.[33]

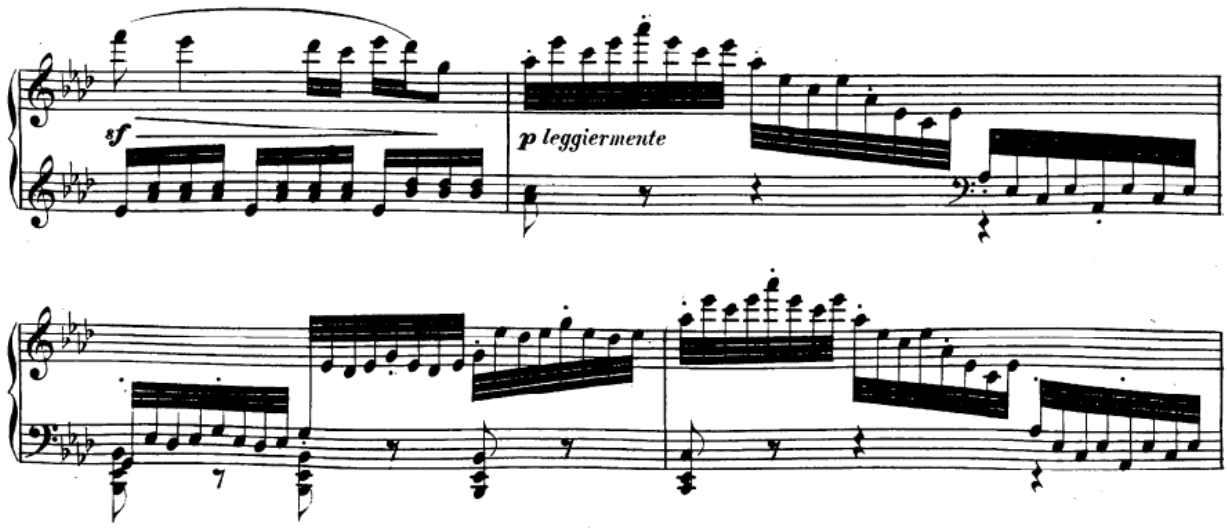
10.2.2 The Staccato Dot

Many composers made a special use of the staccato dot. Staccato, by the definition of Merriam-Webster, means "short and not sounding connected."[34] In the special use to which I am referring, the staccato dots seem to represent a physical gesture rather than a realisation in sound of the definition of the word. It must be recognised that staccato, even taken with the dictionary definition, can be taken to signify the kind of attack as well as the length of the note (similar in this sense to the word articulation, which points to a specific musical meaning as well as body movement). However, the variability of the meaning of the staccato dot depends on its context, particularly with respect to the embodied feel of its surrounding texture and its placement in metrical structure. In the following examples, I will examine staccato dots placed on metrically strong beats and discuss their embodied meaning.

[33] An extended example of this technique can be found in this masterclass of Arie Vardi: https://www.youtube.com/watch?v=B9URWzTvpec

[34] Accessed from Merriam-Webster online <

10.2.2.1 Example 1: Beethoven Sonata in A-flat op. 110



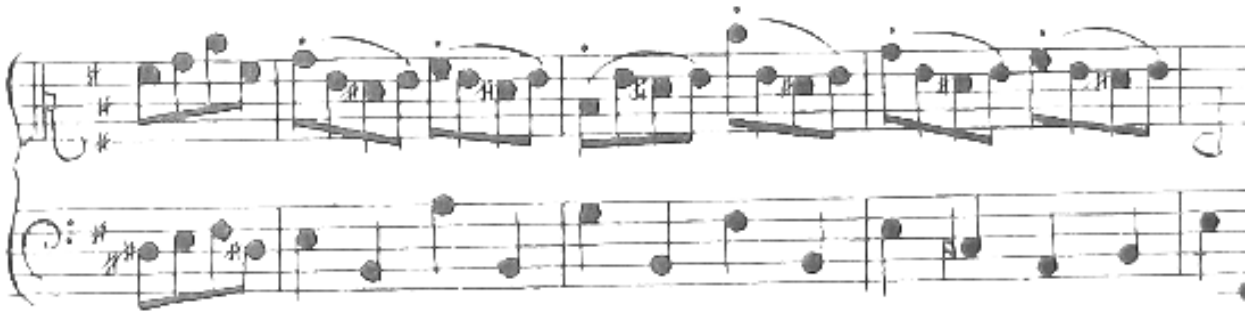
Example 10.8: Beethoven Sonata in A-flat op. 110, Movement I (Breitkopf, Brahms, 1862)

What these dots actually mean can only be answered from a broad understanding of Beethoven's works. He consistently uses this notation throughout his piano compositions in passages which would sound obviously uneven and unmusical if interpreted in what pianist and pedagogue Abby Whiteside (1997) would call a "note-wise" or sequential way – that is by simply playing the staccato note shorter in contrast to its surrounding notes. Indeed the experience of playing this passage *leggiermente* as it is marked results in a separate articulation of the wrist over every four-note group, not a separate articulation of one note separated from its surroundings. When played this way, the passage, which might otherwise be difficult to control, becomes comfortable and seems to almost play itself. It is when read as a gesture that the notation makes the most sense. It is true that the modern piano is so different from Beethoven's that what makes sense on the modern piano might be somewhat different from what made sense on his piano, but this just reflects the fact that the reading of the score is embedded in musical practice which changes historically, and which is itself contextualised by the instrument.

In my understanding of this Beethoven example, each staccato dot on every group of four thirty-second notes indicates a separate movement of the forearm (which results in an articulation of the wrist). Many other composers make a similar use of the staccato dot to indicate a separate gesture of the arm. In these cases, reading the staccato as a "short note" can easily result in an interpretation that is jumpy, erratic and unmusical.

10.2.2.2 Example 2: Bach French Overture BWV 831

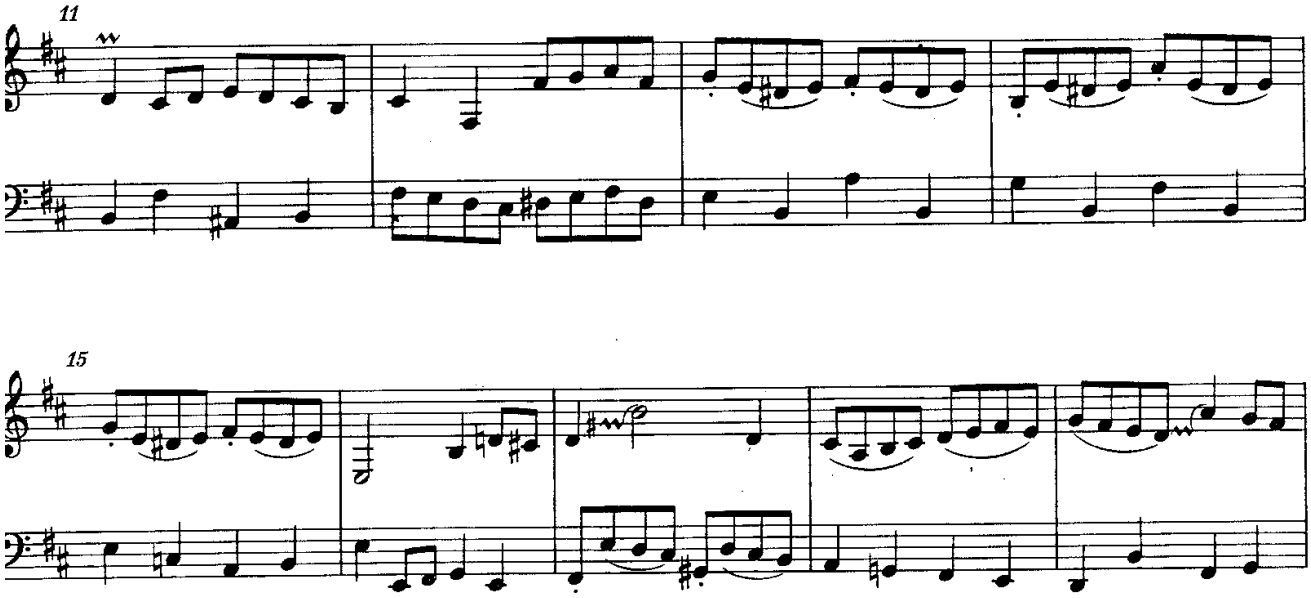
In this example from Bach's French Overture, we see an early example of the use of the staccato dot. Look at this example of the first edition:



Example 10.9: Bach French Overture in B minor BWV 831 (First edition: Weigel, 1735)

Notice again the fact that the dot is placed on the strong beats, and that the same note that has a staccato dot seems to *also* be included in the slur. As Albert Schweitzer notices: "The Bach staccato only rarely coincides with our modern staccato. It's effect is not so much a key pizzicato as the short and heavy stroke of a bow. It's effect is therefore to accentuate the note rather than lighten it." (Schweitzer 1911: 370). The analogy with bowing of a string instrument is particularly apt, since such a gesture over the timescale of the slur can be considered a parallel to the gesture of coarticulation on the piano.

In modern editions, an understanding of legato and staccato as a dichotomy, and the reading of such a concept onto these scores, results in corrections of the notation. In the Bärenreiter edition of the passage above, the slurs are corrected to include only the notes *after* the dot, presumably because the editor thought that the notes had to be either staccato (with a dot) *or* legato (with a slur) but could not be both at once. This correction seems to reflect the sequential understanding of a staccato dot - that it applies to one note, and that it means that the note in question is short - an understanding which has changed over time. Again in this case, an embodied reading similar to the reading of Beethoven op. 110 (above) seems to make the most musical sense. With this reading, there is no contradiction between the slur and the dot as notated in the first edition.



Example 10.10: Bach French Overture in B minor BWV 831 (Bärenreiter)

10.2.2.3 Example 3: Schubert: Impromptu op. 120 no. 3

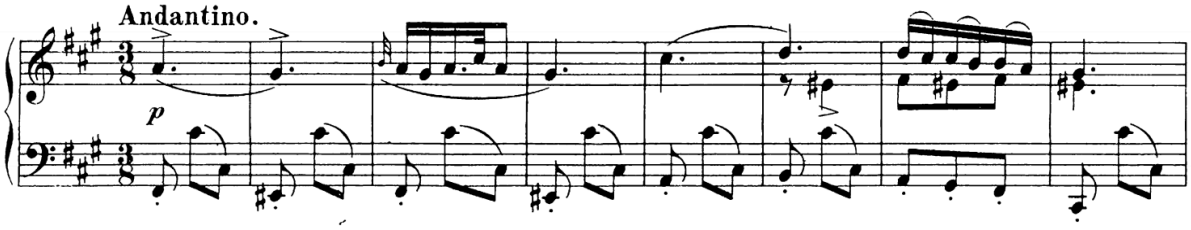
In this example from Schubert (the Impromptu op. 120 no. 3) Schubert seems to tell the pianist not to try to connect the bass note with the supporting figuration in the left hand. Doing so opens the hand to a stretch which results in some small degree of tension across the back of the hand and in the wrist, all of which does not represent a

technical difficulty, and might be considered by some to be inconsequential, but does not lead to the perfect control and suppleness that characterise the execution of this texture with a freely separate gesture for the bass note. In this case, the dot does have an effect on the sounding result, but it is not the effect of making the note shorter. In fact, separating the bass note freely combined with an expert use of the pedal makes the sounding result more controlled, supple and maybe even smoother. Thus the meaning of the dot - the separation that it implies - is a *pianistic* meaning that must be translated by the performing body of the pianist into sound. It does not mean a separation in sound, but a separation in gesture. When I play this passage, I feel that the gesture that plays this bass note originates in the arm and is mediated by a supple wrist. This may result in a slight emphasis on the bass notes in comparison to the slurred notes that follow.

Examples can be found of pianists who play such staccato dots in Schubert with a literal interpretation of "short note." However, I have yet to find a recording of the above passage of the above impromptu played with this kind of literal staccato dot, presumably because even the most scrupulously literal and cerebral pianist would find it to sound ridiculous. In other works, however, this kind of interpretation can be found. If this embodied way of reading is more or less the only viable option in the impromptu example, should a similar embodied reading be preferred in other examples where the alternative literal reading might be aesthetically viable? While I didn't find a recording representing the "short note" interpretation of the staccato dot in the B-flat impromptu, the Andantino from the A Major Sonata D. 959 (Example 10.11) represents an example for which there are recordings that represent a whole range of readings ranging from "extremely short note" (William Grant Nabore)[35] to "moderately short note" (Mitsuko Uchida[36]) to "short

[35] https://www.youtube.com/watch?v=qSjQnIYXb7A (Accessed 2/2/2016)
[36] https://www.youtube.com/watch?v=98MZpEBbJrU (Accessed 2/2/2016)

note but then sometimes with pedal" (Alfred Brendel[37]) to "consistent pedal" (Rudolf Serkin[38]). Of course this is a question of individual preference, though I would argue that the embodied reading is no less faithful to the score than the literal reading. In practice, as I mentioned at the outset, the two perspectives can mix, and it is not my purpose here to argue one way or the other, but rather only to suggest that the dot can be read as indicating a certain kind of gesture.



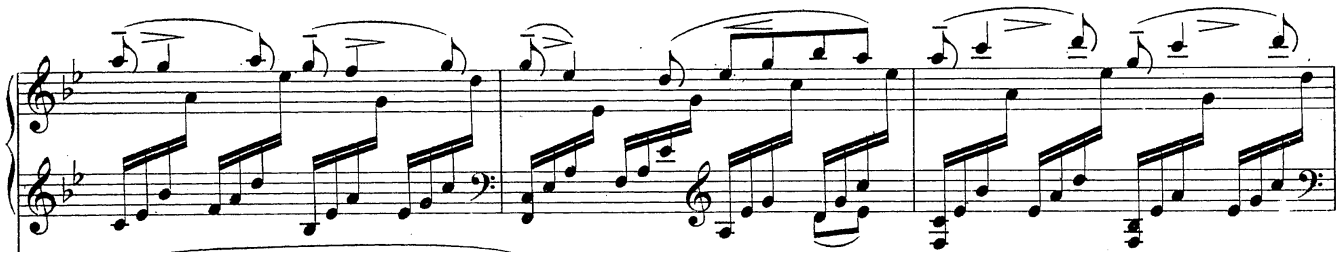
Example 10.11: Schubert Sonata in A major D. 959, Movement II (Epstein, Breitkopf, 1888)

10.2.3 Tenuto

Another example of a notation that seems to have a strong embodied meaning is the use of tenuto in Rachmaninoff. The word tenuto itself - translated as "held" - suggests a kind of gesture. The instruction might suggest that the performer should hold the note longer, or perhaps that a performer should emphasise a note (there are examples in Rachmaninoff where every note of a melody has a tenuto mark, which seems to simply indicate that it should be brought out). Again, its meaning depends on its context, and in this case Rachmaninoff seems to use the tenuto to mark shapes of the arms whereby the weight of the arm - though spread over groups of notes - lands most markedly on the notes with tenuto. These are the kind of "goal notes" (Whiteside 1997) that express a level of

[37] https://www.youtube.com/watch?v=Il6-lZYDpqY (Accessed 2/2/2016)
[38] https://www.youtube.com/watch?v=mQ0abGf69v8 (Accessed 2/2/2016)

structure that hierarchically nests within the structure expressed by the slurs. The spreading of this weight of the arm (the coalescing of notes to form groups) is notated by the slurs and the diminuendo marking for each group. In this example it seems that translating from the score directly to sound would in any case lead to a similar embodied understanding of these phrases. However, if that physical understanding is consciously suppressed, or if the elements in the notation (tenuto, slur, diminuendo) are taken separately, the sonic outcome would be far from satisfactory. Indeed, then, the body is a necessary mediator between score and sound in order for this passage to be played with understanding.



Example 10.12: Rachmaninoff Concerto no. 3 in D minor op. 30 (First edition: Gutheil, 1910)

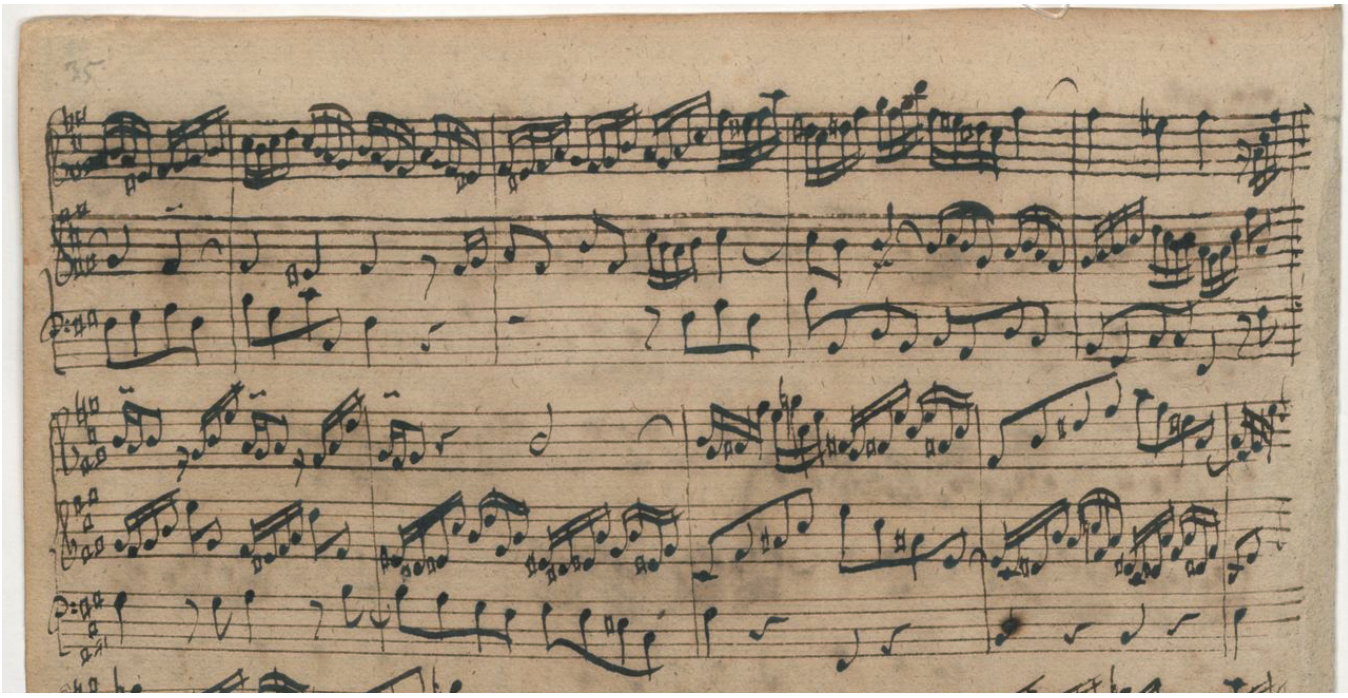
10.2.4 Visual shapes

Often manuscripts contain visual elements that can be understood as reinforcing a gestural understanding. To begin with, though the musical notation may look quite uncomplicated or uncontroversial and is quite easily legible, reading it is not straightforward. Comparing "mainstream" performers and historically specialists, musicologist Colin Booth writes:

> The difference lies in the fact that specialists, alongside the use of rediscovered instruments and techniques, will at least recognise that notation in early music may look familiar, but that its interpretation is a very different discipline from that required when playing Shostakovich. So it can be they, who, by discovering a

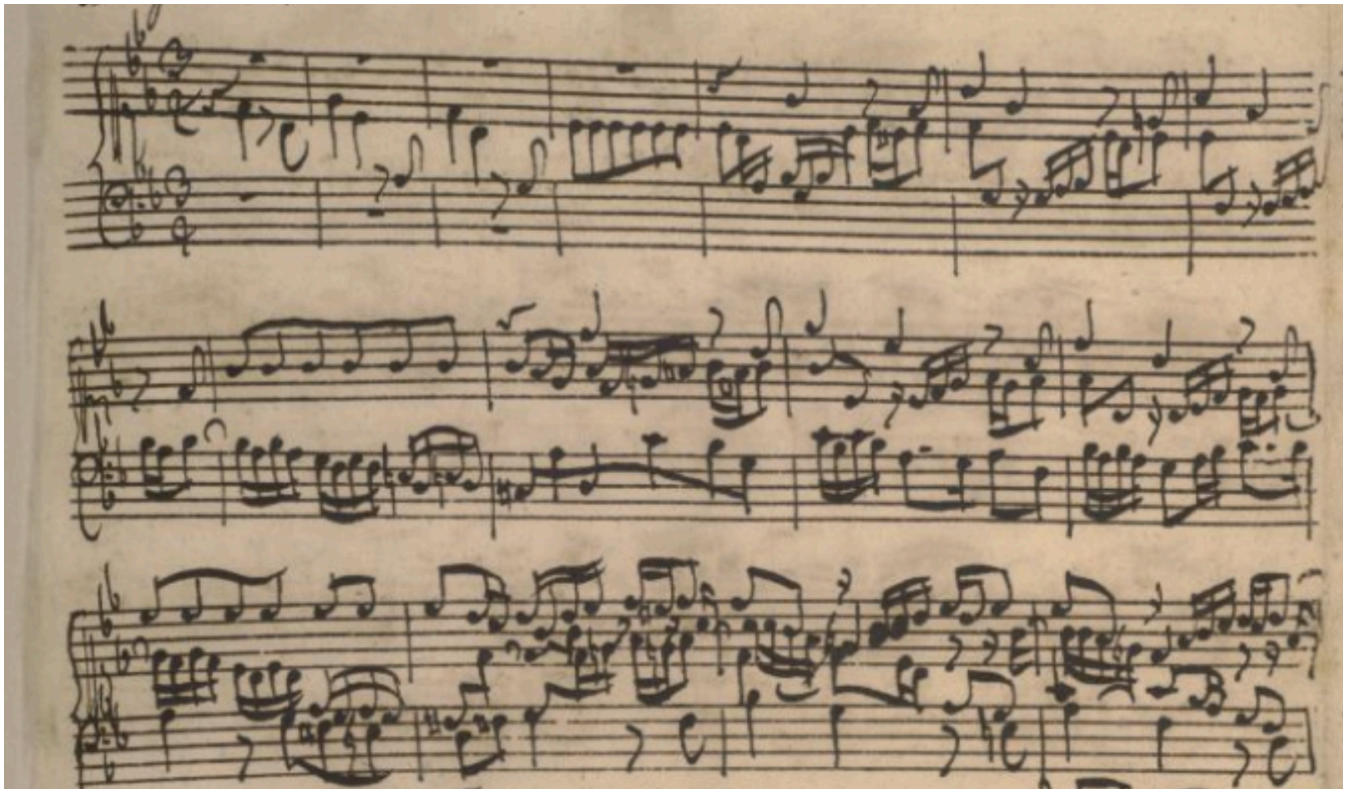
> different set of possibilities within the score (possibilities based on research into performance practice contemporary with the composition), may enjoy a freedom at least equally great, arguably less egocentric, and of a rather different kind. (Booth 2010, Introduction)

In the case of Bach's manuscripts, it seems that Bach tried to visually encourage a gestural interpretation. What is immediately noticeable is the expressive shaping of the beams connecting the sixteenth notes and eighth notes that seem to dance off the page. These shapes most often follow the contours of the notes (as musical gesture often does) but some are more curved and some are straighter, seemingly expressing the degree to which the contours of the notes can be inflected with gesture. Notice, for example, that some examples are straight even when the notes curve:



Example 10.13: Bach Trio on Allein Gott in der Höh sei Ehr (composer's manuscript)

In the following example the beams of groups of repeated notes are themselves curved, and notice the altered beaming of the repeated notes in the soprano on the third line:



Example 10.14: Bach Fugue in G Minor from Das wohltemperiertes Klavier II (composer's manuscript)

Knowing that when a musician reads a score his sensorimotor system is unconsciously activated (Behmer & Jantzen 2011), it is not unreasonable to conclude that these shapes influence the unconscious gestural grip of the music. For a composer so visually precise and expressive (see monogram, Figure 10.1) it would stand to reason that these shaped beams contain visually expressive meaning beyond their symbolic function, and regardless of whether it was intended to do so, it can provide inspiration. Learning a Bach piece from the manuscript - seeing those curves repeatedly during the practice process - has at least an unconscious influence on the gestures used to embody the music.

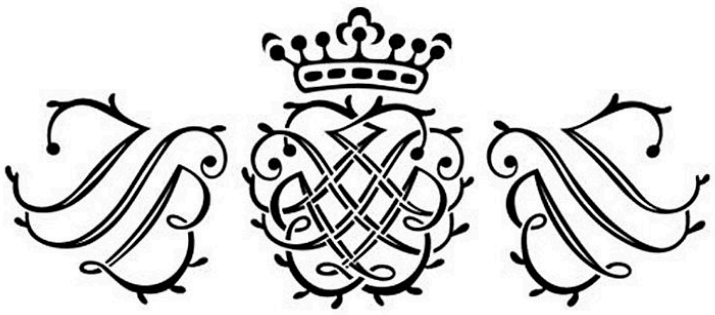


Figure 10.1: Bach Monogram

Whiteside argues for a visual-gestural connection early in the practicing process. In approaching a complex score of contemporary music, she advises the student to begin by just playing the shapes they see on the page (using random notes all over the piano). The student begins with the biggest gestures, following the largest contours of the music. Gradually the student is able to refine and add more details until all the notes are in place. What is notable is that the score is used as a visual artefact representing *physical gesture* in the first reading, and gradually the symbolic reading of the notes as pitches/rhythms is added (Whiteside 1997).

10.3 Abstraction and embodied knowledge

Do musical details and their notation in scores always represent an underlying gesture? Details are an abstraction of the bodily experience of musical gesture, an abstraction that can best be conceptualised with distance - distance between the details and their underlying gesture. This distance can be thought of as distance in time, imitation and abstraction and it can be very small, in the case of improvised music for example, or

very large, spanning centuries and various abstractions of notation. The distance of abstraction begins within the self - it is the distance between a feeling and its expression, between having an unconscious bodily experience, gradually becoming aware of it, expressing it, re-enacting or imitating the expression, glossing the expression with words, notating it. The distance of imitation can be thought of at any of these levels of abstraction - for example, one can imitate another's unconscious bodily movement, or reconstruct it based on their expression or gloss of expression or notation. One can also imitate one's own expression. The distance in time can be small within one person, for example the time between having a feeling and it's musical or verbal expression, or it can be vast, such as the time between a composer's notation of a piece and its performance centuries later.

While details originated in gesture, they have become in some cases thematically disembodied in the twentieth century. The most extreme example of this is total serialism, where the rules by which discrete expressive details or parameters combine were conceptually formulated, making any consideration of the human perceptual system and how those details combine in felt experience subordinate to the system. Despite this bias towards the conceptual, some composers achieved lively and interesting results, and regardless it still remains the job of the performer to play the music in a way that excites the listener, and that is done not with mathematical, conceptual playing but with visceral and energetic engagement, even in total serialism.

11 Conclusion

If instrumental embodied knowledge is an integral part of reading scores, imaginative experience and making music, it follows that developing or modifying such embodied knowledge leads not only to different sounding results (see §8) and also leads to *seeing the scores differently.* In considering notation, I have given some examples of how I see gestural meaning, while holding that this way of reading the scores depends on the practice of the individual musician, which changes over time. Any similarity in the gestural meaning that two different musicians might see in the notation is a result of the fact that we have many formative experiences in common. Because of the structure of our body and its movements, musical gesture at the instrument is layered in sound-producing gestures and concurrent gestures that have a structure of their own at a completely pre-reflective level. This structure is a combination of the musculoskeletal structure of the body and the body schemata or habits of movement of the performer. In Part III I will explore this structure to show the continuum between sound-producing gestures at the periphery of the body and concurrent movements at the centre of the body, and how they are hierarchically related. This will form the basis for discussing polyphonic expression as embodied knowledge in Part IV.

Glossary for Part II

Affordance - the possibility of some action existing between an organism and its environment (Gibson 1979; see footnote to Introduction).

Body schemata - learned motor patterns, habits, or dispositions that require little mental effort to carry out (§5).

Extensional gesture - musical gesture that results in actual body movement in space (§9.2).

Framing - a conscious process used to separate or insulate a part of pre-reflective experience in order to protect it from being objectified by the conscious mind (§6.2).

Imagination perspective - the temporal perspective involving thinking ahead in performance whereby sounds are imagined *before* their execution (§9.6.1)

Intentional gesture - musical gesture that is imagined but not realised in body movement (§9.2).

Interpretation - the act of making conscious decisions in shaping a musical performance (§5).

Invisible body - a pathological form of self-consciousness where the body is "absent from experience" (§6.1, Legrand 2007).

Listening perspective - the temporal perspective involving the performer's own perception after the notes have been played (§9.6.3).

Musical details - objectively measurable modulations of dynamics, timing, and articulation occurring on the sounding surface of the music (§10.1).

Opaque body - a form of self-consciousness where the body is "taken as an intentional object of consciousness" (§6.1, Legrand 2007).

Performative body - a form of self-consciousness characterised by a "pre-reflective experience of the body itself" (§6.1, Legrand 2007).

Playing perspective - the temporal perspective associated the actual moment of execution (§9.6.2).

Polyphonic expression - A performative texture characterised by simultaneous divergence in expression (§3). An example of divergence in expression is found in Example I.1. A more precise definition of polyphonic expression will be given in Part IV (§17.5).

Polyphony - a stylistic description of musical texture with counterpoint as a defining feature, characterised by its distinction from homophony (§2).

Timescale - a unit of musical time measured in the score, such as one beat or one measure.

Transparent body - a form of self-consciousness in which the body is apparent in the "pre-reflective bodily experience of the world" (§6.1, Legrand 2007).

Understanding - a non-conceptual and primarily pre-reflective embodied reaction, depending on the body schemata of the performer (§5).

Part III: Coarticulation

The goal of Part III is to describe how the whole body can be involved in piano playing, and how this corporeal involvement is hierarchically structured. While individual pianists will differ in movement[39], and I do not intend to offer any *prescription* for embodiment at the instrument, an examination of the hierarchical structure of gesture provides a way to categorise these differences, and more importantly to focus on certain choices available for all pianists. For the purposes of this dissertation, the choice to what degree to use the body in shaping ("interpreting with the body" as described in Part II, particularly §7) will be further localised in the degree to which hierarchical layers of movement are used in playing. While the discussion is thus primarily structural, it must be emphasised that each of these layers of gesture has a *felt* kinaesthetic quality, a quality which is communicated in performance. These qualities, while being essential to sound (and to musical meaning) are individual and ephemeral, and will not feature in the current discussion.[40]

In §12, I will introduce the concept of coarticulation and suggest its interrelation with musical structure. In §13 I will discuss how coarticulation is found not only in

[39] Pianists also differ in hand size and shape, and it should be noted that because of these differences, not all options for coarticulation here described will work for every pianist.

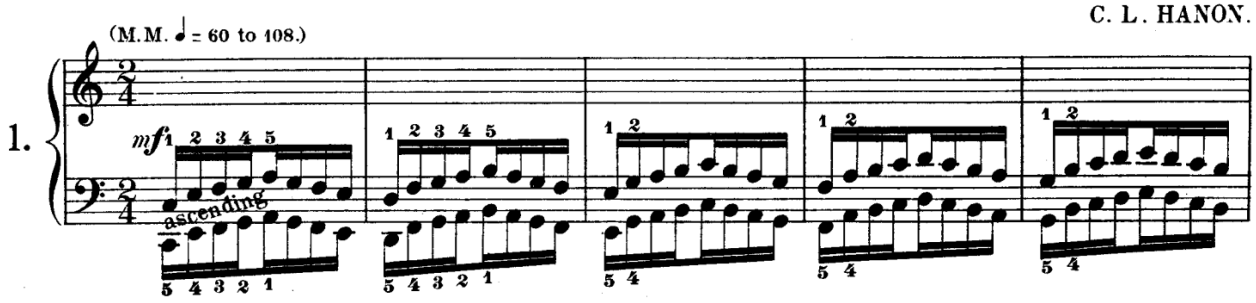
[40] Dancer and phenomenologist Maxine Sheets-Johnstone (2011) has written extensively about felt kinaesthetic experience, and she characterises movement with four basic qualities: tension, linearity, amplitude and projection. The fact that all four qualities relate to the *composite* of the hierarchically nested layers will become clear in this chapter, however the felt qualities of each layer *on its own* will remain outside the discussion. Thus, structure and felt quality are intimately related, but writing about the structural properties allows for a practical delineation of what will become relevant in Part IV of this dissertation.

sources from empirical musicology (which actually use the word coarticulation) but that it is also found extensively in practitioner literature. As a background to my own discussion, I will critically evaluate a representative sample of relevant sources, thereby homing in on a more precise understanding of how coarticulation functions. In §14, I examine how differences in coarticulation constitute one analytical perspective with which to evaluate performances, and I will establish both a notation and a terminology to communicate this analysis. In §15 I will describe how (and why) I used the preparation and performance of the complete Chopin Etudes as a research process and I will show some examples of coarticulation situated within specific passages, examples which may at face value seem like technical observations, but which represent a hierarchical structuring of body schemata which is foundational to musical thinking. Finally, in §16 I will argue, based on the previous chapters, that "interpreting with the body" as a performative choice represents not only a qualitative kinaesthetic experience, but it is necessary for creating a convincing sense of piano legato. This involvement uses the whole body in the performance of single lines, and insofar as this whole-body shaping is hierarchically structured, it can also be used in polyphonic expression, where multiple such lines diverge in gesture at a lower hierarchical level but share gesture on a higher hierarchical level. This latter consideration will be explored in Part IV, for which the concept of coarticulation and the terminology established in this chapter provide a foundation.

12 Introduction

A strong imbrication characterises the relationship between intentional and extensional musical gesture in piano playing, an imbrication which is at its minimal level inevitable, but which can be developed and exploited by the pianist (§9.6). Both analysing music and the gestures that constitute it in performance afford structural thinking, and the aforementioned imbrication suggests that the structure of the body (not exactly musculoskeletal structure but rather structure as represented in body schemata, which in turn are constantly evolving) maps to the structural affordances of the music in one way or another. Because this mapping is highly individual and shot-through with aesthetic meaning, using actual musical examples to discuss the various options such mappings represent would be needlessly controversial. To temporarily (and somewhat artificially) sidestep the aesthetic dimension, I will use exercises to introduce the topic. Because the Hanon exercises are so perfectly bland - a blank canvas of white keys as it were - no one will object to a rather exaggerated manipulation of them in demonstrative performances. Having no particular harmonic implications, the Hanon notes can be used to explore the relationship of contour- and rhythm-based gesture outside of the web of aesthetic choices that a "real" piece of music inevitably entails. After introducing the corporeal phenomenon of coarticulation through these examples, I will turn to a short consideration of the hierarchical aspects of musical structure.

12.1 Hierarchical structuring of gesture



Example 12.1: Hanon Exercise no. 1 from The Virtuoso Pianist (Schirmer, Baker, 1900)

In the three Hanon videos (Audiovisual Examples 12.1-3), three alternative performance of the first exercise from the Hanon books are demonstrated. If you observe the movement of the wrist over the groups of sixteenth notes, you will notice that the arm is pulsing on every note in the first video, over groups of two notes in the second video and over groups of four notes in the third video. Of course I could extend the idea to other groupings as well, but for the purposes of this discussion these three examples will suffice.

In the first video, the arm moves as a unit with the hand, with one such movement per note. In the second and third videos, the arm moves over groups of two notes and four notes respectively. At the same time, one finger or another moves for every note that is played. The fusing together of these individual finger movements into larger gestures in the arm is the subject of this chapter.

This phenomenon implies a hierarchical structure, whereby larger gestures include or contain multiple smaller gestures. The grouping is similar to the grouping of several notes under one bow in violin playing, but different in that the articulation of the individual notes and the overarching gesture occur in the same limb. It can occur on several levels in the body: for example, the torso can include multiple movements of the

arms, which can in turn include multiple movements of the finger. Look for example at my video of the first phrase from Chopin's Etude op. 10 no. 1 (Audiovisual Example 12.4, Example 15.10-11). What you see is the integration of smaller finger movements into larger movements of the arm, which in turn are integrated into larger movements of the torso. These musical gestures can be decided upon consciously in practice or performance, or they can happen without conscious intervention, according to the contours of the notes, the natural physical response or body schemata of the pianist, and in response to his musical goals.

Many factors in this kind of musical gesture are individual and variable: there exists no single definitive mapping between musical texture and specific gestures. Pianists play in many different ways, whether those differences are obvious or subtle, visible or invisible. However, certain principles remain true for everybody and for every possible embodiment, and observations can be made about the hierarchical structure of gesture that suggest structural thinking for performers primarily originates in embodied experience as an *understanding* in reaction to the score rather than a cerebral *interpretation* of the score. It is also true that while passages may be played with many different kinds of gesture, not all gestures fit every passage (Cervino 2013). Roughly speaking, the more difficult the passage is, the fewer the options for embodiment. For example, in the case of the Chopin Etudes, examples of which are used in this chapter, the pianistic demands of the music in many of the Etudes seem to create a narrower range of possible sound-producing gestures for successful performance, and while those may vary somewhat from one player to another, or between different performances of the same performer on different pianos, the hierarchical topology of how the music is embodied remains similar.

12.2 Coarticulation and Musical Structure

As we have seen in the examples above, sound-producing gestures in piano playing are nested in a hierarchy whereby smaller gestures are subsumed into larger gestures that operate on a distinct timescale (Leman 2010). This phenomenon is universal, even though pianists use it differently – more or less consciously and with a varying number of layers. I use the word "coarticulation" to refer to this phenomenon, a word appropriated from speech pathology[41] by Godøy who is a leading figure in the study of musical gesture from the perspective of empirical musicology (Godøy 2011b). Coarticulation is the hierarchical nesting of gesture and the coalescing of one unit of gesture with its neighbour to form an overarching unity or continuity. The units of gesture that fuse together maintain their sense of wholeness or segmentation enough that they are still recognisably delineated but coalesce together enough that they form a new unity on a higher order of timescale. For hierarchical structure to be present, the segmentation and continuity must be sufficiently balanced, since too much segmentation can lead to a breaking of the overarching unity, and too much coalescence would melt individual segments together to the point that they are no longer articulated.

The nesting of the gestures is made possible by the hierarchical musculoskeletal structure of the body, whereby one spine branches into two arms and then into ten fingers, and by the articulation of joints which allow, for example, the hand to go down while the arm goes up (§9.3). The similarity of musculoskeletal structure between different individual pianists belies the incredible variety of coordination that can be observed. The hierarchical nesting of gestures is both naturally occurring (in response to the music played as part of a pianist's training) and can be learned through demonstration or explicit instruction from a teacher, or by conscious self-examination.

[41] Sources from linguistics (speech pathology) and movement sciences, see for example Rosenbaum 1991, Hardcastle and Hewlett 1999.

The structural affordances of written music, found in meter, line and harmony are hierarchical in nature. In the first place, rhythmically speaking, note values nest into each other and beats are grouped into meters and measures are grouped into subsections and sections. Just as important, the structure of the pitches themselves suggests hierarchical structures that can be exposed through analysis. One such helpful method of analysis is Schenker analysis, which attempts to expose the fundamental background harmonic movement in musical structure, movement that occurs on a relatively larger timescale, and the middleground and foreground layers which will fill up this larger timescale (see for example Cadwallader & Gagne 2006). Similarly, an analysis of phrases and sections in the music often results in such a hierarchical structure:

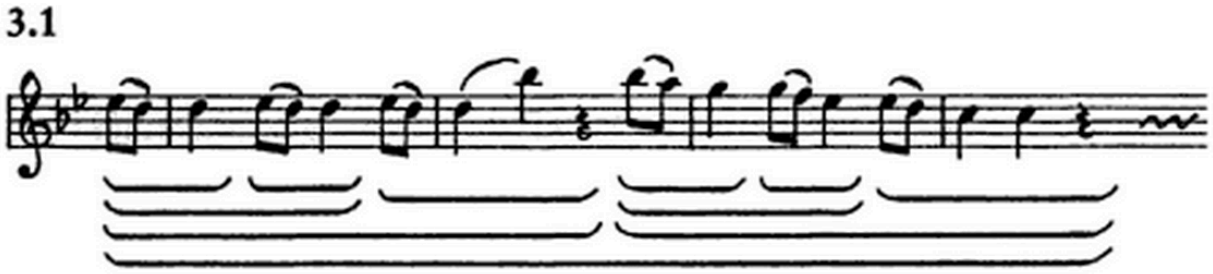


Figure 12.1: Hierarchy of phrase structure (Jackendoff & Lehrdal 1983: 37)

Or when time-span reduction is used it can result in a tree structure:

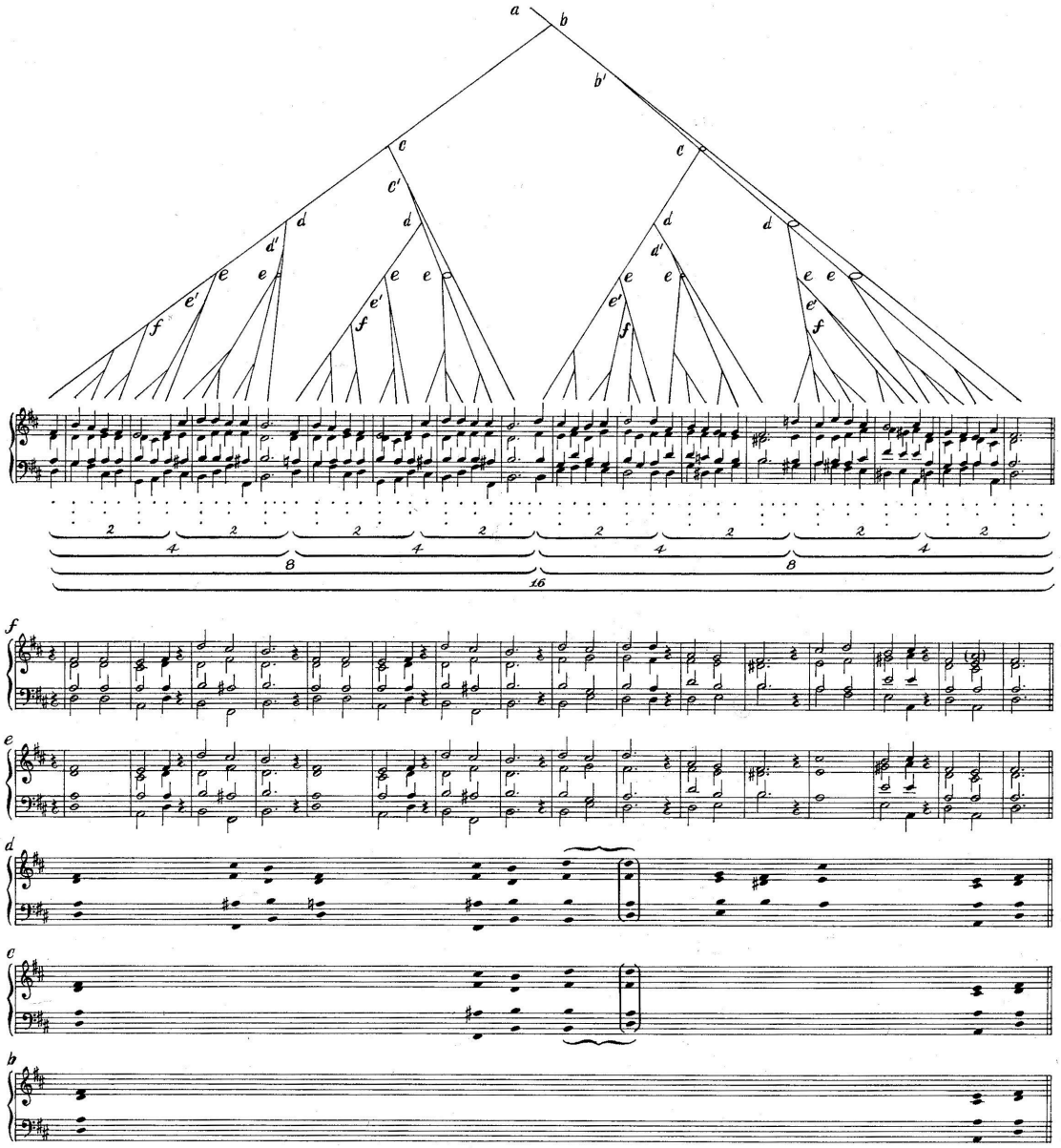


Figure 12.2: Time-span tree structure (Jackendoff & Lehrdal 1983: 144)

While certain groupings in the score might seem to be obvious, the actual segmentation of musical structure is far from clear. In such a simple passage as the opening theme of Mozart's A major Sonata K. 331, analysts already disagree about the grouping structure. Music theorist Lawrence Zbikowski explains this difference in terms

of kinds of hierarchical structures: chains-of-being hierarchies and atomic hierarchies. These two kinds of hierarchical structures vary in their basic criteria for what constitutes information from the score that is relevant to the analysis, the main difference being that some analysts use predominantly rhythm and others use predominantly pitch. "Chain-of-being hierarchies have been mapped almost exclusively onto the domain of pitch - they have generally not been mapped onto the domain of musical meter. Atomistic hierarchies, on the other hand, have been most often mapped onto the domain of musical meter - mapping them onto the domain of pitch has not been met with wide acceptance" (Zbikowski 2002: 322). One can conclude that since the analytical strategy employed determines what structure is found in the score, that the score itself does not contain one fixed structure but rather a series of possible structures, which can be called *structural affordances*.

A performance of a work inevitably communicates an understanding of structure. How we arrive at this understanding as performers, and how we can hear this structure as listeners depends in the first place on the embodied structure of how we *feel* the music - in other words the structure of gesture. Such theoretical analyses as those presented by Zbikowski (based on chain-of-being hierarchies and atomistic hierarchies) are of great interest. They can contribute to or affect the structure of how we conceptualise the music, and though we can choose to employ them in what has been called "analytically informed performance" (Cook 2014), they are not strictly *necessary* for musical interpretation, nor are they the beginning point for performers approaching a new piece of music. One can think, for example, of many child prodigies who play wonderful Mozart with little of the conceptual apparatus or interpretive tools of a music theorist. Despite their conceptual innocence, their playing can be described as structured in a way that a MIDI playback would not be, and this occurs, I will show, as a result of the structure of

gesture, weak and strong accentuation, prefix and suffix gestures and most importantly the hierarchical nesting of such shapes through coarticulation. I have argued that musical notation must be not only *interpreted*, but *understood* and how this embodied understanding is dependent upon embodied knowledge of music and the instrument, a knowledge which in turn varies between individual pianists but is somewhat more similar within various "schools" of piano playing (§10.2). Now I will argue that this understanding is hierarchically structured, and how and to what degree it is structured depends to a great extent on the embodied knowledge of coarticulation.

Through examining some background sources and some discussion of issues and examples from the Chopin Etudes, I will suggest how the structure of gesture, made possible by the structure and coordination of the body, maps to the structural affordances of the music in a performance. I will propose that the two structures are co-creative in performance - that the embodied knowledge, habits or traditions of the performer affect what he will see in the score, and that the score in turn will suggest or evoke certain patterns of movement.

In the previous part (§9-11) I have argued that there are varying degrees to which the musical structure and gestural structure as extensionally enacted in performance overlap - that certain structures communicated through sound in an interpretation may or may not be felt physically as actual sound-producing gestures. I have argued that the more the musical structures imagined by the musical mind are physically felt in sound-producing gestures, the more immediate, convincing and stable the final musical result. Furthermore, I have conceptualised this imbrication of gesture - the "expression of expression" in Adorno-speak (Mazzola 2010) - in terms of distance between the the inner traces, conscious and unconscious, of embodied experiences of gesture and its actual physical enactment at the moment of performance (§9.6, §10.3). As I examine the hierarchical

structure of gesture in this chapter, it should become clear that the mapping of gesture to the musical notation, different to every performer, is itself a kind of performing analysis of the music and forms an essential part of an individual interpretation. The structures of gesture explained in this chapter are a normal and familiar part of playing, and once the language and conceptual scaffolding which allows the discussion of these structures is sufficiently developed, I will show how these structures of gesture function in the embodied experience of polyphonic expression in Part IV.

One of the purposes of this chapter is to examine the different levels of coarticulation in the body in relation to the musical score and to name them and notate them in the simplest way possible. The other goal is to argue that the employment of these hierarchically nested gestures benefits from conscious analysis and has a marked influence on the musical outcome of a performance. Through the research process of learning, performing and teaching the Chopin Etudes (described below) I was able to increase my awareness and conscious control of both my sound-producing and concurrent gestures and their inner or imaginative representations. Though the insight I gained through this process goes both far beyond the scope of this chapter and far beyond what I can put into words, I will use this experience to give a very introductory description of coarticulation.

13 Background

Godøy writes, "Needless to say, we are presently only beginning to understand coarticulation in music" (Godøy 2011b: 79). In fact authors such as Godøy in the field of empirical musicology were not the first to notice the phenomenon, which has been actively studied by pianists themselves since the advent of the instrument, and they are also not the first to write about it. The methods and terminology of such practitioner literature is different, and in evaluating (for example) piano exercises, one needs to understand pianistically if and how coarticulation is suggested by the notes. Relating the insights from empirical musicology to practitioner literature and musical scores is a function that can only properly be done by a performer-researcher. In the words of pianist-musicologist Mine Doğantan-Dack: "In this endeavor, the onus is on performers to break the mould surrounding their notorious image as inarticulate doers, and bring to light what is involved in physically making music and what this entails for musicology." (Doğantan-Dack 2011: 260) As a performer and researcher, I am in the position to examine all kinds of sources ranging from academic writing to recorded sound, from editions of works to masterclasses. My background as a performer and teacher helps me to evaluate sources that that can be understood through this expertise - for example understanding how fingerings represent coarticulation requires the ability to try out the fingerings to discover the bodily meaning that they encode. Similarly, a masterclass or instructional video may have just as much or more meaning related to coarticulation in the *body language of the presenter* and in his or her demonstrations on the instrument than in his quotable verbal discourse. Understanding these "hidden" meanings is a big part of conducting research in the topic, just as important as finally expressing these issues in a research format, which opens them up to further debate and research. Coarticulation is in fact a very basic element of the technique of playing, which when it is mastered seems quite obvious. Explaining it, particularly the

choices that are involved in its employment, is difficult, which is probably why the many sources I examined, while relevant, do not capture the phenomenon in clarity sufficient for my present purpose, which is to provide the basis for examining expressive divergence in polyphony as an embodied phenomenon.

Thus the first stream of sources I will examine comes from the discipline of empirical musicology, where the word "coarticulation" is often used (Godøy 2011b, Jerde 2006, Jabusch 2006). A parallel stream of sources comes from pianists themselves, who use an entirely different vocabulary and seldom use the problematic word "gesture" at all, and certainly never the word "coarticulation." Since coarticulation (the phenomenon, not the word) is everywhere to be found in practitioner literature, practice techniques and exercises, I will examine only a representative selection of sources: one from empirical musicology, one book by a pianist, and one video of instructional material about piano playing. All these sources contribute important ideas relating the hierarchical nature of corporeal experience with music and they represent a solid departure point for Part III.

13.1 Empirical musicology

Coarticulation is a recurring theme in the recent writings about musical gesture by Godøy, who uses empirical methods to measure it (Godøy 2003, 2006, 2008, 2011b, Godøy & Leman 2010, Godøy & Jorgensen 2001). A recent article entitled "Coarticulated gestural-sonic objects in music" provides a good summary of his research on the phenomenon. An opening passage gives his definition both of gestural-sonic objects and how they are strengthened by coarticulation:

> In our research on musical gestures, we talk of gestural-sonic objects in the sense of units based on the convergence of sound and movement into holistically perceived chunks. One of the main criteria for perceiving these gestural-sonic objects as coherent chunks is that they exhibit superordinate trajectory shapes of motion and sound, and that elements or 'atoms' of sound and movement that occur sequentially

> in the course of any chunk are subsumed under such superordinate trajectory shapes. This phenomenon of subsumption of atoms of sound and movement is known in linguistics and in movement sciences by the term coarticulation. Since we believe we may observe similar subsumptions in music-related gestures and sounds, I shall […] speak of coarticulated *gestural-sonic objects* in music. (Godøy 2011b: 67)

He places these gestural-sonic objects on a timescale of approximately 0.5 to 5 seconds, and positions them on what he calls the meso- level of musical structure between the micro- level of individual notes and the macro- level of larger sections.

Godøy makes the distinction between "top-down" and "bottom-up" approaches to segmentation in listening, the first being conditioned primarily by endogenous factors and the second primarily by exogenous clues.[42] Notably, his discussion involves the listener; the performance is objectified into an auditory stream, in which exogenous clues are supplemented with endogenous processes to parse the music into coherent chunks. In fact, the performer makes sense of the music in a similar way, and in the first place this is worked out kinaesthetically or cenaesthetically[43] with the structure of the body and its possibilities for movement providing scaffolding for the structure of hierarchically nested chunks (Godøy 2011b: 68-69).

Using a third-person perspective, Godøy analyzes the motion-sensor data from one pianist. His example of motion-sensor data presents a series of triplets, which are chosen to demonstrate a certain point: the contour of notes in a continuous up-and-down pattern allows results in a predictable up-down movement in gesture, which is recorded by

[42] Endogenous factors are musical qualities that come from within and are used to understand the music – they are imposed on the music in a sort of hypothetical way to try to make sense of the music. Exogenous clues are the actual sounds that suggest a parsing of the music that can lead from the level of detail to the level of generalization.

[43] Marc Leman makes an interesting distinction between the *synaesthetic* transformation of music, whereby properties such as space or distance are perceived, the *kinaesthetic* transformation in which music is felt as a bodily experience, and the *cenaesthetic* transformation in which such bodily experiences have a conscious and conceptual awareness able to be expressed in language. The bridge between body and conceptual mind that the word *cenaesthetic* implies correctly describes the phase of mastery whereby a pianist becomes conscious or self-conscious of a physical experience and thereby can learn to control it or to let it flow (Leman 2010 p. 128).

the motion sensors. While the contour of notes represents an important component in technical gesture, music does not always fall in regularly rising and falling triplets, and in most cases there are various options of how to structure the coarticulation – options which meaningfully affect the interpretive result. The one-to-one mapping implied by Godøy is then a result of the choice of passage and of using only one pianist - asking several pianists to play a passage, or even asking one pianist to play it several times might result in different patterns of movement. Clearly one can ask a pianist to play the same passage with a different movement, or more subtly, to play the passage with a different expression, which might in turn affect the movement employed. For example in the Hanon example that opened this chapter, coarticulation was applied in a way that emphasised the possibilities of rhythm and meter, as opposed to following the contour of the notes.

Regardless, even though Godøy is only analysing one instance of one pianist's performance of one passage, his empirical approach lays out interesting and useful concepts. While the technological setup involved is innovative, Godøy in this article does not include first and second person perspectives, which are necessary for the gestural analysis to have musical or expressive meaning. For example, the question whether the pianist's first person account of how he is playing match the empirical data, and if not, where it deviates is not addressed.

Gestural expression is immediately meaningful from the first person perspective and concept of first person authority (Finkelstein 2003) might suggest that, for example, if I am smiling, the best person to ask for an explanation of that smile is me, since the smile is expressive of an inner experience which I can elaborate upon either with words or with re-enactment. Next best would be the second person perspective, since the emotion behind the smile is expressed in a bodily way and can be readily understood by another person without the need to weigh evidence or interpret at a conceptual level. "We

see emotion. — As opposed to what? — We do not see facial contortions and make inferences from then (like a doctor framing a diagnosis) to joy, grief, boredom." (Wittgenstein, quoted in Altieri 2015: 11). This contrasts the approach of empirical musicology, which generally would start with empirically measuring the actual movements and durations that make up the smile - an exercise that would lead to insight into the muscles that cause a smile, but little insight into the meaning, reason for, or feeling of the smile or the communication that the smile might represent. Such a separation represents a divide between body movement and the psychological. First person authority in describing gesture is contingent upon that gesture being conscious (or being made conscious through reflection). Despite considerable expertise and a research process that aims to make body movement conscious, it is possible that performer-researchers such as myself might learn something about our own body movement from an empirical study in this vein, in a similar way that we can learn from watching a video of our own performance, but the main contribution of empirical musicology to the present research is the language and concepts which can be appropriated.

13.2 Practitioner literature

As I have mentioned in the introduction to this dissertation, practitioner literature has the advantage that while it is not based on empirical evidence, it is based on a lifetime of experiences and observations rather than just one performance in one moment in a empirical musicology laboratory. Abby Whiteside's two books, *The Indispensables of Piano Playing* and *Mastering the Chopin Etudes* (Whiteside 1997 [1955]) present her insights into using the whole body for musical expression, and how this can be achieved in teaching. The first book describes her views on music and the body and the second applies those ideas to the Chopin Etudes. In the informal and non-academic language one might

expect from a childhood piano teacher, she describes the phenomenon of coarticulation in such a way as to make it very accessible for pianists. While she never uses the word "coarticulation," the application of her ideas at the piano shows them to be concerned with developing and bringing into awareness such hierarchical layering of gesture.

From the beginning of *Indispensables*, Whiteside describes an organisation of coordination from a top-down perspective that is originating from the centre and traveling out through the periphery of the physical playing mechanism to the keys. The overall coordination, always including the whole body, is established by the sense of *basic rhythm* or *emotional rhythm*. What she is referring to is the sense of overarching gesture, on a larger timescale than the individual notes, and also on a larger timescale than the tactus or even what Godøy describes as gestural-sonic object, but rather the sweeping gesture that follows a whole phrase without hesitation to its conclusion, originating from the seat of the chair and reverberating through to the fingertips.

Already with this opening proposition, there are some similarities and differences between Whiteside and Godøy. In the first place, when describing segmentation, Godøy distinguishes between endogenous and exogenous approaches, a distinction which is paralleled by Whiteside with her conception of top-down or bottom-up conception of rhythm. While it is true that they are looking at different sides of the musical experience (production and listening) ample evidence from the last decade of research points to an entrainment between musician and listener, a pre-reflective inter-corporeality which would suggest that the same gestural understanding of the music occurs in both domains (Godøy 2011b, Leman 2010, Dahl & Bevilacqua 2010). In what Whiteside calls *note-wise playing*, a kind of playing she finds mechanical and undesirable, the sense of rhythm comes from the bottom up, starting with exogenous clues in the score or what Godøy would call the *micro*-level of musical detail. This note-wise playing lacks what she calls an *emotional rhythm*

which she describes as a bodily experience that comes from within and is a pre-condition for coordination and understanding of any individual piece. In her view, the first priority in approaching music should be to establish this endogenous sense of rhythm, which can then provide a basis for coordination of details on a smaller timescale. She is thus arguing for a top-down approach to the music. Similarly, Godøy proposes to "turn our understanding here upside down, meaning that we really ought to regard coarticulated chunks as primordial to their atom events" (Godøy 2011b).

One difference, however, is the focus between *meso-* and *macro-* levels: Godøy regards the gesture (in the form of gestural sonic objects) as originating at the *meso-* level whereas Whiteside clearly finds the primordial gesture at the *macro-* level of the music. This is an important difference, since it is echoed across the field of music gesture research. In empirical musicology, gesture is almost always afforded a timescale of between 0.5 and 5 seconds, based on research in the psychobiology of rhythm (Trevarthen 2011). Movements of the upper body are perceived as "extra" or "unnecessary" (Jerde 2006, Jabusch 2006). However, according to Whiteside (and I venture to guess that most professional musicians would agree) these concurrent gestures on higher timescales are primordial to the gestures of the smaller levers of the playing mechanism[44] which in turn deliver the impulse to the key through the fingertips. Rather than being extra, they are essential to music making.

Noteworthy is Whiteside's repeated use of the word "emotional rhythm." Since emotional changes are physiological changes, measurable externally, which then become conscious as feelings, it follows that these physiological changes also occur on a certain timescale during the experience of music (Damasio 1999). Certainly, they can occur at

[44] As unfortunate as the mechanical metaphor is, viewing the body once again as an object, the words "lever" and "playing mechanism" used by Whiteside (1997) to refer to the individual body part or the body as a whole remain the easiest and clearest terms, and I will use them throughout the remainder of the dissertation.

what Godøy calls the *macro-* level, though Godøy's *macro-* level represents such a broad range of timescales (from sections to movements to whole compositions) that it might bear further subdivision. The gradual visceral experience of emotional change, to read between the lines and supplement Whiteside's text, occurs on a timescale higher than the flow of gesture from the torso that follows a musical phrase, but nevertheless this flow of gesture is inextricably linked to emotion in the sense that the quality of movement communicates vitality affects.

The structuring of gesture in Whiteside's method is a process that places the "goal notes" or important structural arrivals first, after which the remaining notes are gradually added. This initial abstraction she calls an "outline." Instead of playing the notes as written, then, the pianist would start practicing by playing, for example, the downbeats to get a sense of the overarching pulse, after which he might fill in the half notes, quarter notes eighth notes and then finally the whole texture in subsequent readings. Thus he starts from the top down – the endogenous feeling of basic rhythm is used to determine the highest level of textural abstraction, and then this overarching rhythm is maintained as lower levels are "tucked in" using smaller levers. In each step towards fulfilment of the whole texture, the continuity of gesture is maintained on the preceding levels so that when the texture is finally complete, the overarching pulse represented by actual physical movement remains intact (Whiteside 1997). Whiteside's method thus allows for a working out of several hierarchically removed levels of musical gesture by starting from the top down. The choice of the goal notes is perhaps deliberate and reflects an interpretive judgment on the part of the performer in the beginning, but as this method is practiced in several musical examples, the embodied hierarchical structure of gesture becomes a part of the body schemata of the pianist, and is thus available for pre-reflective activation in subsequent musical examples. As the feeling for basic rhythm is mastered, it is this

endogenous rhythmic experience itself that makes sense of the score - an embodied understanding rather than an interpretive judgment. This serves as a model for how conceptual or conscious strategies can act as guides for embodied knowledge, much like training wheels on a bicycle, only to be discarded once the embodied knowledge is mastered.

Godøy similarly writes of targets *on the instrument* and targets *at certain points in time*. He finds "goal postures, or keyframes, in time, and we find these typically at accented points, that is at downbeats (in metrically clear music) or other accent points (both in non-metrical and metrical music, in the latter case with accents that contradict the usual metrical accents), or at salient points in melodic contours." (Godøy 2011b: 75). While it is clear that Godøy is describing the same phenomenon as Whiteside's "goal notes," he does not express the multi-level complexity of Whiteside's hierarchical understanding of the musical phrase, which is scalable for each piece of music and for each individual interpretation. While Godøy writes of targets and their intervening materials (prefixes and suffixes), Whiteside's process leads to a cenaesthetic experience of the musical structure in which goal notes can be nested within each other in an infinite variety of hierarchical levels. Thus, Godøy's thought process aims to pinpoint a certain structure in musical gesture, while Whiteside's opens up a method of musical goal-oriented thinking-through-gesture.

It is to Whiteside's credit that she begins with a sense of the basic rhythm, which can then be used to figure out the highest level of structure in the musical score. The basic rhythm is the first impulse, which then meets the score and adapts the score (by the outlining process) in order to negotiate an understanding. In creating an outline, from the beginning the pianist is engaged with a musical decision-making process that is best described not as merely conceptual or merely kinaesthetic but rather as cenaesthetic. Thus,

the body and its sense of rhythm is the starting point for music and this impulse is then used to create musical structure through the structural affordances of the score.

Another more recent example of research in piano technique has come from piano pedagogue Dorothy Taubman (Golandsky 2003). This approach, known as the Taubman Technique, is widely influential in the United States and is gaining popularity worldwide. Pianist Therese Milanovic (2014) has published the first full-length academic study (her doctoral dissertation) on the Taubman techniques using an auto-ethnographic method for documenting her experience in learning them. Dorothy Taubman herself started to write a book about her approach to piano playing but never finished it. After attempting to write about her approach she realized that it was best communicated through teaching or through masterclasses because of the necessity of demonstration and feedback in order to avoid misunderstanding. As a result, the main presentation of her method is a series of videos in the format of ten DVDs (including lectures supplemented by masterclasses and demonstrations) presented by Edna Golandsky, her leading assistant teacher. In the videos Taubman herself comments on certain issues that are discussed and demonstrated in the lectures. The videos are exemplary in their clarity of presentation and demonstration, and Taubman's work is insightful and enormously useful. I used the ideas in learning some particular passages at the time I immersed myself in the videos, and surely the embodied knowledge that I thus incorporated remains in my repertoire of movements at the keyboard. However, there is one drawback to this approach that I will try to explain.

In contrast to Whiteside, who begins with the inner feeling of rhythm in relation to the structure of the music, a feeling which is from the beginning musical, the Taubman technique starts with a conception of technique that is ergonomic, efficient and mechanically oriented. The coordination necessary for virtuoso piano playing is developed by Taubman in the form of some basic principles of movement that when mastered can be

applied to the music. (An example of one such principle is that double notes are always rotated towards the thumb.) According to Taubman, when the correct techniques are established, they can be applied to any musical passage and in a separate process the imagination will furnish the variety of sound and expression needed for a musical performance. This is indeed a fundamental difference between Whiteside and Taubman, since with Whiteside the expression of the music, the technique, the understanding of structure, and the beauty of a perfectly shaped phrase are all simultaneous and co-creative, resulting from the way that sound-producing gestures are structured in the body which is, then, the fundamental first step of interpretation of the score. The gestures themselves are expressed in the sound, and the musical imagination is just as much in the body as in the mind.

The idea that the sound-producing gesture, or technique, is separate from the musicianship or imagination of sound reflects - again - the Cartesian divide. In terms of the process of piano playing under this paradigm, the process of imagination occurs first, after which the imagined ideas are executed by a body that simply obeys. Any discrepancy between the imagined sound and the sounding result is considered to be a technical flaw - a flaw of execution that can be remedied by technical development. Under this paradigm, the Taubman method offers an exemplary solution in a school of technique that is universally applicable in the piano repertoire since any piece can be played using the Taubman technique.

However, as I have argued before, I hold that the mind and body are not so perfectly and ideally separate - the technical means of execution affect not only the sounding result but also the imagined musical conception. With this understanding, there is a fundamental distinction to be made between Whiteside's approach, where interpretation, execution, the imagination and the body are all engaged simultaneously,

and Taubman's approach, where musical imagination is separate from technique, which in turn is described as a set of specific movements or principles of movement which can be applied universally to any music.

In terms of coarticulation, there are also major differences in the results of the Taubman and Whiteside methods. In the Taubman technique, forearm rotation is considered to be as fast as the fingers (Golandsky 2003, vol. 1). This is one of Taubman technique's main features, inspired in turn by Matthay (1912), and indeed the ubiquitous use of forearm rotation makes it possible to play very loud and very fast for a long time without getting tired. For those with focal dystonia, this can provide a way of articulating the notes using the arm and fingers as one unit. Thus, the possibilities of the fingers and the possibilities of forearm rotation are collapsed to one hierarchical level. With the Taubman technique, moving the fingers independently of rotation is counter-indicated, which when followed strictly would remove the possibility to nest individual finger movements on one timescale within overarching forearm rotations on a higher timescale – they move together as a unit.

While this actually works for "getting out the notes" (forearm rotation does work very fast and can be used consistently), what troubles me is the collapse in the number of hierarchical levels in the playing mechanism. Similarly, Golandsky repeatedly asserts that the forearm, wrist and hand should be used as one unit, which suggests a limitation in the freedom of movement of the wrist itself. If the body were indeed just as much a locus of musical imagination as the mind, then simplifying the physiological function of the body in such ways would also simplify this particular sort of musical imagination. Not only this, but the principles of the Taubman technique, no matter how efficient and brilliant, seem to reduce the vocabulary of gesture, rather than encouraging exploration of each passage to choose between options of how it physically could be realised. It becomes a replacement

for physical creativity, a formula to follow when playing music. It follows that the musical results, no matter how ergonomic or reliable, may be impoverished.

So far, I have taken a brief look at one source from the field of empirical musicology, one book by a pianist and one video presentation of a famous piano method. However, one of the richest sources of information about coarticulation comes not from verbal description, but from musical notation, exercises and of course from direct observation of performance. Later in this Part (§15) I will show how the Chopin Etudes and the editions, fingerings and exercises that they have engendered constitute just such a repository of knowledge.

13.3 Other approaches

Many books and techniques have directly or indirectly attempted to furnish processes for understanding the hierarchical structure of music with embodiment. These sources generally fall into two categories, the first of which includes the pedagogical practice of alternative embodiments of music away from the instrument (in order to understand the music better) while the second includes techniques relating to the actual embodiment of sound-producing and concurrent gestures at the instrument. In first category there are many techniques designed for the education of young musicians. The rhythmic gymnastics of Emile Jaques-Dalcroze, known as Dalcroze Eurhythmics, for example, teach rhythm through movement. The feeling of meter structure - of stressed and unstressed beats - is vividly explored through games and activities that internalise this hierarchical attribute of rhythm (Jaques-Dalcroze 2007). More recently, music theorist Alexandra Pierce (2007) has developed a kind of embodiment based on a theoretical analysis of scores. A consideration of breath-support in singing leads to the first example in the second category, an example in which Doğantan-Dack (2011) relates a specific

pianistic kinaesthetic experience with breath-support by analogy. In this section I will begin by examining these methods and then comparing them to the practitioner literature in the previous section.

Pierce presents a practice in the embodiment of music that takes the performer away from the instrument and aims to find ways to embody different elements of the music - melody, meter, structure - in a particular kind of gesture. She proposes simple gestures that can be used to physically feel elements of the music in the hope of increasing the "vitality" of the music in performance (Pierce 2007). Her focus can be characterised as an embodiment of analysis, rather than analysis of music through embodiment, a crucial distinction. Using the temporal classification of gesture presented earlier (imagination, playing and listening perspectives §9.6), Pierce's method seems to be squarely oriented in the imagination perspective. According to her method, once the student has physically felt the gesture in relation to the musical example, the gestural understanding thereby gained will translate by a process of transfer into a better sounding result at the moment of playing. No overlap is proposed, in the sense that the gestures in Pierce's method are not physically realised during performance (playing perspective). However, it should be noted that the actual doing of such physical gestures entails its own three-fold temporal-gestural perspectives. The imagination of the movements she proposes from an armchair perspective is enriched by their execution in movement, and the proprioceptive experience of this execution (representing a sort of kinaesthetic listening perspective) with its tight imbrication to the imagination perspective allows for a progressively more vivid imaginative kinaesthetic experience as the gestures are repeated. In other words, on the level of conscious thought, one can make an incredibly detailed mental account of the gesture, but the "transparent body" (§6.1) and its schemata is anyway given in this cerebral activity. In order to actually develop the body schemata that might underlie new

or more developed cerebral activity, the gestures must be enacted with actual body movement, allowing for this imbrication of temporal perspectives. When I do this gesture and then remember it consciously afterwards, my conscious representation is enriched by an associated unconscious under-layer of perceptual or kinaesthetic memory. Pierce's strategies are vulnerable to criticism in the face of a purely cerebral or armchair analysis, since their meaning lies in the actual body movement of their performance, without which her system of movements can seem pointless.[45]

Other such experiences aim to enrich the imagination perspective of gesture by establishing embodied knowledges or body schemata through the actual performance of extra-pianistic gestures. Asking a student to actually sing a line can help them to shape the line in with a more cantabile sound in their playing. The actual singing activates the muscles and kinaesthetic experiences involved in singing such as the breath support, the tension of sustaining the phrase, the shaping with the voice, and the timing over large intervals. In my pedagogical experience, actually singing and merely imagining singing lead to noticeably different results. If I ask a student to imagine singing, they will call forth a mental picture of how it feels to sing, and optimistically that conscious mental representation might already be already well connected to a perceptual, unconscious memory of how it feels to sing. However, if they actually sing *that specific phrase*, the distance between the bodily experience and it's expression in musical details is much closer, and the expression is therefore much more immediate (§10.3). For that reason, it is an almost universal practice for a teacher to require pianists to actually sing the vocal line in a Lied accompaniment class (a practice that has withstood the almost unanimous opposition of the students, who feel self-conscious about solo-singing in front of their colleagues). In learning to accompany congregational singing, organists also sing along,

[45] This vulnerability is present in my own research in Part IV, since without the *actual experience* of playing the examples, the embodied experiences and meanings of polyphonic expression disappear.

knowing that the timing of how the tactus is felt is influenced by the kinaesthetic experience of singing. While this becomes a familiar bodily experience, and can be called forth or imagined in rich perceptual detail after actually doing it a few times, it remains true that actually doing it makes the experience more vital and immediate, and even experienced church organists might still sing through or hum along with hymns in preparation for or during the actual church service. Singing involves patterns of tension in the body - breath support, sustain of tone - tensions which influence the feeling of musical tension.

If imagining singing (or actually singing) while playing can help the pianist to communicate a sense of cantabile, Doğantan-Dack (2011) takes one more step in relating the embodied experiences of singing with the sound-producing and concurrent gestures of playing. She draws an analogy between the patterns of tension across the hand of a pianist - which she calls the "singing hand" - and breath support. While Pierce's work contributes to the imaginary perspective of gesture, Doğantan-Dack shows the overlap between the imaginary and playing perspectives - that the bodily experience of tension in breath support is actually felt during performance and not just imagined. Instead of being felt wherever in the body one feels breath support when singing, it is felt in the activity of tension or readiness on the inner surface of the hand, a tension that can sustain a phrase pianistically in a manner parallel to how a singer sustains phrases with breath support. The "singing hand" that Doğantan-Dack describes fits into a category of experiences that I will present later (§15) as "coalescence of the hand."

While I do share the enthusiasm for embodiment that Pierce displays in her research, I have some reservations about her choice of approach parallel to the reservations I have about the Taubman technique. Both begin with specific gestures presented *outside of a musical context*. After these gestures are mastered, they are then

superimposed onto musical examples. In the case of Pierce, the gesturing *follows* a sort of theoretical analysis, an analysis sharing many attributes of a Schenker analysis. The order matters! The conscious apparatus of theoretical understanding is called forth first, and then gestures that are prescribed to match different elements of the music are added. It is therefore an embodiment of a conscious analysis, rather than an analysis by embodiment (which would occur somewhat less consciously, and therefore call forth a much richer palette of associations and experiences.) Pierce's method represents this use of consciously pre-decided gestures which are applied to elements in the music, instead of beginning with the musical example in question and letting it inspire its own gestural realisation in a more intuitive and musically responsive way. Parallel to the reification of gesture that happens in the process of notation, the fixation on particular gestures as a method for embodiment leads to a sort of freezing of gestures whereby they are no longer freely responsive or subjective, but rather a formula dutifully to be followed. As Adorno writes: "By the visual fixation, where the musical gesture is positioned into a simultaneous relation to its equals, it ceases to be a gesture, it becomes an object, a mental thing" (Quoted in Mazzola 2010: 120). In the execution of these predetermined gestures, one encounters the "opaque body," (§6.1) and although this is a phase that can be practiced through until the following phase, when gestures become so ingrained that they no longer require this conscious fixation, it is perhaps unlikely that a student will actually reach such a level, since it is a practice away from the instrument and thus outside of the normal practice routine.

In a certain way, Whiteside also begins with a generalisation of gesture. She writes about "basic rhythm" and "emotional rhythm" as the starting point for approaching a piece, which is a sort of general embodiment pattern of rhythm. However, it is not specific gestures in the sense of "move your arm in a graceful arc in front of you" as Pierce might propose or "use double or single rotation" as Taubman might propose. It is more a

general call to feel the embodiment of rhythm, which is undefined enough to be realised differently for different musical examples. After all, rhythm can be felt anywhere in the body with any sort of repeating gesture. In this way it is responsive to the music in an intuitive way, since the structure of the music can be represented as mapping to the structure of the body.

It could be said that singing and dancing also represent specific gestures that occur in specific parts of the body, and therefore my reservations about the Taubman technique or about Pierce's gestures might also apply to singing. However, singing is not specifically shaped like one of Pierce's gestures and thus it is very responsive to aspects of the musical texture, such as the general emotional character and the particular contour of the notes. Dancing also retains the specific quality of movement - the specific quality of the *type* of dance, and within that the specific quality of the particular *example* in question, and the particular *individual gesture* within that particular example. Thus it remains responsive and open to the musical texture without imposing a fixed, conscious movement - the kind of fixation that, echoing Wittgenstein, we might call "the grammar that tries to force itself on us" (Wittgenstein 2009: §304).

14 Musical structure and embodiment in performance

Musical structure exists in the analysis of a piece, not in the score itself. The score on the other hand has structural affordances, which are features that allow a certain range of structural analyses (Cook 2014). An analysis is constructed from materials such as concepts, historical and stylistic understandings, comparative insights and analytic traditions, which are then fitted onto the piece according to the chosen criteria for analysis. For example, as mentioned in §12.2, whether an analyst is looking primarily at pitch or at rhythm will influence the grouping structure of the music (Zbikowski 2002: 322). A theorist does not approach the score empty-handed but rather comes with both an agenda for what he wants to accomplish and knowledge and techniques to achieve that end. The composition is fitted into the analytical approach.

Insofar as performances represent the realisation of one of the possible structures of a piece, performances represent a kind of analysis. Besides the format of the outcome, the main difference lies in approach - that performers begin by playing, and analysts begin with concepts - and the fact that the understanding of performers is thus more heavily dependent on embodied experience. While the experience of playing provides the normative context for performance analysis, musicologist John Rink (2002) describes a method of realising a performance analysis away from the instrument. Pointing out that there should be no one-to-one correspondence between analytical findings and expressive details, he explains the difference between "rigorous analysis" and "performance analysis." Some methods that he recommends as examples of performance analysis (in preparation for a performance, that is) are to graph the dynamics, graph the tempo, and draw the contours of the melody. Interesting to note is Rink's use of gesture in performative analysis. The act of actually drawing out tempo, melodic or dynamic contour on paper is itself a gesture and the resulting graph can be read as either a diachronic

process or a synchronic whole (Rink 2002). Indeed, in an earlier article, Rink writes that performance analysis "tends to be more dynamic through its sensitivity to momentum, climax, and ebb and flow, comprising an outline, a general plan, a *set of gestures unfolding in time*" (Rink 1990: 323, emphasis mine). Rink makes the distinction between structure and shape, defining shape as the felt correlate of form. "Performers 'feel' form not necessarily in terms of the structures demonstrated by analysts, but in the sense of musical 'shape' - an elusive but vital concept." (Rink 2004: 44). In writing about this shape, Rink continuously refers to phenomena that are felt with the body - rhythmic vitality, intensity, and momentum.

Structure in the performance of a piece, when felt as gesture, can be communicated directly to the listener by a similar process of understanding, a listener who may or may not have music-analytical conceptual knowledge. The most immediate understanding of structure in a performance, then, is by listening and understanding the felt sense of gesture rather than by measuring, inferring and interpreting. The problem in simply listening is that in order to describe what structure is heard in a performance, the structure must still be conceptualised. This conceptualisation might entail the breakdown into musical details (as Rink's method recommends) and it can easily disturb the fragility of felt experience by the "grammar which seeks to impose itself on us," in this case the conceptual framework of the analytical system, into which the music must fit. However, examining the structure in terms of gesture rather than musical details allows for the subjectivity of those gestures - the affect and quality as well as the direction and amplitude - to remain to a greater degree undisturbed.

To a limited extent the structure of a performance can be extrapolated by empirical analysis of the details of expression, although as mentioned earlier (§10.1) the interaction in perception between different kinds of details (dynamic, articulatory and

temporal) means that isolating one of these kinds of details can lead to misleading results. Music theorist Mitchell Ohriner, for example, has shown that by analysing the timing of phrases (the group-final lengthening in specific) using durational contours he could show the structure of groupings that are expressed in the timing of the interpretations of a Chopin Mazurka. He shows that different pianists seem to express different analyses of the hierarchically nested groupings in the same phrases. In fact, it is not only the segmentation of phrases and sub-phrases that is different among different performers, but also the level of hierarchical structure that is most salient in expression as shown by contours of temporal flexibility and dynamic change. "If performance can alter perceptions of grouping structure and its hierarchy, then it can also alter whatever analytical conclusions can be drawn from grouping structure." (Ohriner 2012)

14.1 Hierarchical structure

Precisely how the hierarchical structural affordances of the music are mapped to the body is an elusive topic, since one cannot argue for a one-to-one mapping, partly because it is the embodiment itself that helps to determine such a structure in performance. Even if the structure were fixed, one could almost never say conclusively that a specific group of, for example, four sixteenth notes should be felt with an overarching gesture of the wrist, or determine the shape or expressive qualities of such an overarching gesture. Such an understanding might appear pre-reflectively in playing of one pianist, but the givenness of this particular pianist's body schemata in such an understanding prevents it from being universal. As soon as one makes such an absolute claim, there will be another pianist that embodies the music in a different way - with a different fingering, or different sound-producing gestures. But it is also true that certain textures afford certain kinds of embodiment - an issue that has been explored by Cervino (2013). Since the way the music

is embodied represents a crucial part of the performance outcome, whose success is evaluated on aesthetic grounds, this embodiment is strongly intertwined with aesthetic feeling, an aesthetic feeling that can in turn be used in critical listening. This is one difference in aesthetic judgments between different traditions or "schools" of piano playing.

It is interesting to consider to what degree the embodiment of musical phrases is a conscious process. Unlike music theorists, who approach music first from a conceptual level of understanding, pianists approach music by playing, which is an embodied experience of making sense of the music. In taking stock of this process, it is tempting to characterise it as cerebral or corporeal, these being represented as two extremes:

1) If the process of embodying the musical structure were a *completely conscious* process, then one could argue that the act of embodying the music *follows* the cerebral interpretation of grouping structure and points of strong and weak emphasis. Thus the pianist would see groupings in the music (by conscious analysis or interpretation) and subsequently embody them with consciously chosen gestures. This would more-or-less coincide with what Nicholas Cook calls "analytically-informed performance" (Cook 2014).

2) If the process of embodying the musical structure were a *completely pre-reflective* process, then one could similarly argue that the grouping structure *follows* the embodiment of the music. In this case, the actual physical act of getting a grip on the notes would provide the basic information that would then coalesce into a fully formed sense of structure. In this case, the embodiment then *precedes* and *conditions* the understanding of structure.

Although one could try to enact either approach, neither describes a normative performance process. Both cases are too extreme - embodiment is clearly not completely conscious and also clearly not completely pre-reflective. Furthermore, and more

importantly, the two extremes epitomise dualistic or Cartesian thinking once again. In the first case, only a music theorist with no pianistic know-how whatsoever (a creature whose existence is doubtful) could possibly claim to the cerebral part of 1, since the "transparent body" (to use Legrand's term, see §6.1) is anyway given in the perception of the score. For the pianist, a) the *kinaesthetic* experience of playing the music, coloured by the givenness of the "transparent body," and b) the *cenaesthetic* experience of body movement, described as the "performative body" (§6.1) provide the normative middle ground. These two intermediate modes of musical thought themselves represent a useful characterisation of the modalities of musical thought, in the first case action-oriented towards the task at hand and in the second case oriented towards expression through body movement (which we have described as "interpreting with the body" §7).

In both a) and b), the conscious mind tends to focus primarily on what is perceived as the most salient level of expression[46] with other hierarchical levels remaining at the periphery of awareness. This judgement of salience can be determined pre-reflectively by a) the kinaesthetic or b) the cenaesthetic feel of the gestural-sonic objects or by an act of conscious interpretation. During the practice process these simultaneous levels of structural hierarchy can be "practised-in" additively, one after another all at once (first 1, then 1 and 2, then 1 and 2 and 3) so that each level receives conscious attention. The sequence of such a process - if it proceeds from the top down or the bottom up - often affects the result. Playing a passage slowly, for example, places the Schenkerian foreground temporarily in the centre of attention as the most salient level of expression, and repetition of this foreground expression forms bodily habits that remain as the piece is sped up and focus is shifted towards longer timescales. Starting with only slow practice leads to excessively numerous or large gestures on lower timescales, which may prevent

[46] The idea that one hierarchical level is the most salient level of expression is an idea explored by Mitchell Ohriner (2012) who finds evidence of this in analysis of recordings.

coalescence into over-arching gestures. Recognising this, Whiteside wrote, "slow practice has nothing to do with the exhilarating experience of skimming over the notes in a beautiful performance" (Whiteside 1997). In practice, I find myself constantly jumping between levels to explore and practice in expressive possibilities.

14.2 Ambiguities

Groupings are obviously more difficult to extrapolate with an empirical analysis of recordings (in the manner of Ohriner 2012) than they are to produce as a performer. Trying to fit a mathematical model of a durational contour onto a specific musical span of time in a recording demands a filtering out of one specific timescale in the temporal hierarchy, when in performance the expressive contours operate on many timescales simultaneously. The expression of lower or higher hierarchical levels of timescales, then, can confuse attempts to pinpoint one expressive contour onto a specific timescale. In a given recording of a piece, all of the timescales are expressed at once, but from the perspective of a practicing musician, various groupings on various timescales may be experimented with or isolated sequentially in the practicing process. These experiments and reflections leave traces in the final performance in this way: repeating phrases and groupings forms both a musical conceptual understanding of the form and physical habits of how the music is embodied. Both the understanding of the structure and the physical habits may or may not be consciously decided upon at any moment in the practice process, but they do not have to be *consciously* executed in performance because they are already ingrained in the habits and embodied skill of execution that operates pre-reflectively. I may, for example, be distracted if an audience member falls off their chair during a performance - for a couple of seconds my mind wanders - but the music, the phrasing, the understanding of structure - all these aspects of the performance can continue without

interruption despite my lapse of concentration. At the same time, the aspects of embodiment that have been made conscious during earlier phases remain available for conscious manipulation.

The grouping structure is also expressed by various combinations of expressive details, combinations that only make sense when taken together (§10.1). As Clarke writes: "timing can show phrase structure in different ways – i.e.: that you can emphasise a strong moment by lengthening it or by lengthening what precedes it" (Clarke 1988: 15). In comparing two performances of the same piece, the use of different expressive details leads to a different sounding result, but that sounding result can express the same structural understanding or grouping. Or the sounding result can express a different grouping. Thus there are differences at the level of *∂etail* (often differences of how much, since the kinds of details work together) and at the level of *ϑtructural unϑerϑtanϑing*.

14.3 Terminology

To make sense of these differences, a specific term is needed refer to a segment in the music that is expressed as a grouping in the sounding result. Godøy writes of gestural-sonic objects, a term that refers to coarticulated groupings happening over timespans of 0.5 to 5 seconds. For the purposes of this dissertation, these gestural-sonic objects must be differentiated based on extensionality and intentionality (§9.2). While I have earlier argued that expressive details are connected to an underlying gesture, and conceptualised the immediacy of this connection with distance (§10.3), these details are connected sometimes over such a great distance that the underlying gesture is forgotten. Furthermore, the connection to gesture may very well be only intentional (in the imaginary perspective) and not extensional (in the playing perspective of time). For those

reasons it seems like the term should be more neutral with respect to embodiment. From here on, I will refer to these segments characterised by expression as *expressed timescales*.

Timescales are neutral measurements in the score - musical time that is measured in notes rather than milliseconds, and is thus variable with tempo. They can also be neutral facts in performance (an inexpressive MIDI performance of a piece, for example, can represent timescales in sound, but those timescales are executed without an expression in musical details which might further define their grouping). *Expressed* timescales, on the other hand, have some degree of expressive detail, which shapes and defines their grouping in sound. This may be a simple crescendo, for example, or it may be a gesture that is reflected in all three kinds of expressive details. When the expression over a timescale is embodied in actual physical movement, it is an *embodied expressed timescale*. When the expression over the timescale is primarily mental - when it is not felt with actual physical movement at the moment of performance - it is a *disembodied expressed timescale*. (How expressed timescales can be disembodied will be clarified later in this section).

But there is one more category of timescale necessary to describe a performer who embodies timescales with movement but fails to communicate this movement through sound (thus the gestures are seen but not heard). As I have written earlier, I believe that most gestures at the instrument can be heard in the sounding result because concurrent gestures serve as a kind of musical thinking in the sense of embodying phrasing (§9.4). However, considering that some gestures are only heard and not seen (like the application of weight), there is a spectrum between seen and heard, and on this spectrum there can be gestures that are more visible than audible. In these cases, their expression in sound is negligible. For these gestures, I use the term embodied *non-expressed timescales*. Gestures involving contour (and thus spatial distances on the keyboard) which are merely used to

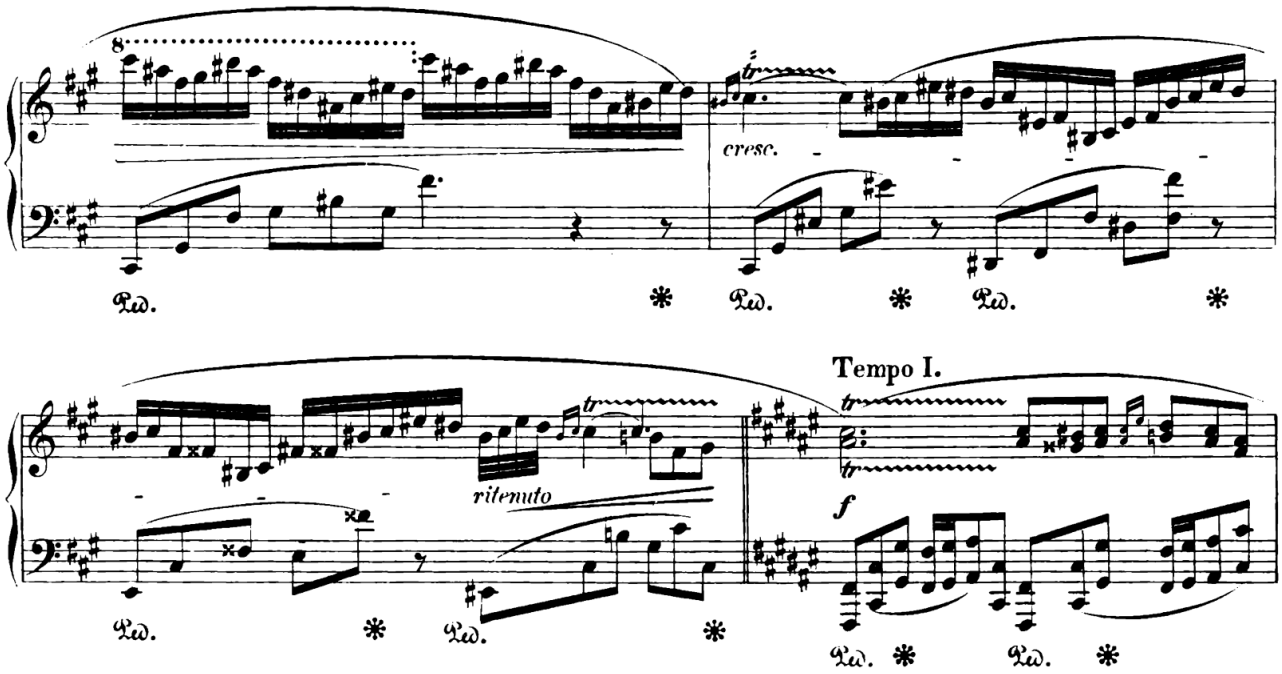
navigate the topography of the keyboard, but which do not result in expression on the timescale that they inhabit, fall into this category as well.

	Expressed	*Non-expressed*
Embodied	Embodied expressed timescale	Embodied non-expressed timescale
Disembodied	Disembodied expressed timescale	Neutral timescale

Table 14.1 Timescale descriptors

If individual timescales express gesture (either embodied or disembodied) then the gesture itself has a certain structure. Gestures in music lead to patterns of strong and weak emphasis, as I have discussed before, and they seem to have a prefix (before the strong emphasis) and a suffix (after the strong emphasis) (Godøy 2011b). Since the arrival at the point of strong emphasis can happen anywhere within segment of music, the segmentation of the musical score might be ambiguous while the timescale on which a gesture occurs (measured between points of emphasis, for example) might be clear.

As an example of the hierarchical nesting of timescales, consider this example from Chopin's Barcarolle op. 60:



Example. 14.1: Chopin Barcarolle in F-sharp op. 60 (Schirmer, Mikuli, 1895)

The crescendo marked in this example lasts for one and a half bars, during which florid patterns of sixteenth notes carve out contours with turns or corners. Playing a simple crescendo (in the sense of every note a little louder than the last one, increasing in a straight line) is structurally simpler than playing the crescendo while simultaneously shaping the prefix and suffix gestures centred around the goal note of the b-sharp on the strong beat of every half bar. The structure can become even more detailed with the expressive shaping of each pair of sixteenth notes. The point is that all those timescales can be simultaneously embodied through coarticulation as *embodied expressed timescales,* or they can be expressed in sound without such coarticulation as *disembodied expressed timescales*.

In both cases the notes are played, and the descriptor *disembodied* refers to the lack of overarching physical gesture that corresponds on the same timescale as the expression in question. To make this difference clear, imagine five successive adjacent notes that are to be played with a crescendo. In the mind and the ear, the crescendo is one gesture that spans all five notes. But in its physical execution, there are many ways to

arrive at that end result. For example, one could simply play the five notes individually, physically relaxing in between, and using mental concentration to make sure each note is louder than the last one. In this case, one intentional gesture is executed by five separate extensional gestures. The notes constituting the crescendo are embodied, but the overarching gesture - the crescendo itself - is not. In this case it is a *disembodied expressed timescale*. By contrast, the notes could be executed with a gradually increasing pressure from the top arm over all five notes. In that case, the individual key-drop of each note is still taken by the fingers, but the larger overarching gesture of onset of weight causes the gradual crescendo. Thus the unity of the mental gesture (one crescendo) is mirrored by the unity of one physical experience (the gradual increase of pressure on the keybed). The crescendo could then be said to represent an *embodied expressed timescale*.

When these overarching levels of expression are embodied, they are closer to the gesture they represent since the alternative of viewing them as simply a collection of details represents one more degree of abstraction - a greater distance (§10.3). In practical terms, the more the expressive shape maps to the body through the imbrication of expression and gesture, the more stable and convincing the artistic result. In the example of the crescendo above, separating five notes into five separate gestures opens the performer to the risk that if just one of the those five gestures is uncontrolled and falls outside of the overarching shape of the crescendo, the effect is lost. If the five separate gestures are visible to the audience, the effect is weakened[47]. If five separate gestures need to be controlled, much more concentration and mental effort is required than if only one gesture needs to be controlled. The possibility for error or imprecision is five times greater.

[47] In this dissertation, the visual aspect of gesture is hardly mentioned. It is, however, a communicative aspect of performance that is perhaps more important to non-expert audiences than it is to musicians who are apt to be focused more upon sound. If perception is included in the concept of "sound" (thus *perceived sound*) then the visual aspect is highly relevant, since it is the composite of visual and aural cues that form the perceived impression of musical gesture, and this perception of gesture in turn colours the perception of sound.

On the other hand, if one gesture is used, more physical tension is required to maintain the even pressure on the keys. But the decision is usually quite simple: the physical resources of a pianist's technique can easily be expanded through practice and are absolutely stable on stage, while the mental resources (concentration) are extremely unstable under stress and moreover the use of concentration to control lower level physical gestures distracts the attention or salience of expression from higher hierarchical levels of musical communication. Aside from the practical advantage of embodiment of higher levels of musical hierarchy, there is a distinct advantage for the final musical result since listeners seem to be good at perceiving when the body is fully engaged, in which case the performer seems to be more involved and more committed to the performance. The illusion of embodiment when these overarching levels are not embodied can be maintained through feats of concentration, but as soon as one detail is out of place, the gesture is exposed to be only imaginary and not physically felt.

In the above paragraphs, the paradigm for musical expression roughly follows this sequence from imagination to execution and thus to sounding result, a sequence which does not reflect the imbrication of these processes, especially during the practice phase where repetition plays a role. The act of executing this small crescendo with one overarching gesture (thus as an *embodied expressed* timescale as opposed to a *disembodied expressed timescale*) influences the musical imagination itself. With the even onset of weight into the keys, the imagination of the crescendo will became more defined and specific as it is enacted by the body. This is the "thawing to gesture" proposed by Mazzola[48] (2010: 27). As the gesture is repeated or practiced, other expressive details might be affected; the gesture of onset of weight might also be expressed in articulation and in timing (for

[48] "Performance involves the score, possibly its analysis, then the thawing of the score's symbols to gestures that are then transformed into sounds via the instrumental interface" (Mazzola 2010: 27)

example the notes might be inflected in time with a kind of rubato that shows the direction of the crescendo.)

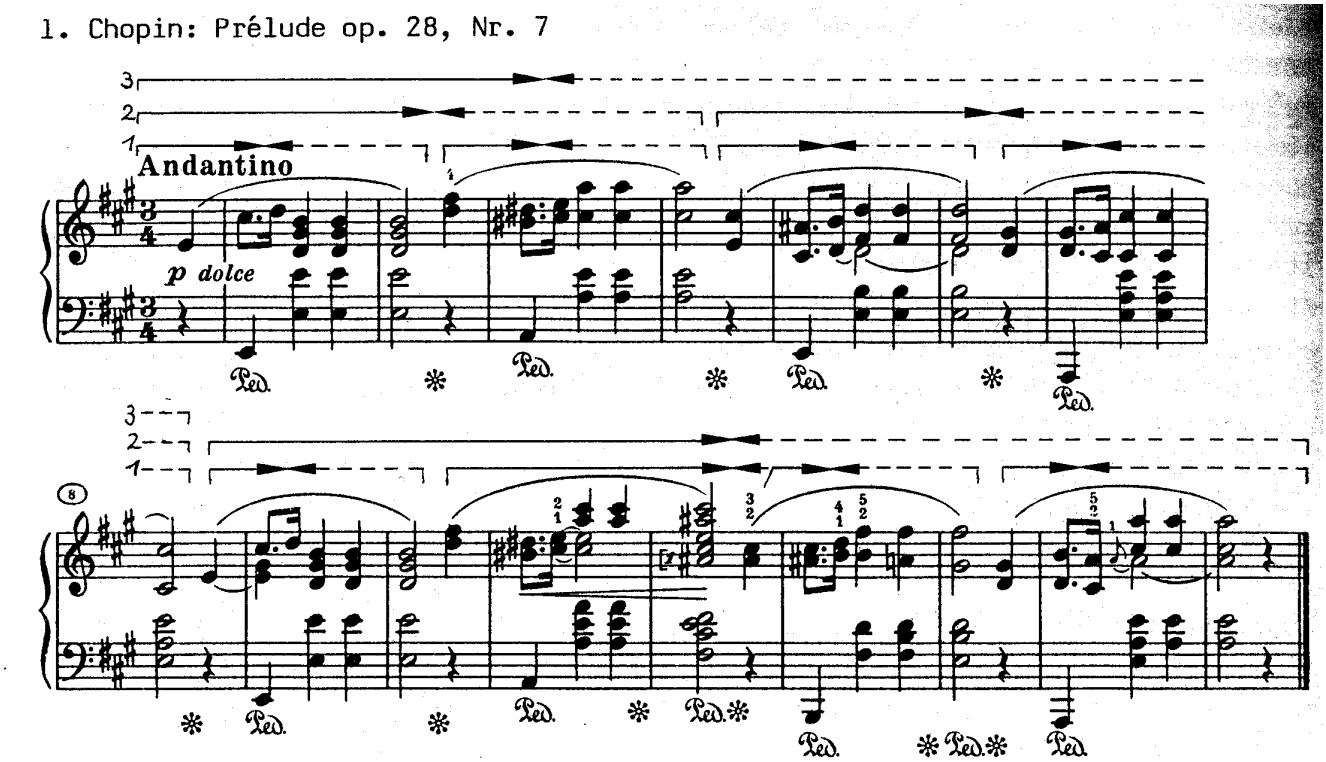
This line of thought yields two assertions (building upon §10.1 and §10.3):

1. The more the musical imagination and the embodied experience of playing overlap in expression, the more immediate the expression.
2. When types of expressive details (dynamic, articulatory, temporal) are embodied as gestures, they have an effect on each other in the physical experience of extensional gesture.

14.4 Notation

Possible notations for these sorts of expressed timescales might include nested slurs or tree structures (see Lehrdal Jackendoff 1983 for example) both of which have their distinct drawbacks. They efficiently show the timescale, and in the case of the nested slurs they can be used in conjunction with accent marks to show emphasis, but it seems like the notation should integrate the shape of gesture - its relative intensification towards a climax and relaxation afterwards - in a way that shows the continuity of movement either towards or away from some moment of arrival.

The clearest example I found is the notation from pianist and teacher Renate Wieland in *Denken und Spielen* (1988).



Example 14.2: Notation of hierarchically nested timescales showing suffix and prefix (Wieland & Uhde 1988)

Notice how the prefix and suffix of the gestures are notated with straight and dotted lines and the points of arrival are marked with arrows. In this analysis there are three levels of overarching hierarchical shape. Of course we could go both higher and lower in counting hierarchical levels. The numbering shown in this example proceeds from foreground to background (in Schenker-speak), an ordering that will be used in subsequent discussion in this dissertation, both in referring to notated hierarchical layers and in referring to the hierarchically-nested coarticulatory gestures which embody such layers.

The numbering could start on smaller timescales in this case (the focus of Wieland's example is on larger groups of structure, whereas coarticulation goes all the way down to the smallest groupings). To go to smaller timescales, we could group the sixteenth

notes with their following quarter note, playing them in one movement. This would imply a certain fingering whereby the sixteenth note fits into the same hand position as the following quarter note (Chopin shows this unity of hand position clearly in bar 5 and 11 where the sixteenth note pitch is tied to a half note, perhaps on the surface a redundancy considering the pedal is held, but which forces the hand to take both the sixteenth notes and the following quarter note in one hand position). There is thereby a heuristic implication that the first two notes of every slur should be grouped together on this same level of hierarchical structure, an implication that can be verified through practical experience. For the maximum suppleness of the hand in connecting the sixteenth note and its following quarter, the hand should be at least partially released from the dotted eight note, using the pedal, thereby avoiding any quick movements which might disrupt the overarching continuity of the higher levels of gestural hierarchy. The priority for finger legato is thus given to the faster notes. This can be seen in bar 11 (where the grouping of sixteenth note to the following quarter requires a fingering such as written in this score, and the finger legato connection from the dotted eight note on the downbeat to the following sixteenth note is thus impossible). At the same time, to create the desired legato between the first note of the slur and the second note, where the pedal is not marked, one has to finger those in one hand position. Thus each of the timescales shown by the slurs can be further divided into two parts, parts that are suggested by the embodied experience of playing the passage.

14.5 Transfer of understanding through teaching

This piece is an interesting example since, being one of the simplest pieces of Chopin, it is often taught to young students. If left to his own devices, the young student might choose a fingering that would require a change of hand position between the

sixteenth note and the following quarter note, connecting instead the dotted eighth note with the following sixteenth note[49]. As a result, the quick, angular movement of the hand required to navigate the sixteenth note interrupts the *dolce* character and the steady procession of the rhythm, introducing a certain frantic quality that remains both audible and visible no matter how well this fingering is practiced.

The teacher must then communicate a more pianistic understanding of this music, something he might do by writing in a more musical fingering, demonstrating how to play the piece with a smoothness of gesture that fits the music, explaining in words, conducting, or in many other ways (or with a combination of all of these at once.) He is explaining an embodied understanding as part of the education of the student, and if the student does not understand with one form of explanation, he will try another until the understanding has been transferred. This process is one of demonstrating, glossing or translating a gesture into forms both verbal and conscious or non-verbal and embodied, and communication can occur at all these levels. Through repetition this understanding becomes part of the pianistic culture of the student, whether it be conscious or not, and when the student is faced with a similar passage in the future, his hands might automatically reach for such a musical fingering (calling forth and adapting the same body schemata ingrained through repetition of the previous example). The grouping from the playing perspective (§9.6.2), then, is already determined by this sort of embodied understanding. Furthermore, the influence of embodiment is not limited to the playing perspective in the sense that the imagination, playing, and listening perspectives are tightly imbricated through the practice process (§9.6). Hence this pianistic understanding from the playing perspective builds a kind of embodied *aesthetic* knowledge in the student: if after studying this piece he hears another student playing it with a clumsy fingering, for

[49] Every piano teacher of children who has used the John Thompson Lesson Book Grade 2 where this piece appears rather prematurely, can attest to this!

example, he will immediately hear this problem, whereas before he became aware of this feature in his own playing he might not have been aware of any problem in listening to the other.

Perhaps this is a very obvious example, but this kind of pianistic understanding is built over many years and becomes incredibly subtle. As previously mentioned, it is also dependent on traditions (passed down from teacher to student in something like a family tree of influence). The idea shown by this example, that the grouping structure of a passage on a lower timescale can affect the overarching continuity of gesture on a higher timescale, indicates that the segmentation is not neutral with respect to the topology of gesture (as prompted by the topography of the keyboard in a specific sequence of notes and rhythms). This example also indicates that we cannot refer to the structure of the body (as if seen by an x-ray) without taking into account that body schemata are learned and taught in the normal upbringing of a pianist, and that these habits form the foundation upon which structural thinking in performance is built. The degree of sophistication in these body schemata determines to what degree motor cognition[50] or "interpreting through the body" can be used to create hierarchical structure in performance, and thus the degree to which the embodiment itself can be considered structurally analytical.

14.6 Differences in structure between performances of the same piece

Developing this line of thought, the kinds of differences of structure between different performances of the same piece can be separated into categories, using the terminology established in §14.3. First, a performance can express more or fewer hierarchical layers of structure, or the timescales that come to expression can be different.

[50] The term "motor cognition" has been used recently (see for example Godøy 2015) to refer to the extended or embodied cognition that offloads cognition onto bodily interaction with the environment (§7).

Second, the segmentation on similar timescales can be different. Third, the degree to which a structural level is emphasised in expression can be different (the prioritisation of a structural level as being most salient in expression, see Ohriner 2012, §14). Fourth, the degree to which a structural level is embodied (the imbrication between the expressive details, forming an intentional gesture, and their underlying extensional gesture) can be different. Thus one can say a performance is more or less structurally layered, and two dissimilar interpretations might be structured to a similar degree but in a different way: either the segmentation of the music is different or the level of expressive focus (the level that is most salient in expression) varies between the two interpretations, and across all these categories the degree to which the expressed timescales are embodied can vary. This map of structural differences provides a theoretical framework for appraising the phenomenon of polyphonic expression, which will introduce yet a new dimension across all these categories. Approaching music this way can seem rather bloodless when conceptualised in this manner, but it must be recognised that the felt qualities of gesture (according to Sheets-Johnstone 2011: tension, linearity, amplitude and projection, see footnote to Part III) are composite perceptions of all hierarchical layers, and as such the hierarchical structure is deeply intertwined with kinaesthetic experience.

15 Coarticulation - an exploration

In the examples of notation above, I have delicately tried to avoid this question: if these notations are to be read as gestures, *where* in the body will they take place? After all, the whole idea of coarticulation is the hierarchical nesting of gestures, which relies on the specific joints and capabilities of the performing body. If there was a one-to-one mapping of the music to the body, the answer would be simple, but in practice there are many options.

Because of this complexity, it is difficult to describe coarticulation in actual examples in any useful or stable way. However, there is much to be said about the topic, and after having introduced coarticulation in general in §12-13, I will now turn to examine a few central features of coarticulation and to demonstrate how it works in the context of a few selected examples from the Chopin Etudes. It is not my goal in this section to write about the qualitative feeling of the movements in question, but rather to focus on the structure of how the gestures combine in the body, and the various experiences of muscular activity that come into awareness while playing. Because of individual differences, other pianists might disagree with one or another example that I present below. However, I hope and rather expect that other pianists will recognise their own experiences in the discussion. In other words, it is not my goal to provide any new pianistic insight into the Chopin Etudes, but rather to describe the experience of coarticulation involved in playing them and by doing so to establish a conceptual framework for coarticulation that can support the discussion of polyphonic expression in Part IV. It must be remembered that while the discussion will seem to focus on what one might view as technical issues, each of these issues represents a certain hierarchical structuring which, when appropriated into the body schemata of the pianist, is available for *expressive* use in all pianistic contexts. Sophistication of line and form at the level of

motor cognition, then, is founded from these technical experiences, an argument that has been halfway presented so far and one that will be resumed in the conclusions to Part III.

15.1 Research Process

In order to approach the large and complicated issue of coarticulation, I decided at the beginning of my research trajectory to seek to develop awareness of coarticulation through studying, performing and teaching the 24 Chopin Etudes of op. 10 and op. 25. I used these experiences as a springboard for reflection, which led off in many directions tangential to the present research (which I will exclude from the current discussion) but also led to the distillation of some central observations about coarticulation.

My goal in learning and performing the Etudes was to reflect about the embodied knowledge of coarticulation and how it is communicated, and by doing so to develop my own playing. This knowledge is to some degree communicated through the specific technical-musical demands of the Etudes - knowledge that came from Chopin himself - but also knowledge that has been extensively taught, explained and developed in the almost two centuries since they were composed. Of particular (but tangential) interest to me was how embodied knowledge is communicated in a pedagogical setting and what forms of communication seem to be particularly effective.

The first part of my research was to learn (or in some cases relearn) and perform all of the Etudes, while focusing on an appraisal of coarticulation alternating between reflection and practice. I had already played op. 10 in its entirety in 2009 in Dallas, and I first performed op. 25 in 2013 in Brussels and on the island of Schiermonnikoog and then both books together in the Hague and Paris in August and September 2014. Since learning them, I have also had the chance to teach several of them to a handful of my private students and later in workshop-masterclasses at the Royal Conservatoire of the Hague

(first for the Bachelor and Masters level students, and then also for the Young Talent department). In this dissertation, the Etudes are used as a springboard for further reflections about coarticulation, reflections that will form the basis for the artistic experiments and analysis in the next chapter. In this process, certain issues pertaining to coarticulation kept recurring in my awareness, and it is upon these issues that I will focus in this section. Because of the focus on coarticulation, and not specifically on the Etudes, I will not limit my discussion to examples from the Etudes but will rather try to fill out each idea with whichever example is clearest.

In fact, the Chopin Etudes themselves can be viewed as a kind of pianistic research undertaken by Chopin himself - a research that expanded the possibilities, both technical and musical, of playing the piano. His goal in writing the Etudes (which he called "exercises" in his letters) was to develop his own pianism (Eigeldinger 1988). Significantly, the technical and musical challenges are integrated. The history of the form of piano etudes includes innumerable dull exercises of the likes of Czerny and Clementi, but Chopin was perhaps the first composer to recognise that the ultimate technical development must result in a beautiful sounding piece - that technique and musicianship hang together as one coherent intelligibility. A successful performance of a Chopin Etude must therefore answer the challenge of being both technically brilliant and musically beautiful. It is the particular genius of Chopin that he found a way of integrating these challenges - solving the musical problem of creating a beautiful phrase will very often help to solve the technical problem of playing it. On the contrary, aiming just to "play the notes" leads to frustration, since without the musicality of proper phrasing the muscles involved get tired. A more musical approach involves the whole body, and thus many layers of movement, so the problem of endurance disappears. This more musical approach, then, involves a better implementation of coarticulation whereby hierarchically nested layers of movement are better activated to

lighten the burden of the small muscles that move the fingers. Musicality and coarticulation are integrated - playing more musically leads to better coarticulation and better coarticulation leads to better musicality.

In this section, I will draw on insights and reflections using examples from the Etudes. The Chopin Etudes remain one of the best resources to develop the body schemata underlying coarticulation, and Chopin's notation can best be understood with the this awareness. Because the musical and technical aspects are integrated, the notation can be viewed as both the instruction for how the music should sound and how the technique should function. It thus has an *embodied* meaning that is equally as important as the meaning to be found in the score and the sounding performance.

One additional reason for the use of the Chopin Etudes in this discussion is that they are studied worldwide by almost every advanced classical piano student. As pianist Paul Badura-Skoda puts it, " . . . these are the Etudes on which the world's elite pianists have cut their teeth, so to speak, ever since they were composed a century and a quarter ago"(Badura-Skoda 1973: vi). They are widely required in competitions and exams, and they rank among the most familiar repertoire for professional pianists. Thus they present the perfect example for discussion, since understanding their embodied meaning depends on having played them, and so most pianists can immediately join the discussion. The Chopin Etudes are rich with significance for pianists in that they represent both a tradition of pianism as well as a tradition of research into pianism. Many pianists have voiced opinions about the Etudes, some have made editions, fingerings, transcriptions or exercises and others have written books. The editions of pianists Alfred Cortot and E. Robert Schmitz (Merritt 2007), and the transcriptions of Leopold Godowsky, for example, all contain enormous insight into coarticulation, communicated through fingerings and

exercises. Whiteside[51] also used the Chopin Etudes as her main example in applying ideas from her book *Indispensibles of Piano Playing* (1997). Informally, various snippets of advice float around between pianists by word of mouth and through teacher-student relationships.

Another reason to study the Chopin Etudes has to do with the specific nature of the coarticulation that is required to execute them. As mentioned earlier in the chapter, the movements used to play a piece of music can map to the structural affordances of the musical score in many different ways. In many simpler musical examples, a dizzying variety of possible movement structures can be employed. Of these possibilities, I certainly might prefer one or the other on aesthetic grounds. It might also colour my perception so that in judging other pianists, I might be inclined to prefer a similar choice because it comes close to my own embodied feeling of the music. However, a different mapping could be perceived as original or refreshing. In any case, there are viable alternatives that might fit different personalities, instruments and audiences. These are coarticulatory gestural affordances, the corporeal parallel to the structural affordances upon which analyses are based. Because of their technical demands, the Chopin Etudes require more specific mappings - hence the range of coarticulatory gestural affordances is narrower. In other words, there are fewer viable alternatives in embodiment for this music to be played in a brilliant and artistically successful way.

15.2 Coarticulation issues

As previously mentioned, the goal of this section is to focus on a few specific facets of coarticulation that arose into awareness through my study of the Chopin Etudes. The fact that these observations, which are rather obvious in practice, need to be made in a

[51] See *Mastering the Chopin Etudes,* bound together with the *Indispensables* (Whiteside 1997). In it, she explains how the ideas from *Indispensables* can be applied to the Chopin Etudes.

research context points to both the large amount of work that needs to be done in this kind of artistic research, and to the difficulty of expressing these phenomena in words. In this section, I will begin with a discussion of continuity and legato (§15.2.1 developing the thread started in §9.3), since continuity is a constitutive property of the overarching trajectory shapes of gesture defined by coarticulation. The often-visible overarching trajectory shapes of the arm are related to an experience in the hand that I will describe with the word coalescence (§15.2.2). I will then discuss division of movement and weight, relating such division to the hierarchical structure of gesture (§15.2.3). The Chopin Etudes display many intriguing examples of conflicting gestural groupings based on either contour or rhythm, and I will examine the layering of how these elements interact (§15.2.4). Finally, I will examine some hierarchical organising principles (§15.2.5).

15.2.1 Pianistic and organistic legato

The most commonly written directive in the Chopin Etudes is the word *legato* and its derivatives (*sempre legato* and *legatissimo*). According to the Dolmetsch Music Dictionary, legato means "smooth playing style in which the notes seem bound together[52]" and according to the Oxford dictionary "in a smooth flowing manner, without breaks between the notes[53]." The Dolmetsch definition situates the fact that notes are bound together in the perception of the listener ("seem bound together") while the Oxford definition is somewhat more absolute about the binding-together ("without breaks between the notes"). Both definitions, however, begin with the felt quality of legato ("*smooth* playing style" and "*smooth flowing* manner", emphasis mine.) Obviously what legato means is more complicated than a dictionary definition, legato being a historically and instrumentally situated term. Speaking generally, however, the dictionary definitions

[52] Last accessed from <www.dolmetsch.com> Feb. 21, 2016

[53] Last accessed from <www.oxforddictionaries.com> Feb. 21, 2016

both point out two conditions: a) that the music should feel smooth and flowing and b) that the notes should be (or should be perceived to be) connected. Following the first of these conditions, legato can best be thought of in terms of a principle of continuity (Hatten 2004: 239, Wieland & Uhde 2002). This continuity is sometimes thought of as a continuity of sound (featured in part b of each definition), an idea that refers either to continuity from one note to the next where one note ends when the other note begins, or even to the overlapping of notes, a phenomenon which is sometimes called "over-legato." Following the Dolmetsch definition, one must question where this legato in sound takes place in the actual acoustical space of the performance. After all, a line which might sound detached when heard from the position of the pianist might sound quite connected or even substantially over-legato in the audience due to the acoustical resonance of the concert hall space. Musicians take this into account and play differently in every space, perhaps using different amounts of pedal, so the effect for the average listener (since they might sit at widely varying distances from the instrument) is judged and the connectedness of legato in sound at the instrument is compensated for accordingly. In organ playing, which occurs for the most part in much more reverberant spaces, there is talk of "gespanntes legato," a kind of continuity where notes are separated enough to provide clarity of attack but connected enough to maintain the feeling of legato over the phrase, a feeling that in this expression is one of the maintenance of tension and overarching continuity. In fact in both organ non-legato and organ legato, there is very often anyway a substantial overlap in resonance between tones, considering that the decay of sound in a reverberant church lasts several seconds. In any case, continuity of sound can be judged from a close acoustical vantage point and also from the vantage point of the audience. Obviously if the listener perceives legato and non-legato in notes that anyway might overlap, legato is not precisely a quality of the sound itself, but a perception by the listener of continuity in the sound.

Legato of course is not just the continuity of connecting sounds, but also the continuity of the kind of sound. A string of notes does not sound particularly legato if there is great dynamic discontinuity between notes, even if the notes are actually connected with the fingers (because this does not give the feeling of a "smooth flowing manner"). Likewise, legato requires a continuity of rhythm, not in the note values (because adjacent eighth and sixteenth notes, for example, could very well sound legato) but rather in the progression of the underlying tempo, which might be transformed by stretching or compressing fluidly, but must not be cut or modulated too abruptly if the sense of legato is to remain.

What we have come to consider in the previous paragraphs are the same details that communicate gesture: articulation, dynamics and timing. This suggests that rather than the idea of legato as *continuity in sound* or *perceived continuity in sound*, we can better understand continuity as *continuity in gesture*. Legato as continuity can then be thought of from the perspective of the performing body. Legato as an overarching sense of gestural continuity has its embodied correlate in the overarching gestures that are the subject of this chapter and which are described with the word coarticulation. The purely acoustic properties of continuity (are the sounds continuous? from which vantage point?) are separable from the embodied continuity of legato (are the gestures continuous? where in the body, and over what groups of notes?) insofar as one can make a continuity of sound without coarticulation and one can make a continuity of coarticulated gesture while playing notes that are separate. However, the continuity of sound is only one element in the listener's perception of legato, supplemented by the continuity of dynamic and temporal contour. When all these elements converge, the listener perceives a feeling of gestural continuity, a "smooth playing style" or a "smooth and flowing manner."

15.2.1.1 Conceptual versus embodied legato

Introducing legato to children, teachers direct students to connect successive notes with their fingers (this is often called "finger-legato" when contrasted with "pedal-legato"). The implicit or explicit definition of legato as "connecting notes with the fingers" results in a category of mistakes of understanding both in organ and piano playing. In the following sections, I will attempt to describe a couple examples of such mistakes, which in turn will show how coarticulation, and thus using more hierarchical layers of continuity than merely the fingers, is a constitutive element in legato playing. Through a discussion of an example in organ playing, I will focus on a conceptual or rule-based approach of interpretation which in its strict stipulations actually blocks the "smooth flowing manner" of legato, and in discussing piano playing I will argue that continuity can be felt in different places in the body. Of course both issues apply to both instruments, but the issues are best approached through examples.

Sometimes in organ playing and teaching, a very strict adherence to rules, such as those taught by Marcel Dupré (who built them on ideas from Lemmens who himself was inspired by North German practice) governs articulation (Hammond 2012: 65). When a student is told to measure the silence between the notes, for example to play two quarter notes at exactly three-quarters note value, he might *feel* the strong subdivisions created by this rhythmic cut-off, thus breaking the overarching continuity that could otherwise hold the phrase together. For this reason, rule-based legato is often detrimental to legato as embodied continuity. Pierre Cochereau explains this difference in approach succinctly. In the following quote, he addresses the tendency to play Bach as following a rule (not an instruction in the score, but a stipulation given from teacher to student in how to interpret the score - a stipulation that may be based on historical feeling, personal aesthetic or response to the instrument in question, but is nevertheless conceptual and completely

outside the musical score) and then contrasts it to his approach of feeling the music with the bodily experiences of breathing and bowing:

> Some organists would play Bach completely staccato. For one and a half centuries people have been playing Bach completely legato. I think the correct way is to keep in mind that in his lifetime Bach was much better known as a violinist, as a composer, and as a choir director than as an organist (although, of course, he was a wonderful organist). So it helps to compare his organ works with pieces for other instruments and voices. For example, some organ pieces could be played on the harpsichord; some could be performed with voice and small accompaniment; some could be played perfectly with stringed instruments. And that is a good clue, I think, to the phrasing…[Bowings and breathing] are certainly the two most important things in all music! (quoted in Hammond 2012: 67)

What I want to highlight is the enormous difference between a *conceptual* or *rule-bound* definition of legato and an embodied understanding of legato as a sense of continuity, a "smooth and flowing manner." Though the two paradigms might lead in some cases to the same phrasing (after all the rules were often made by great musicians), the musical communication that takes place comes from a very different space in the inner world of the musician. Following the stipulation of any conceptual definition of legato is in the first place a rather cerebral, calculated experience distinct from the embodied feeling of legato that connects mind and body in gesture. Surely the rules were intended only to guide a certain phase of the practice process, and then to be discarded, but teachers like Dupré reduced the musical response to following the stipulation all the way through to performance. His way of stipulating was by editing the scores and fanatically enforcing obedience. Cochereau remembers, "He would tell us, 'my boy, look at the score and do what is written.'" (Quoted in Hammond 2012: 65). Of course it was his (Dupré's) highly edited edition of the Bach score, and "do what is written" meant following Dupré's strict rules for the realisation of notation!

If performers can play legato from very different inner spaces (oriented more towards conceptual rules or more towards felt embodied qualities) listeners perceive it in different ways as well. A Dupré-like examination committee of organists might all share the same rule-based definition of legato, enabling them to evaluate objectively whether the student is playing legato, based on their shared rules and stipulations[54]. An audience of normal humans, however, is likely not equipped with such rules, and furthermore is not in the first place oriented towards the objective or cerebral. The only thing absolutely in common for every listener is the sense of gesture, since the perception of "smooth flowing manner" and its constitutive gestural continuity is universal. The Dupré-like examination committee, however responsive to such felt qualities, might choose to stand by their rules and stipulations since they seem to be *objective* enough as grounds for judgment. It is again a case of the "grammar which imposes itself" since the convenience of being able to articulate such ideas leads to their eventual dominance, even when they clearly do not do justice to the phenomena they aim to describe.

My point is not precisely to argue against such rules or definitions. Rather, I would like to point out that they can become disconnected from embodied experience - thus becoming dry and leading to boring performances. Because they have a conceptual aspect, they can seem more objective; they offer an easy solution to questions of interpretation and an easy criteria for evaluation. However, the responsiveness to the individual quality of the passage and its particular gestural affordances can be overruled by this conceptual orientation. Rules (historical/stylistic, musical, technical) are to some degree necessary in teaching, but they should be limited to the practice room and even there continuously grounded in an embodied understanding that calls upon the student to be aware of how

[54] This Dupré-like examination committee is imaginary, though my own experience with organists (apart from my teachers and the organ faculty at Codarts where I studied) is that they are rule-oriented to a much greater degree than pianists. This presents an interesting question for further research. However, my argument here is merely to contrast two views of legato, which will become clear in the following paragraphs.

the rule affects and can be incorporated into the particular feel of continuity of the passage in question. By the time of performance, the rule must have disappeared from conscious awareness to allow a much richer embodied response to the felt qualities of the moment, or else such felt qualities must be carefully framed (§6.2) and thereby emphasised to balance against the objectifying force of the rule.

In contrast to organ playing, where the tone lasts as long as the note is held, in piano playing, the shape of each note with a strong attack and decay (variable depending on the instrument) makes continuity of *sound* more difficult to achieve. Perhaps partly for this reason, pianists are often more sensitive to the need for embodied continuity (the "smooth flowing manner") than organists. Pianists are also freer to use movement, especially movement of the torso, to "inhabit" the shape of notes during a performance, because for organists the coordination of arms and legs limits the amount of freedom of movement (since the organist must balance on the organ bench without the help of the feet as an extra point of weight-bearing stability.)

Be that as it may, legato playing is elusive to many otherwise competent pianists because of the same orientation of legato towards the mental sphere of interpretation ("connecting with the fingers" or another such definition) rather than towards embodied understanding (a "smooth flowing manner"). One symptom is a lack of sensitivity to contours and corners[55] in the musical line. The body is governed by a certain physics whereby changing the direction of movement of the arm, for example, involves overcoming a degree of inertia.[56] From stasis to movement also has a transition involving inertia. As described earlier (§9.3), angular changes of direction or speed, therefore, feel discontinuous. It must be observed that while these are also *kinetic* properties observed in

[55] By corner, I mean the change of direction from notes moving upwards to notes moving downwards.

[56] This point is described by Leon Fleisher in a recent interview (Fleisher 2016).

the physics of the external world, they are particularly immediate in gesture as *kinaesthetic* properties of self-movement. As such, they are kinaesthetic qualities of coarticulation, which, while immediately available for perception in embodied expressed timescales, may also be modelled imaginatively and sounded through disembodied expressed timescales (§14.3). When this movement is invested with tension, the amount of activity that has to change directions increases, leading to even more resistance or inertia. When a pianist turns a corner in a legato line with no inflection, any degree of musical tension or continuity built up in the vector towards the corner is lost, because such an inertia-less corner is discontinuous in our bodily experience of movement. The "finger-legato" notwithstanding, such an inertia-less corner feels abrupt and is the antithesis of the "smooth flowing manner" which constitutes legato. The pianist might argue that he played legato, but that would just expose his impoverished definition of legato as connecting one note to the next on the Schenkerian foreground level, a definition which neglects to address the problem of creating the perception of continuity on superordinate timescales.

One might argue that if he connected the notes with his fingers, he achieved at least some nominal embodied sense of continuity. But looking at the structure of the body, the fingers are next to each other and releasing one finger while firing the next doesn't *necessarily* involve continuity in gesture over a group of notes. Each note gets a separate attack from a different part of the body (a different finger, that is). On the other hand, an overarching trajectory of the arm (coarticulation) might provide such continuity. This train of thought leads to an examination of various places in the body that continuity can be felt, a topic that will be returned to periodically throughout this chapter (see particularly §15.2.2).

15.2.1.2 Activity and inhibition

Continuity can occur naturally or it can be practiced consciously. In the latter case, it is useful to note that continuity can be created by two distinguishable processes, a distinction made clear by the Alexander Technique between *doing* and *inhibition* ("not-doing" or "undoing" in Alexander-speak) (de Alcantara 1997: 20-21). The activity of *doing* something starts with a mental idea consisting of the desire to create continuity through muscle activity, an idea of where the continuity will happen, and willpower to make it happen. In this case, the result is an activation of muscles that actually create the experience of continuity. A simple example is moving the arm in a continuous arc - the idea originates from the words on the page and calls forth a very familiar experience. How the arm moves and what arc it follows are both functions of the habits and body schemata and choice of the individual. The *doing* can be imaginary in the sense of consciously holding an image of continuity in the mind, or it can be the actual physical *doing* of moving the arm.

In playing, this activity of making continuity has to compete with the various discontinuities that may be felt as a result of the articulation of the body necessary to produce each note. Later in this chapter I will examine how levers such as the top arm, forearm and fingers can be "blocked together" whereby the joint between these levers becomes rigid and they operate as one unit. If all of these joints are blocked together, then every finger stroke will be felt all the way through the playing mechanism from the fingertip to the spine. Of course, it would be extremely difficult to play in this way, and every note would be discontinuous at every level of the body. This phenomenon can most obviously be seen in clumsy octave playing, where vibrations from each octave are felt from the fingertips to the top of the head. Any active continuity that the player would like to create has to compete with these vibrations. Of course this is not the ideal way to play

octaves, but one encounters it often among students and sometimes even among professional pianists.

When the active *ðoing* of continuity is strong it can gradually overcome the discontinuity of such reflexes. Such a process becomes much easier when combined with an *inhibition* of the muscular activity that causes the blocking in the first place. Alexander Technique is built on the development of this inhibition, in the first case to take care of what Alexandrians call "primary control". Simply stated, primary control is the inhibition of any muscular contraction that causes the neck muscles to contract. In Alexander Technique lessons, students do various everyday activities like sitting in and getting up from a chair, squeezing the hands lightly on the back of a chair, and breathing while lying on the floor in an effort to free the neck from any undue contraction during those activities, while repeating conscious directions.

Alexander technique is particularly effective at separating the layers of movement that might become stuck together, allowing joints to function more freely. As Vivian Mackey (a veteran Alexander teacher and cellist) explains, primary control can also be developed in other joints in the body (Mackey & Armstrong 2002). During almost two years of Alexander Technique lessons, my experience was that it was extremely valuable in learning how to work on coordination through inhibition and direction. However, there seemed to be a certain drawback, which at the time I could not articulate. With the conceptual framework of coarticulation, it is now possible to concisely verbalise this drawback: Alexander technique removes discontinuity by inhibition, but in minimising the muscle activity needed to play it also inhibits continuous overarching movement that gives liveliness and continuity to the music. Thus it inhibits coarticulation along with the

undesirable physical reactions that hinder performance[57]. Pedro de Alcantara acknowledges this problem and shows it be a phase in the learning of the technique, a phase which is overcome as the student improves (De Alcantara 1997).

In §9.7, I outlined a categorisation of a spectrum for gesture between involuntary and willed. In a piano student, the direction of development naturally proceeds towards increasing voluntary control of movement. Excluding the first category (involuntary movement), the pianist then can decide whether to allow or employ movement over groups of notes. In some cases, this leads to a choice between movement and stasis, a choice that is made in the playing perspective but (as we have seen by the imbrication between the imagination, playing and listening perspectives of the performer, see §9.6) which affects imagination and listening as well. Since movement is such a fundamental part of movement and expression, it is easy to argue for more movement in place of stasis, but such a position is too general. In fact, more movement has structural implications insofar as excessive amplitude of movement by one lever (say of the forearm) can interrupt the continuity of movement on a hierarchically larger level (say of the top arm). So rather than arguing for more *amplitude* of movement in general, I would argue for more hierarchically nested *layers* of movement.

In the case of the Hanon exercises, amplitude in the finger attack is encouraged: "Lift the fingers high and with precision, playing each note very distinctly" (Hanon 1928: 2). Such magnification of amplitude at one layer in the gestural hierarchy, while pedagogically useful, also carries the danger of exaggeration. Primarily focusing on the high and distinct attack of the fingers can lead to a static or immobile arm. This is the reason that these exercises can easily lead to mechanical or expressionless playing, and the

[57] Obviously my own experience with Alexander technique may not match that of others, and it is not my purpose to critique the technique, but rather to explain its relation to coarticulation.

problem can be overcome easily by showing the student how to combine the finger attacks with overarching gestural continuity based on contour and rhythm.

15.2.1.3 Phrase-arching and intonation

While the finger-action and over-arching gestures shown in the Hanon exercises exemplifies coarticulation on a relatively short timescale, coarticulation also occurs on higher timescales, thus forming a continuum from the *shortest* timescales, which I will connect to the concept of "intonation," and *longer* timescales, which I will describe with the word "phrasing." Beginning with the latter, the concept of phrase-arching (introduced here in §10.1) enters around the phenomenon of hierarchical nesting of timescales that have expressively arched contours, measurable through analysis of temporal and dynamic changes (Cook 2014: 176-177). In the normative kinematic model of music scholar Neill Todd (1992), the confluence of these temporal and dynamic changes gives a sense of movement on the phrase-arched timescale that obeys certain elementary laws of physics. Cook has convincingly demonstrated the use of the concept in analysing recordings. Insofar as phrase-arching is inherently hierarchically situated, and models continuities of movement on these hierarchical levels, it seems to provide a theoretical extension to the current discussion as well as an empirical ratification of this extension through its occurrence in some recordings. Interestingly, Cook finds phrase-arching to be historically and geographically situated and places its most striking exemplifications in recordings coming out of the Russian piano tradition of the mid-to-late twentieth century, particularly noticeable in the recordings of Neuhaus and his musical and genetic offspring, such as

Stanislav Neuhaus (his son), Stanislav Bunin (his grandson), Vladimir Ashkenazy, and Vera Gornostaeva[58] (Cook 2014: 176-223).

Cook finds what he considers to be the first clear documentary description of phrase-arching in the writings of music theorist Hugo Riemann, while he observes that phrase-arching is not clearly to be heard in recorded examples by Riemann's students (Cook 2014: 181). This description from Riemann focuses explicitly on the level of musical details, thus referring to the measurable waxing and waning dynamic and temporal shapes that constitute phrase-arching. Cook (2014: 212) also situates phrase-arching in culture, connecting it with the concept of the "natural" and "simplicity," both found in Neuhaus's book *The Art of Piano Playing* (1973).

Since consideration of how phrase-arching is felt in the embodied experience of playing could connect it directly to coarticulation and to the hierarchical layers of felt continuity that constitute pianistic legato, and since phrase-arching is anyway perceived as musical gesture or movement on these hierarchical timescales, it is relevant to the topic of creating legato through coarticulation. Neuhaus was aware, on the one hand, of the "system" of Stanislavski, who is referenced directly by Neuhaus in his book (1973: 67), and also, more importantly, of the concept of *intonation* of the musicologist Boris Asaf'ev, a concept which is also to be found in Neuhaus' book (1993: 71). As I will explain, it seems likely that the phrase-arching found by Cook in Neuhaus' recordings was inspired by these concepts, or at least grew out from the broader intellectual roots that the concepts share.

Both Stanislavski's acting method and Asaf'ev's theory of musical semantics directly connect hierarchical structure to embodied experience. Stanislavski's idea of *bits*

[58] In the interest of full disclosure, I must note that my most recent piano teacher, Naum Grubert, studied with Theodor Gutman, himself a pupil of Heinrich Neuhaus. This certainly colours my discussion of legato in this section at some semi-conscious level.

and *таʂкы* represents a hierarchical building up and breaking down of the "rhythm" of a play, by which each hierarchical level ("bit") can be practiced with its conscious motivation ("task") until it is incorporated into muscle memory. This describes a conception parallel to Neuhaus' view of the "artistic image" of a composition (Whyman 2013: 71, Neuhaus 1973, Stanislavski 1989a, Stanislavski 1989b). In Asaf'ev's work, the recurring concepts of "symphonism" and "intonation" reflect a similar hierarchical understanding, appropriating the idea of musical form as a living process and connecting musical expression directly to social meaning, respectively. The Bergsonian metaphor of *élan vital*[59] (an impression of being motivated by a sense of inner life) can be felt in both Asaf'ev's symphonism (Dixon 2007) and in Stanislavski's methods[60].

Apart from the relative paucity of English-language sources, it is particularly difficult to home in on one definition of Asaf'ev's intonation concept because it evolved over the course of his writings in a sometimes-contradictory manner[61]. Asaf'ev uses the word both in reference to composition and performance, where the choice of a sequence of notes might call forth an image (for example, a "hunting call" or a "sigh") and on the other hand the performance itself can generate its own layer of expressive meaning. Despite any ambiguity in its definition, the importance of intonation[62] (интонация, *intonatʂia* or *intonazia*) on post-war Soviet musicianship can hardly be overstated, and it has become a shibboleth of Russian and Russian-trained pianists that can be heard daily in lessons and

[59] A term coined in his 1907 book *Creative Evolution*.

[60] In fact, Asaf'ev and Bakhtin shared similar intellectual roots, having both studied philosophy under Nikolay Lossky who was notably influenced by Henri Bergson (Morson & Emmerson 1990: 178, Dixon 2007: 37) and it is in context of this idea of *élan vital*, the "pure inner change and flow, the pure Heraclitian flux of self" (Morson & Emmerson 1990: 179) that his conception of polyphony in Dostoevsky gains the most depth (see §1).

[61] To this end, musicologist Valentina Kholopova (2000) sets forth a categorisation of possible intonational transfers and Viljanen (2005) positions intonation in the context of the philosophy of Bergson and the political pressures of social realism. A more thorough examination of intonation in Russian pianism is outside the scope of this research, but represents an avenue for further research.

[62] For the remainder of this dissertation, use of the word "intonation" refers to Asaf'ev's concept of intonation.

masterclasses, its meaning for pianists thus established by its use.[63] From how it is used, it is clear is that the word is more than simply an analogy between the vocal inflection of speech and musical expression, but rather connects all manner of affective experience directly to the shaping of the most basic and irreducible units of music, shaping that is neither only a musical image nor only a technical movement, but an organic integration of both. According to Asaf'ev's theory, intonations are socially shared expressions, and are thus understood in common among a larger or smaller social set, and these shared expressions allow for the direct communication of meaning. Because both composers and performers intone, and these intonations connect with shared experiences of the audience, intonation is conceived as a semantic theory of musical expression. Writing about intonation, pianist John Bell Young comments, "here all the components of musical interpretation — expressive declamation, articulation, inflection and even that gestuary of physical movements that is all too often apocryphally described as 'technique' — dissolve one into the other like so much sugar in coffee" (Young 1998). Because intonation is predominantly used to refer to the investment of the smallest units of music - intervals, motives, and small scale contours and rhythms - with such socially resonant expression, it is often used in parallel with the word phrasing, which arches with its own natural *élan vital* on higher timescales.

The impulse towards intonation on a hierarchically subordinate timescale to phrasing and its imbrication with the actual gestures of playing already point to coarticulation as having a co-creative relationship to phrase-arching. Godøy places gestural-sonic objects on a timescale of 0.5 to 5 seconds (the timescale on which

[63] As pianist John Bell Young (1998) writes: "Though it is also understood, among Russian theorists, as a compositional technique that governs intervallic relationships, it is its ordinary, every-day meaning that intrigued me. Indeed, I was always astounded at how often Margarita Alexyeevna, and virtually every Slavic musician I've ever known, used the word, not only at lessons and in master classes, but in reference to musical expression. And as I began to take a closer look, it became increasingly apparent that intonatsiia, as a generic concept, is so universally understood and accepted by every Russian schoolchild that no one even bothers to talk about it anymore."

movements are readily perceived as gestures), which seems to demarcate an upper limit for the perception of gestural continuity as *one gesture*, but the levels of intonation and phrasing on these timescales can then show further overarching progression to create a superordinate sense of organic unity extending all the way up to the level of the whole composition. The expression or perception of movement at these higher-level timescales (greater than five seconds) depends on the expression of their hierarchically constitutive parts, without which they would be perceived as static. While the appropriation of the idea of *élan vital* in creating an organicism of music may have been situated in a specific cultural and political context (the organicism inherent in Asaf'ev's "symphonism" and the strong connection to shared human experience in the concept of intonation helped to defend music against accusations of Formalism), it led to what amounted to an exploration in hierarchical continuities, an exploration of just how far the idea of legato can be taken at the piano. Because of the direct connection of intonation with the intervals found in the score, with socially shared meanings and with the embodied experience of playing, the whole expressive structure (or organic unity) built on top of it is therefore responsive both to the performer, the audience and the score.

It is clear that phrase-arching is only one performance option, and that despite its possible original organicist inspiration (*élan vital*), its use can become mechanical and general. As Neuhaus warns,

> There is no tone "in general", just as there is no interpretation "in general", or expression "in general"; nothing is "in general". In this connection I would recall those pages of Stanislavsky's book in which he refers to the expression "in general" as a very great misfortune (Neuhaus 1973: 67).

However, the tendency towards generalisation is checked by the specificity in the smallest semantic units at the foreground of the musical texture - the intonations which are

inspired from the notes in the score, and at the same time embody and express such a broad range of shared human experience. In discussing coarticulation, it is easy not to see the psychological meaning in body movement, just as it is easy to forget body movement in the psychological experience of the "artistic image." Because intonation for the pianist is inextricably connected to the gestures used in playing, and because of the the imbrication between these gestures and the intentional gestures that underlie imaginative musical imagery (see footnote to Part III), the theory of intonation suggests a semantics of gesture which is centred in the coarticulation of the pianist.

15.2.2 Coalescence

Continuity can be found in the movement of many parts of the playing mechanism. The first example is coalescence of the hand into a coherent unit, an experience which I will attempt to put into words in this section. Coalescence in the hand is felt in relation to continuity in movement in other levers. Next, I will briefly describe and illustrate this phenomenon with examples.

The fingers and thumb are held together by a web of ad- and ab-ducting muscles and various ligaments, allowing a complex variety of movement. A certain forming of the hand for which I will designate the word "coalescence" (a forming that results in a hand shape) allows successive notes or fingers to share in an overarching continuity. This coalescence shapes the hand so that fingers are positioned on the surface of the group of successive notes that are to be played. Without such a hand shape, a great deal of movement from the arm would be required to position each finger upon the note it is to play. Thus the topography of the keyboard, itself characterised by the height difference between the black and white keys and the height of the keystroke with its various intermediate mechanical events, is mediated by the hand shape which allows for the

topology of adjacent notes to feel smooth in the arm. A simple hand shape for five successive notes is a basic first step in learning the piano. Chopin, always pedagogically insightful, had students begin with the three longest fingers on the black notes, thus matching the topography of the keyboard with the topography of the hand (Eigeldinger 1988, Verbalis 2012). In musical passages the shape is constantly changing, so the coalescence is experienced as a dynamic activity. Roughly speaking, the amount of coalescent activity is an inverse relationship to the amount of activity required by the arm in negotiating the vertical and horizontal distances within the reach of one hand position. Fatigue, which is most often felt in the arm, can thus be overcome by more accurate coalescent activity in the hand.

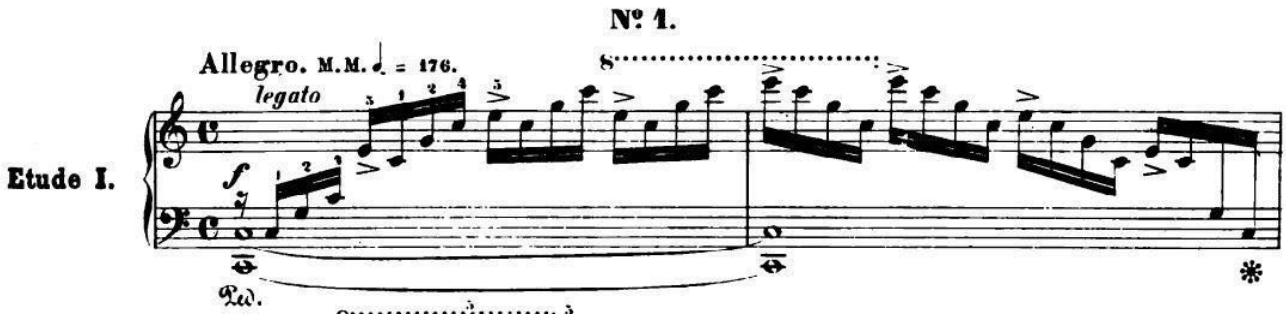
To explain in another way, if the arm follows behind each finger in a more-or-less straight line, then it will follow the contours of the notes on the keyboard. Coalescence of the hand can facilitate the smooth shaping of such overarching contours in the sense that the activity of muscles in the hand takes over and minimise the vertical activity of positioning the fingertip on the surface of the key and the distance of the key-drop during the attack of the note. A certain smooth topology of space is opened up by these contours, a topology that can be continuous even over discontinuity in the surface texture (articulation of the fingers). Of course the fingering has a large influence on the continuity of the forearm, as does the topography of the sequence of notes on the keyboard. If short fingers (thumb or fifth finger) are used on black keys, the arm must travel in towards the black key area, a movement that can be either continuous over a few notes or sudden and discontinuous in an "emergency situation."

The top arm is one joint further removed from the topography of the keyboard and articulation of the fingers, so it is roughly speaking more insulated from the small vertical negotiation of each individual note. Importantly, the top arm can move in one overarching

continuity while the forearm follows smaller nested trajectories, so long as the joints in question are flexible. The torso represents an even larger opportunity for continuity, since even the largest leaps of the arms can be contained within an overarching continuity of movement of the torso. Of course it would be a mistake to think of the torso as one unit of the body, when in reality there are enormous possibilities for movement through the rib cage that differentiate one shoulder from the other. The onset of weight into one arm or the other, for example, is governed by muscles in the torso that differentiate the stream of power from one side to the other.

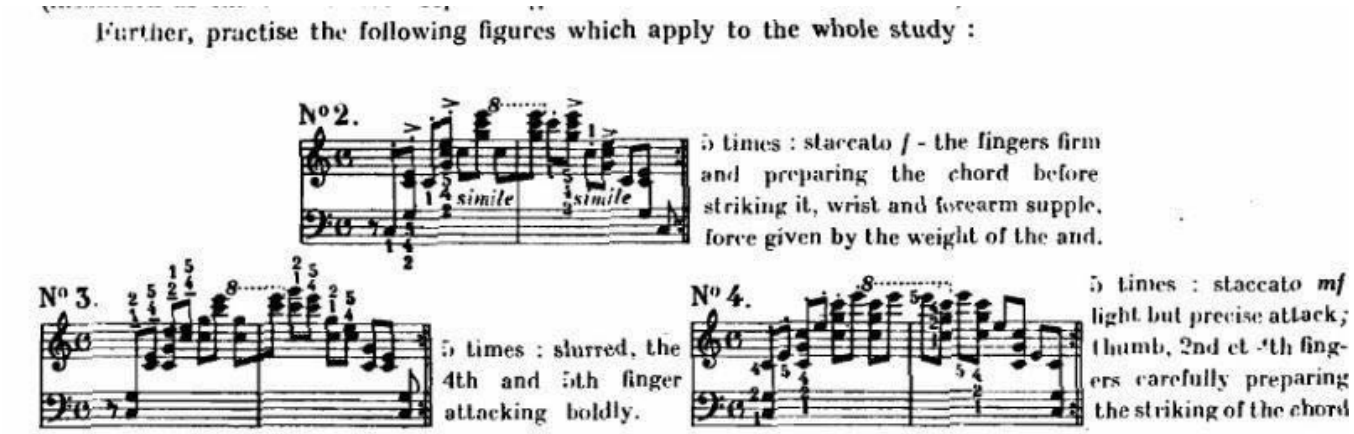
15.2.2.1 Anticipatory cognition and the "singing hand"

To begin with, consider the Chopin Etude op. 10 no 1. Here I give a version which follows Chopin's manuscript of the opening passage:



Example 15.1 Chopin Etude in C Major op. 10 no. 1 (Breitkopf, Rudorff, 1880)

In order to understand the kind of coarticulation involved, first consider this exercise taken from Cortot's edition of the Etudes:



Example 15.2 Exercises before Chopin Etude in C Major op. 10 no. 1 (Cortot, Maurice Senart, 1915)

In the instructions, he writes to prepare the fingers before striking each chord. That, together with the fact that he puts the notes together into chords, suggests the same ontogenetic physical process which begins with the overall groups of notes and only later puts them into the normal texture of one note after the other. Compare this to psychologist David Rosenbaum's definition of coarticulation: "the term *coarticulation* refers to the simultaneous motions of effectors that help achieve a temporally extended task" (Rosenbaum 1991: 15). From Godøy: "*anticipatory cognition*, in the sense of both planning ahead and actually moving effectors in place before they do their job, is an essential feature of coarticulation, and means that coarticulation works by considering whole chunks at a time" (Godøy 2011b: 72). Clearly the purpose of Cortot's exercise is the facilitation of coarticulation in the coalescence of the hand.

In this Etude, I describe the onset and offset of weight (a crucial overarching gesture which will be examined in its own section later in §15.2.3) as being *spread* around the accents by an intonation on the timescale of four sixteenth notes. This is due to the speed of the Etude and the fact that engaging larger levers to apply extra weight to a single note in this speed is impossible. Without such support from larger levers, the sound would

be too small for the forte dynamic, and the arms would tire before the end of the piece. Rather, the onset and offset of weight is engaged over groups of notes in a hierarchical structure (further discussed in §15.2.5). Coarticulation involves two related corporeal experiences: the coalescence of units at one level of gestural structure and the overarching movement that is possible as a result. These processes are so intertwined that they might seem to be two sides of the same phenomenon, but physically they are felt in different parts of the body and from that perspective they feel like two related but separate experiences. In this case, the hand must have enough tension or tone to hold the fingers in some kind of readiness proportional to the weight that they will receive. That readiness or tension allows the arm to be free to apply such weight - so the relation is clear. The spreading of weight over several notes is accomplished by various kinds of activity. The finger might activate the onset of weight with a finger attack. Forearm rotation might allow the transfer of weight (this is one of the fundamental ideas of the Taubman technique: see Golandsky 2003.) But there is a kind of spreading tension inside of the hand itself that anticipates the transfer and gives the stability that allows an overarching movement to occur. This kind of coalescence is a sort of strong but supple barrier between the movement of the fingers and the movement of the arm, allowing the fingers to engage in many small movements for individual notes, which nevertheless do not hamper the smoothness of movement of the arm.

In the Hanon examples (Part III), if the overarching movement over groups of sixteenth notes were to be applied without this kind of coalescence or tension, then the notes which are played with the arm (the goal notes corresponding to the timescale of the gesture) would be strongly accented and the notes in between would be very weak (because the arm is much more massive and strong than the fingers). But this is not necessarily the case. I can also spread the weight of the arm through the notes that occur

during the phase of gesture when the arm is going up - and I do this with a kind of strength of the hand that spreads the weight of the arm's attack across several surrounding notes.

This kind of tension of the hand can be demonstrated very easily with pressure and movement on a surface (like a table for instance.) Starting with the wrist in a neutral position, effect an onset of a strong pressure into the fingertip (until the end of the nail turns white) while simultaneously raising the wrist. Then repeat the same movement while spreading the onset over several successive fingers. Connections can be felt between the finger that is "playing" and the other fingers. For example, holding the thumb strong in a gently curved position (similar to a resting position) can give stability to the third or fifth fingers. It is thus also in position that is ready to play. Similarly, holding the last joint (the distal interphalangeal joint) of one finger strong is an activity that can be supported by activity in the whole hand, which places all fingers in a similarly anticipatory shape. Such a feeling of activity in the hand allows the arm to move freely over groups of notes, and the shock of each attack remains local in the hand and does not reverberate up the arm.

Chopin's first etude develops coalescence by the even spreading of weight over groups of notes and by the opening and closing of the hand suggested by the contour of the notes. This coalescence must be balanced with a suppleness of the hand for the etude to be played fluently and without fatigue. Chopin's student Friederike Müller-Streicher remembered:

> When I played with him the study in C major, the first of those he dedicated to Liszt, he bade me practice it in the mornings very slowly. "You shall benefit from this Etude. If you learn it according to my instructions it will expand your hand and enable you to perform arpeggios like the strokes of the bow. Unfortunately, instead of teaching, it frequently un-teaches everything". I am quite aware that it is a generally-prevalent error, even in our day, that one can only play this study well

> when one possesses a very large hand. But this is not the case, only a supple hand is required" (quoted in Ekier 2000)

While this might seem like a technical matter, this very *coalescence*, taught to beginners as the rounding of the fingers, and then "un-taught" by the shifting kinaesthetic dynamic of the opening and closing of the hand in Chopin's study, and the *suppleness* thus developed, become a site of expression in legato playing. Coalescence as a bodily phenomenon is close to what Doğantan-Dack calls the "singing hand" (2011) in that it represents a certain sustained tension which embodies the sustained quality of the phrase and enables a sustained sound, whether it be in fast passages such as this Etude or in more lyrical passages. Doğantan-Dack uses this photograph of Gilels in performance to show what Godøy would call anticipatory cognition:

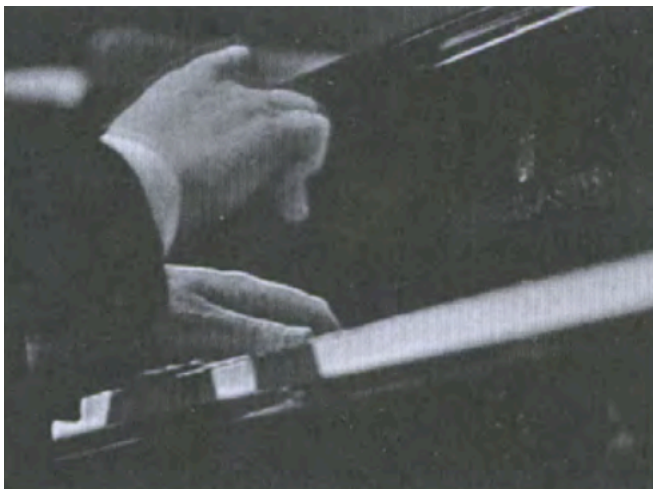
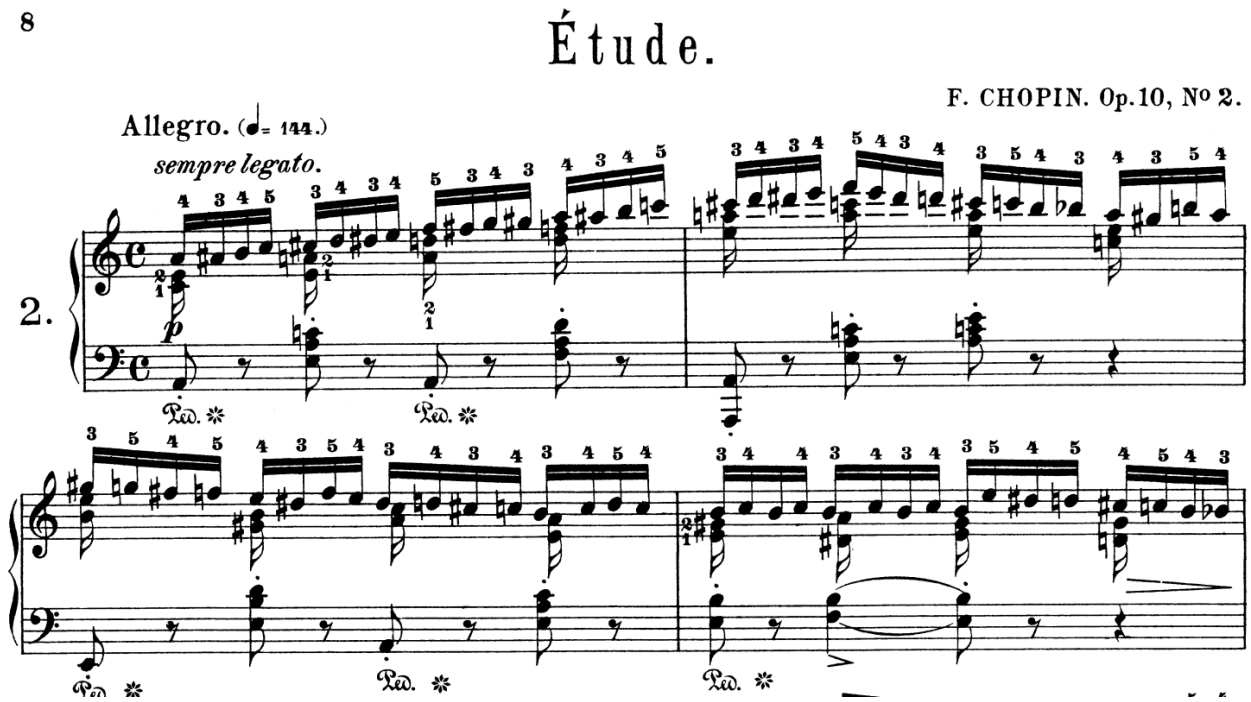


Fig. 15.1: The hand of Emil Gilels preparing to play a melodic note in the first movement of Tchaikovsky Concerto No. 1 in B-flat minor op. 23 (image taken from Doğantan-Dack 2011: 257)

In the research of Doğantan-Dack, the idea of normative pianistic cantabile is further developed by a survey of pedagogical literature, where she finds "the image of grasping, or grabbing the keys" (Doğantan-Dack 2015: 185). Out of this insight, she offers the "principle of overhand grip" as another constitutive element of pianistic cantabile, a

principle that refers to a coalescent experience of the hand in anticipation of touching an object. It is precisely these embodied experiences in the hand that Chopin prepares through virtuoso playing. Whereas in a cantabile passage, a (untalented) student could still make their way through the notes without the "singing hand" or without the activity of the "overhand grip," in the first Etude these experiences are required without compromise by the difficulty of the Etude. Indeed, Chopin's first Etude demands a virtuoso command of the coalescence and suppleness of the hand, and these same muscles and body schemata are directly relevant to the production of a cantabile sound.

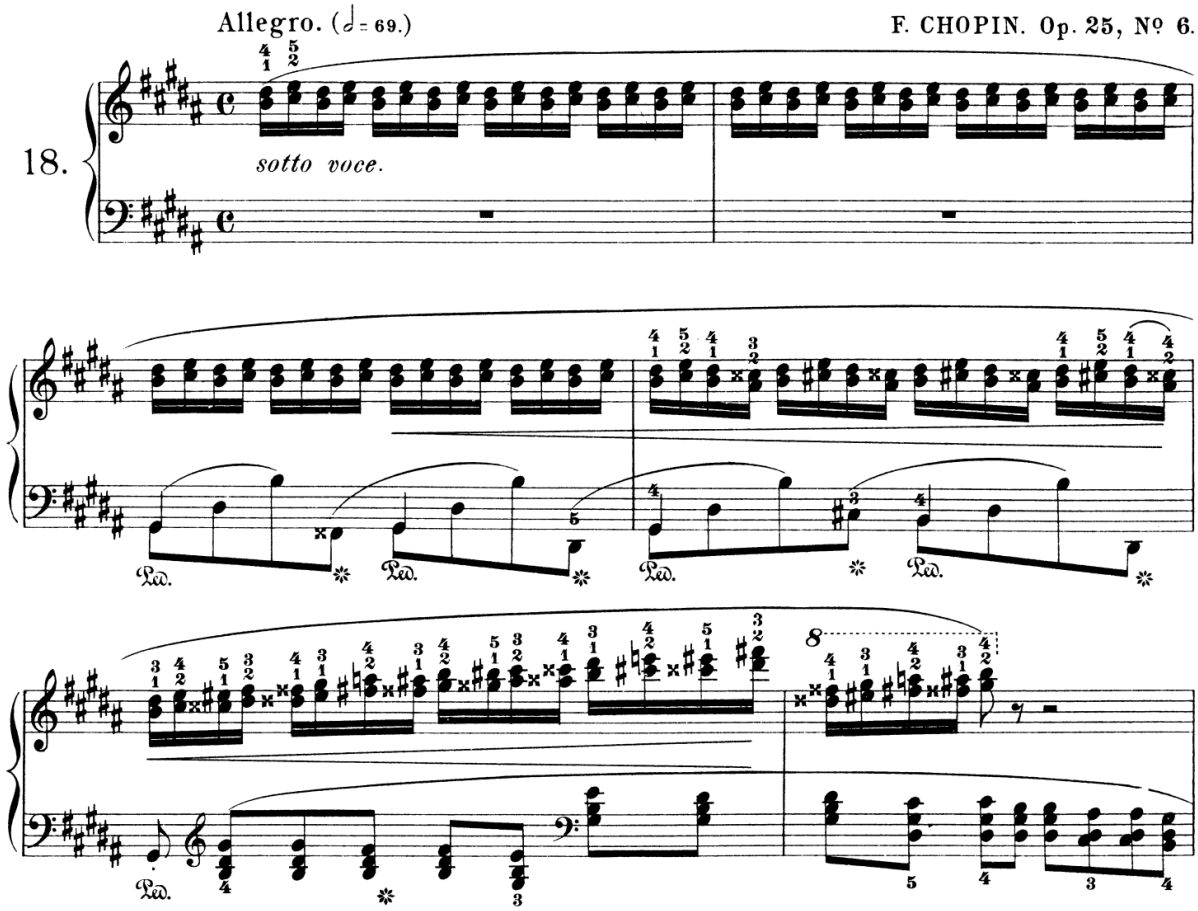
While I have chosen to begin with the first Etude, similar specific demands of coalescence are found in all the other Etudes, often in combination with varying other overarching gestures. In the second Etude (op. 10 no. 2) Chopin aims to develop such a kind of cohesive strength or coordination in the hand between the fingers 3-4-5. This study is quite difficult, and demands an expert control of coalescence in the hand in coordination with particular overarching shapes from the forearm. Above that, an even but slight onset of weight from the top-arm helps to create the crescendo over the ascending lines without fatigue. In this case, the coalescing strength in the hand functions not to deliver weight (or not very much) but rather to keep the fingers in a position ready to play the next note - a variety of anticipatory cognition - which then allows larger levers a smoothness of topology, at least over groups of four sixteenth notes. The development of coalescence in fingers 3-4-5 connects quite directly to the experience of playing the third Etude (op. 10 no. 3) which I will discuss further in §15.2.3



Example 15.3: Chopin Etude in A minor op. 10. no. 2 (Schirmer, Mikuli, 1895)

15.2.2.2 Unification of hand - double notes, one gesture

The feeling of tension or readiness that characterises the "singing hand" is dynamic and connects in a plastic manner to the keys, often with a sense of "overhand grip." However, not all experiences of coalescence have this sort of grip. One specialised case of coalescence occurs in the playing of double notes. In the playing Chopin op. 25 no. 6, for example, the double thirds can be played with the fingers which play *individually* but coincide in time.



Example 15.4: Chopin Etude in G-sharp Minor op. 25 no. 6 (Schirmer, Mikuli, 1895)

The danger of this approach of articulation by the fingers is that the simultaneity of these individual attacks can easily "disintegrate" in performance. When this disintegration happens, the attack of each of the thirds is no longer together, an unfortunate problem that plagues many student pianists. A much more stable approach is to make an appropriately shaped frame in the hand and to take both notes with one movement. The articulation in this latter case occurs primarily elsewhere than in the fingers, although the fingers are extremely active in shaping and reshaping the coalescence of the hand. According to the Taubman approach, the articulation to be employed is double rotation, always directed inwards towards the thumb (Golandsky 2003). Pianist Gyorgy Sandor argues for a staccato or non-legato approach in double notes (Sandor 1981: 93-97). In any case, finger articulation, articulation by double rotation, and staccato articulation are not mutually

exclusive, since these movements blend in an accomplished technique. The balance between these initiators of movement, however, is of utmost importance. It does seem to be the case, when reflecting about double notes, that the initiation of the articulatory movement can be localised in either the fingers or in the vertically unified experience of playing both notes with one gesture, while the fingers retain their shape. In my playing, I feel a connection between how the vertical sonority is played (either as one articulation for both notes or as two articulations, one for each note) and how I hear it. The sense of heard polyphony is greatly enhanced when the fingers articulate each note individually within the vertical sonority, or at least when such finger articulation is felt as initiating the act of playing. On the other hand, leading the articulation of vertically aligned notes with double rotation leads to a slightly flatter, more one-dimensional sound, despite the fact that this vertical sonority can be shaped and voiced at will. Whatever benefits the finger-oriented articulation might have in perception in slower passages, what works for me in the Etude op. 25 no. 6 is a light double-rotation with a completely relaxed wrist, giving the feeling of fluttering over the keys in a light legato rather than sinking into them.

15.2.3 Division and Weight

If the playing mechanism is viewed as a hierarchy[64], with the fingers on the lowest level, division in the initiation of movement occurs in a hierarchically removed and hierarchically similar fashion. In the first category is the separation between the initiation of movement between hierarchically removed levers, for example by the fingers as distinct from the arm. Such a coordinated vertical division of movement is described by Sandor in his account of the staccato motion, where each lever participates (Sandor 1981: 96). In the second category is the separation of movement between two different fingers, or between

[64] Imagine a skeleton: one spine, two top arms, two bones in each of the two forearms, and ten fingers

the two arms, a kind of division encountered in the previous section with finger-articulation of double notes. Clearly both kinds of division are important for piano playing, and particularly so for the unique demands of the Chopin Etudes.

Parallel to the division of the initiation of movement, the division of the onset and offset of weight is an aspect of extensional gesture which is crucially important in piano playing, and one which will be presented in §15.2.3.2. It is often more audible than visible. Weight is sometimes misunderstood as relaxation, which leads to heaviness and boredom. In fact, as I will show, applying weight to the keys is a particular kind of activity that gives enough resilience to joints towards the periphery of the playing mechanism to transmit weight from the relatively more massive levers closer to the centre of the body. If the playing mechanism were to be completely relaxed, the weight in the fingertip would be minimal since without this structuring and supporting activity of the muscles, weight from the arm or the torso cannot be transmitted.

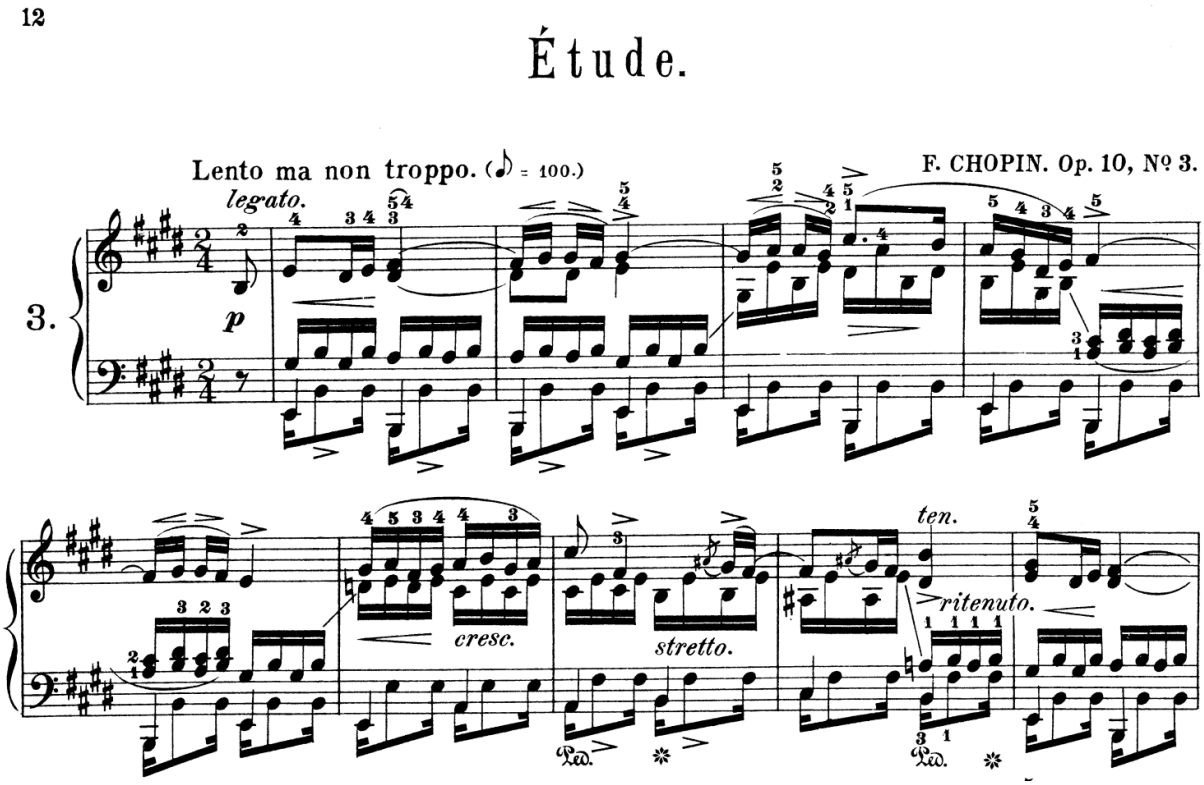
15.2.3.1 Levers and felt time

Of course different levers have different mass, but this mass is mediated by the gradient of resilience across various joints. Because of their different mass, these levers also have different inertia leading to different *felt* temporal profiles. In the book *The Primacy of Movement,* phenomenologist Maxine Sheets-Johnstone reflects on the difference between phenomenal world time and felt time, a difference emphasised in the writing of philosopher Ronald Bruzina (Sheets-Johnstone 2011: 126). Sheets-Johnstone explains the difference between ordinal and cardinal structures in time, the former being *quantitative* and the latter being *qualitative*. She gives the example of "suddenly" as a form of apprehension of a now moment, an example taken from Aristotle, and argues that it is different from other apprehensions of the now moment like "just now" or "a long time

ago." In the felt time of the musical performance, the mass and the resultant inertia of levers results in a different felt time depending on which lever is used. "Suddenly" is a good example, since what is sudden for the arm is *longer* in terms of ordinal time than what is felt as "sudden" for the fingers. Thus levers have both different weight and a different sense of inertia-towards-movement and inertia-in-movement. The division of activity between levers is thus conditioned and in some cases (involving, for example very fast notes) is limited by the felt perception of the levers in both their amount of time-to-activation and their weight.

15.2.3.2 Streams of power

While the employment of weight by use of levers of various mass is conditioned by and interdependent upon felt time, and invested into smaller levers by resilience across joints, the way it is poured into these hierarchically lower levels is asymmetrical. I refer to *streams of power* in order to contrast the amount of weight invested from one hierarchically higher lever into multiple parallel hierarchically lower levers. To describe streams of power, I will use the example of Chopin's Etude op. 10 no. 3. Often called the "voicing Etude" by students, this Etude can be used to learn how to invite weight into one part of the hand more than the other. The right hand part has both melody notes (often longer note values) and accompanying notes. The melody notes seem to invite a kind of sustained weight that embodies their expressive shape, coupled with the correlated coalescence in the hand, which invites the weight only into the melody notes and not into the accompanying notes.



Example 15.5: Chopin Etude in E Major op. 10 no. 3 (Schirmer, Mikuli, 1895)

The onset of weight from a higher lever in the body (the forearm or torso) into the fingers needs to be divided to achieve this balance. If we envision the weight as a stream, then the melody notes receive the stream of weight and the accompanying notes operate with smaller levers outside of the stream of weight. I shall refer to notes as being "in-stream" or "out-of-stream" with respect to weight. In most cases, weight is divided unequally between different simultaneous sounding notes (because most chords or double notes are unequally voiced). One gesture may play the double note or chord as a unity (§15.2.2.2) but the coalescing tension of the fingers invites the weight to land on one side of the hand more than the other, or through one finger more than another.

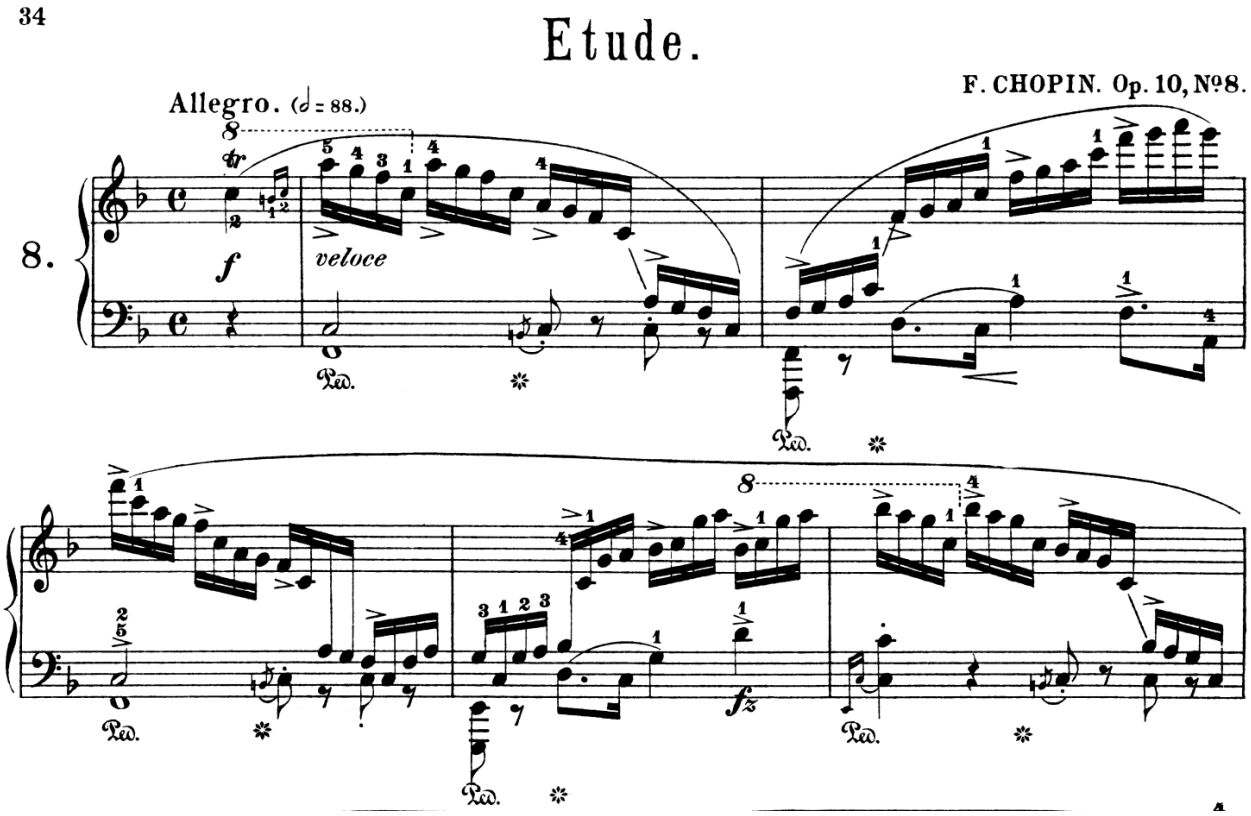
In the last paragraph I referred to the division of weight between one side of the right hand and the other, accomplished by an activity in the hand that invites the weight more into one side than the other. A parallel division of weight occurs between the arms when the onset of weight originates from the torso. As previously discussed, the transfer of

weight from the torso to the fingertip is dependent in any case on some muscle tone across the various joints separating the torso from the fingertip - if the joints are all completely relaxed then the movement of the torso would not result in any onset of weight in the fingertips. That sense of muscle tone or resiliency across the joints is by no means a fixing of the joints movement into a certain angle; it is rather a gentle resistance that invites some of the impulse from the torso into the fingertips. This activity of each arm in inviting the weight of the torso can happen unequally, resulting in one arm being "in-stream" and the other "out-of-stream." A correlate activity can take place in the ribcage, which can send movement or weight into the arms, either equally or unequally. This particular activity can be felt by placing hand on the table and leaning forward, and then shifting the weight slowly between one hand and the other and observing which muscles are active in this process. "In-stream" and "out-of-stream" are the extremes of division, but in reality there is often a gradient where a certain percentage of weight goes to one side and the rest to the other. When this gradient is held continuous over successive notes or chords, the voices end up dynamically stratified. When the gradient is in flux, the result is divergence in expressive shape, which will be discussed in Part IV.

15.2.4 Contours and rhythms

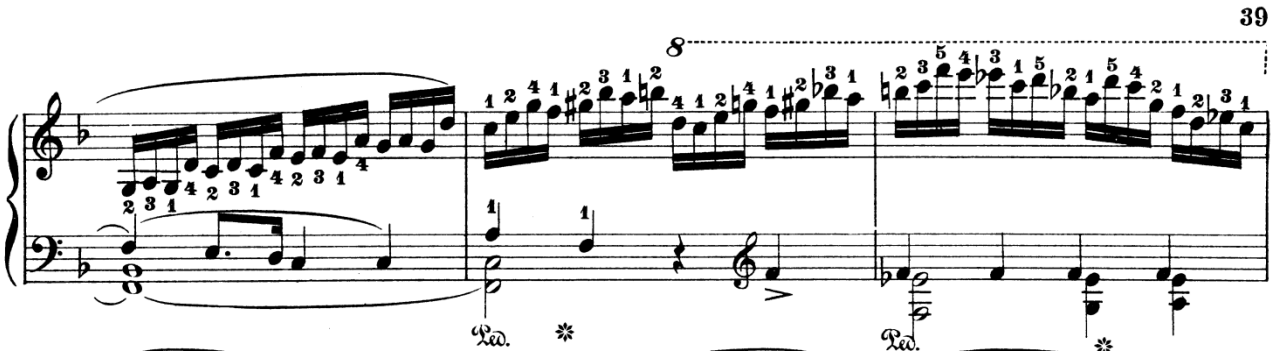
As I described in §9.5, musical gesture can be categorised as contour-based or rhythm based. These types of gestures often blend, and in the Etudes Chopin highlights and problematizes this interaction by superimposing contour- and rhythm-based patterns that occur on unlike timescales. Take for example the Etude op. 10 no. 8, which begins with metrical accents that coincide with the fingering shift in the opening passages, allowing the arm to easily move in sympathy with the rhythm of the music (Example 15.6). Later in the piece, this resonance between movement and meter is broken as Chopin

introduces a contour-based pattern of three sixteenth notes onto a rhythm-based pattern of four sixteenth notes (see the right hand part of the second measure of Example 15.7). This superimposition brings the motivation for the shape into awareness, since a contour-favouring approach would sound quite different than a rhythm-favouring approach.[65] In fact, if this were composed as free standing notes without meter, the hand would naturally intone the notes based on the contour, so adding the expression of rhythm- or metre-based intonation can be seen as an extra step. In some music the hemiola effect is desired, but often in Chopin the most interesting approach is the combination of both metre- and contour-based intonation, which combine in creating a complex topology of gesture.



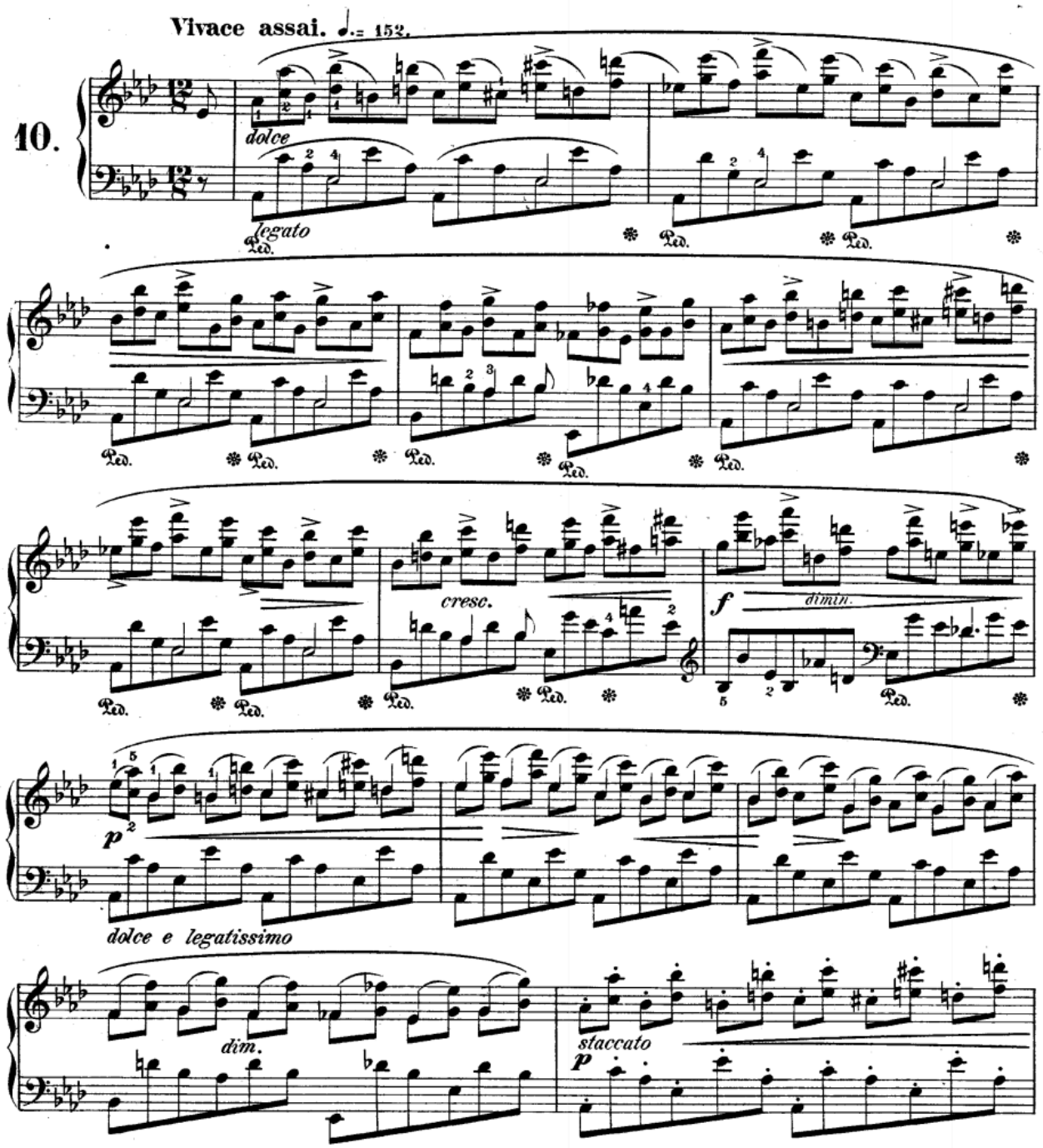
Example 15.6: Chopin Etude op. 10 no. 8 in F Major (Schirmer, Mikuli, 1895)

[65] The rhythm-favouring approach would follow the metre, which is further strengthened by the quarter notes in the left hand.



Example 15.7: Chopin Etude op. 10 no. 8 in F Major (Schirmer, Mikuli, 1895)

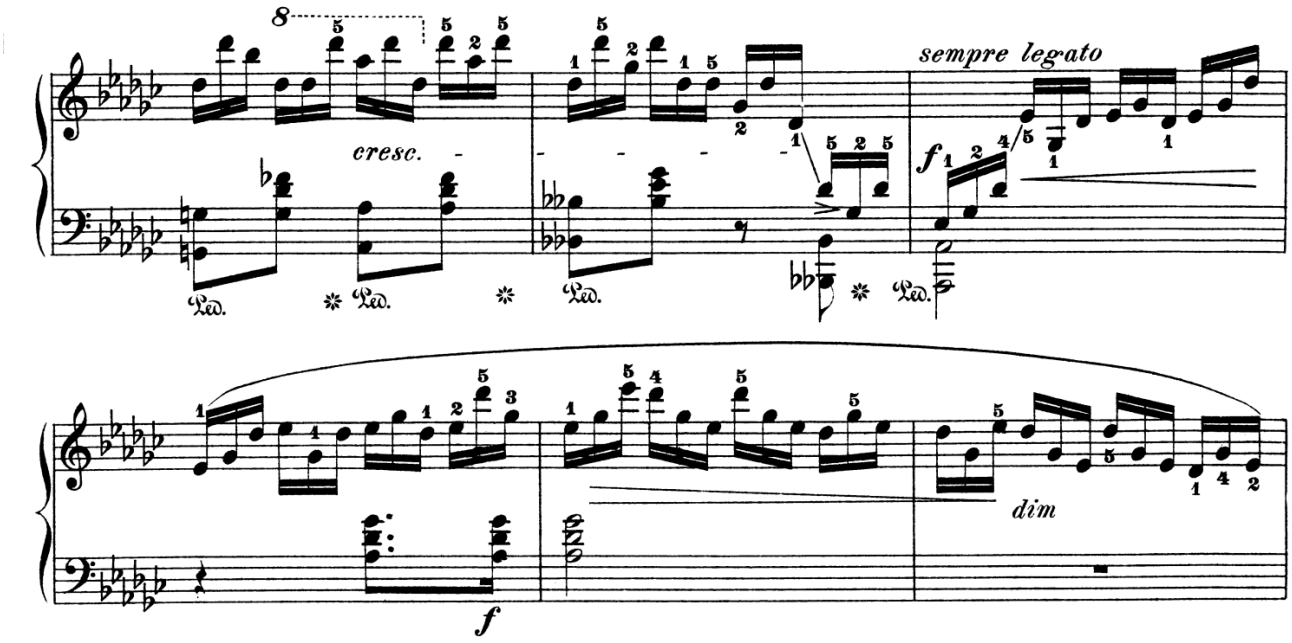
In the Etude op. 10 no. 10 (Example 15.8), different options of grouping are superimposed upon repetitions of similar material, requiring topologically distinct coarticulation. In the case of the accentuation over three eighth notes, the smallest overarching gesture embodied by the forearm falls into these accent patterns, whereas starting in measure 9, the same material falls into patterns of two eighth notes in the right hand while the left hand continues in grouping of three eighth notes.



Example 15.8: Chopin Etude in A-flat Major op. 10 no. 10 (Bote & Bock, Klindworth, 1880)

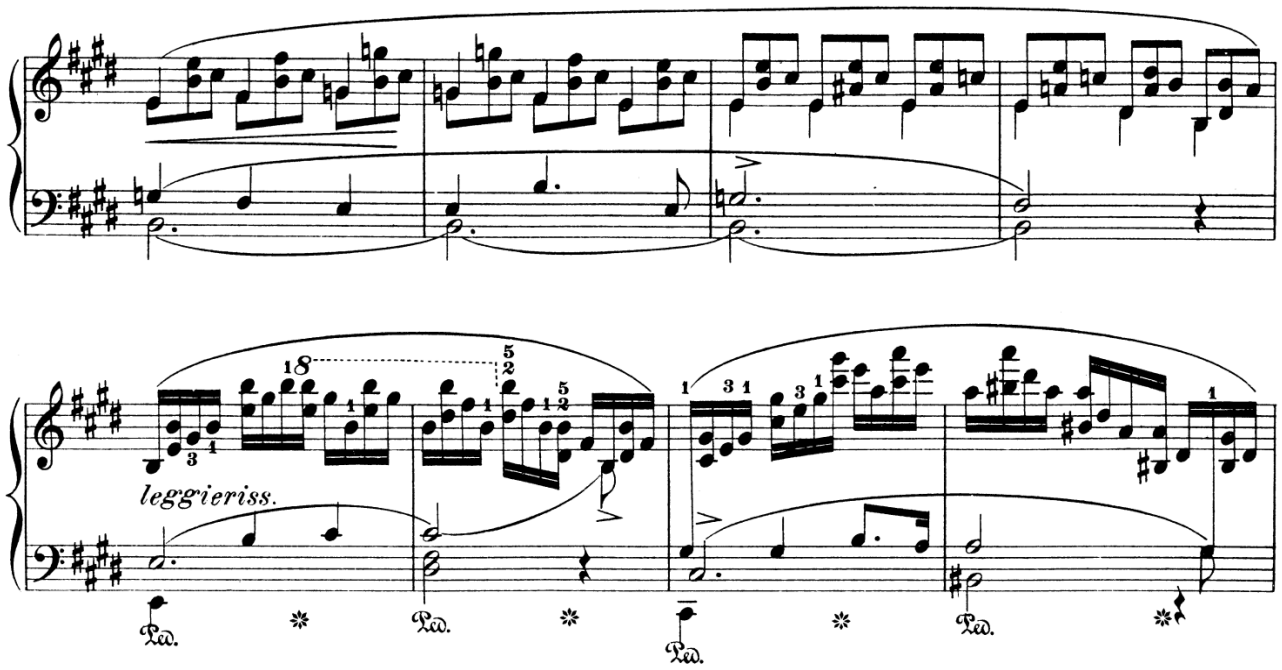
Similarly, the Etude op. 10 no. 5 has a layering of contour- and rhythm-based groupings that fall on unlike timescales. It can be observed even in the first two measures of Example 15.8, where the rotational unit of two notes in the right hand (left-right) forms

a grouping of two notes, over which the rhythmic grouping of three notes is superimposed. More noticeably, in measures 3-6 of Example 15.9, the contour-based grouping of four notes is layered over the rhythm-based grouping of three notes.



Example 15.9: Chopin Etude in G-flat Major op. 10 no. 5 (Schirmer, Mikuli, 1895)

Another example is found in the transition from the triplet eighth notes to sixteenth notes in the right hand of the following example. Like in the A-flat Etude (Example 15.8 above), Chopin gives two contrasting embodied experiences in a similar kind of figuration. In the first case, the thumb coincides with the metre and voices the melody, whereas in the second case, the figuration, with its lateral unfurling, suggests a contour over groups of three sixteenth notes while the metrical structure suggests a grouping of four sixteenth notes.



Example. 15.10: Chopin Etude in E Major op. 25 no. 5 (Schirmer, Mikuli, 1895)

Several other Etudes suggest similar patterns of unlike rhythm- and contour-based intonation, and indeed these details represent an important intensification of the complex topology of gesture. Lateral movement suggested by contour, in and out movement covering alternately the black and white key areas, the application of weight for rhythm-based intonation, and vertical movement all combine in the legato ("smooth and flowing") gestures, building a complex and versatile set of body schemata and a freedom of movement that is then available for use in other music.

15.2.5 Hierarchical organising principles

Regarding the initiation of movement, one can contrast *top-down* gestures that come from the centre of the playing mechanism to the periphery and *bottom-up* gestures that seem to be triggered by or grounded in the topography of the keyboard. Top-down

gestures are characterised by progressively more movement in the flow from centre to periphery. This can be thought of like the moving of the hand of a clock: the part towards the middle moves the least but steers the movement of the whole hand. By contrast, bottom-up gestures ground themselves in points on the keyboard that remain rather more constant while the arm pivots around them.

15.2.5.1 Centre to periphery / Top-down

To examine the top-down perspective, let us revisit the first Etude, this time in the edition of Cortot:

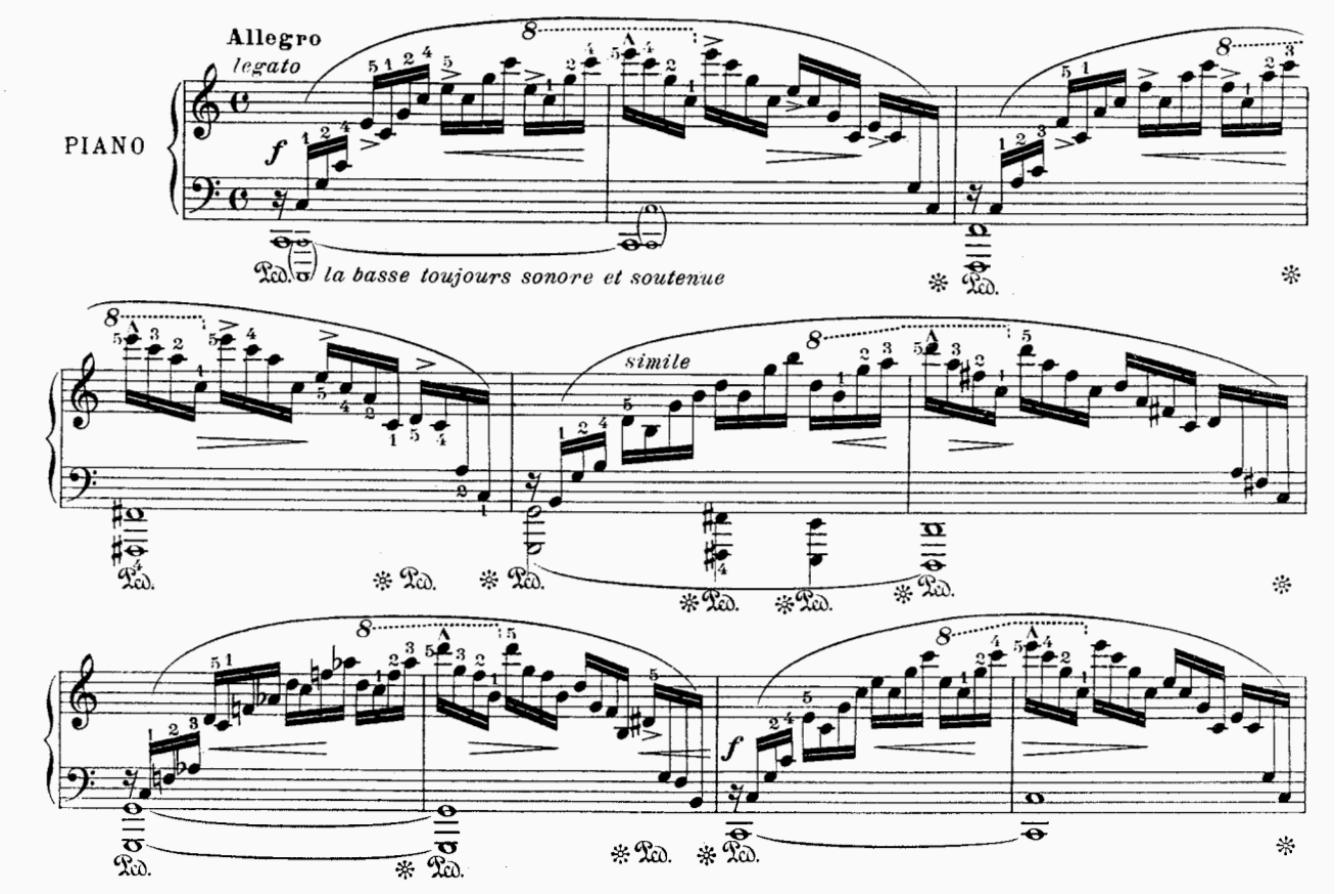


Figure 15.11: Chopin Etude in C Major op. 10 no. 1 (Senart, Cortot, 1916)

The timescale of nested gestures is clearly to be seen in the notation, both in the contour and in the expression marks from Cortot. Starting from the top down, we have the direction that the bass should be "always sonorous and well sustained." This directive suggests an active legato touch between the octaves whereby the continual contact or pressure on the bottom of the key is maintained through the phrase (the legato fingering holds always one note as the hand finds the next octave). This physical experience can be viewed as extending over the whole eight bar first phrase. On the next lower level, there are two bar phrases, notated with slurs and dynamic swells. These suggest an onset and offset of weight by the right hand. Note how Cortot marks the top note with a ^, clearly showing what Whiteside would call the "goal note" or what Godøy would call the "target" or accented point, surrounded by prefix and suffix gestures. On the next level down are the accents marked on the quarter notes. Should they be played simply as accents removed dynamically from their surrounding notes, they would break the directive of "legato," a directive that is in Chopin's manuscript. Taking them together with the legato, then, they suggest dynamic intonations around the accent, whereby the onset-offset of weight that creates the accent is spread over the directly surrounding notes. This spreading in turn suggests yet another overarching gesture over small groups of notes. Finally, at the lowest level is the finger action that takes every sixteenth note.

Thus Cortot's edition of this first phrase implies *at least* these levels of hierarchically nested gestures:

1. The eight bar phrase
2. The two bar phrase
3. The quarter notes
4. The sixteenth notes

These four levels already exceed the three levels (*micro-* *meso-* and *macro-*) of Godøy, and I have not discussed the larger sections of the piece yet, sections which are marked by building excitement and visceral developments which are just as much physical as the movement of a finger. Again, here is an edition that has fewer editorial additions:

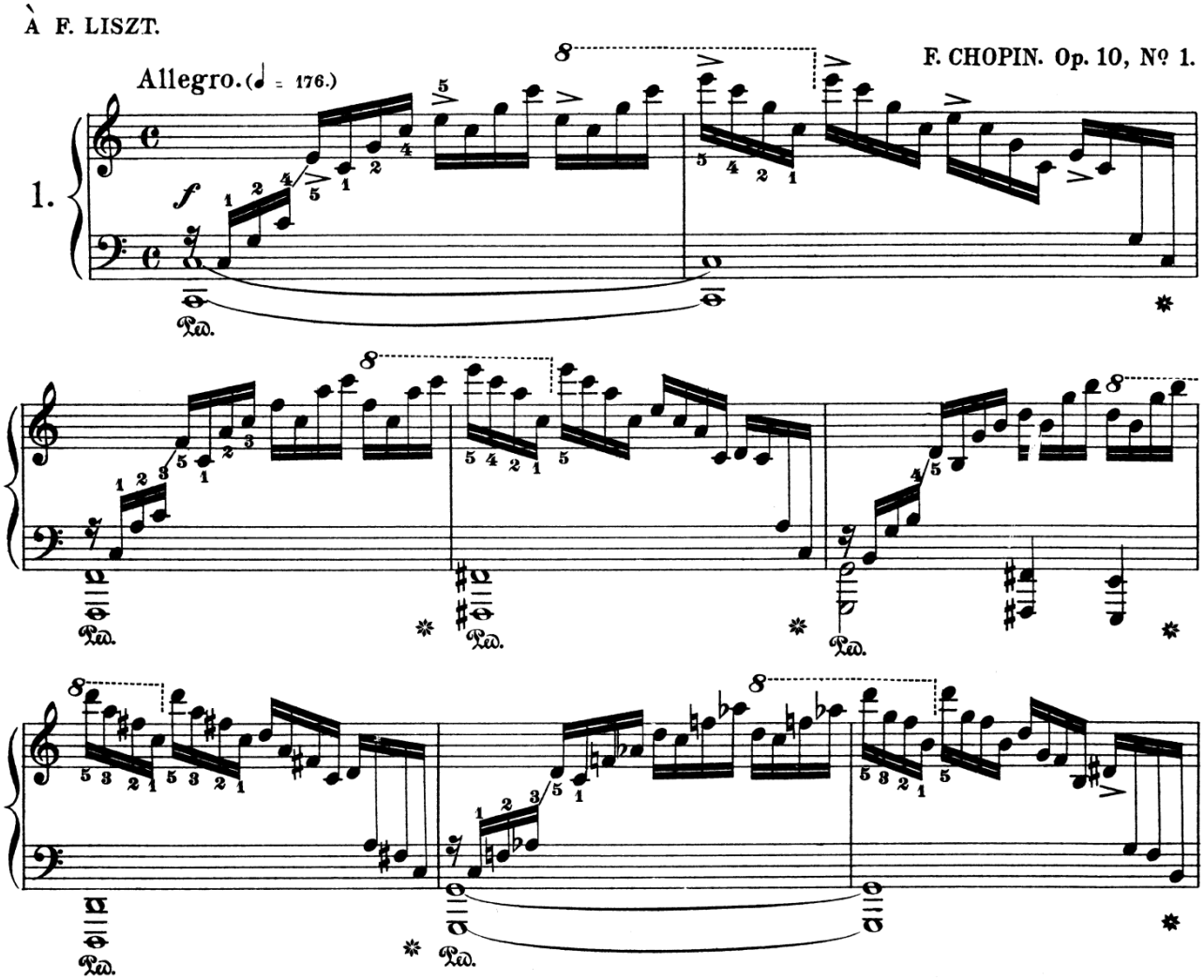


Figure 15.12: Chopin Etude in C Major op. 10 no. 1 (Schirmer, Mikuli, 1895)

Notice that the accents and legato marks are original, and the two bar and eight bar phrases are obvious. Of course, one might argue that it would be possible to play this passage without some of the characteristic coarticulation I have described, for example it

might be possible to play this passage without the application of weight, but from my experience playing and teaching this piece, if it is to be played forte, legato, at mm=176, and with the accents, those physical experiences will arise naturally since they are indeed indispensable for such a virtuoso execution.

The direction of sound-producing gesture in this passage (that is the direction in space) can seem largely to be determined by the contour of notes (§9.5). The hand must travel across the keyboard to reach the right notes, after all. However in closer examination, this direction and where it is felt is a key part of how the technical difficulty of this study can be overcome. As Whiteside points out, the direction of the right top arm must be in a continuous direction across the first measure, *not* following the change in direction between the fourth and fifth sixteenth notes and parallel places (Whiteside 1997). These smaller changes of direction should be taken by the wrist end of the forearm, and should be "tucked into" the overarching continuity of the top arm. There is a fundamental structural difference between these two ways of playing the first measure (and all subsequent measures of the Etude, following the same principle). In the case that the top arm retains this continuity on the timescale of the measure, its gesture is hierarchically removed from that of the forearm and hand. In the other case, if the top arm follows the changes of direction occurring on every quarter note, it is working as a unit with the forearm and thus is on the same hierarchical level of gesture. The two embodiments are thus topologically and structurally dissimilar. The difference lies in the possibility for movement of the joints (and by this I do not particularly mean flexibility in the sense that can be gained by stretching, but rather in the body schemata that allow such freedom of movement in performance). Chopin used the imagery of bowing to describe this overarching gesture of the top arm (see recollection from Chopin's pupil Friederike Müller-Streicher quoted in §15.2.2.1).

The reason that I list this as a top-down example is that the order in which the gestures are ingrained really matters in achieving this overarching "bowing" of the top arm, and the topology of the gesture depends on this continuity of direction. Whiteside describes a process that she calls "outlining" to explain practically how to do this (Whiteside 1997). Outlining involves playing only the goal notes first, and gradually filling in hierarchically less important goal notes and finally the whole texture. The process focuses on preserving the overarching gesture while adding subordinate timescales, and typifies the top-down approach.

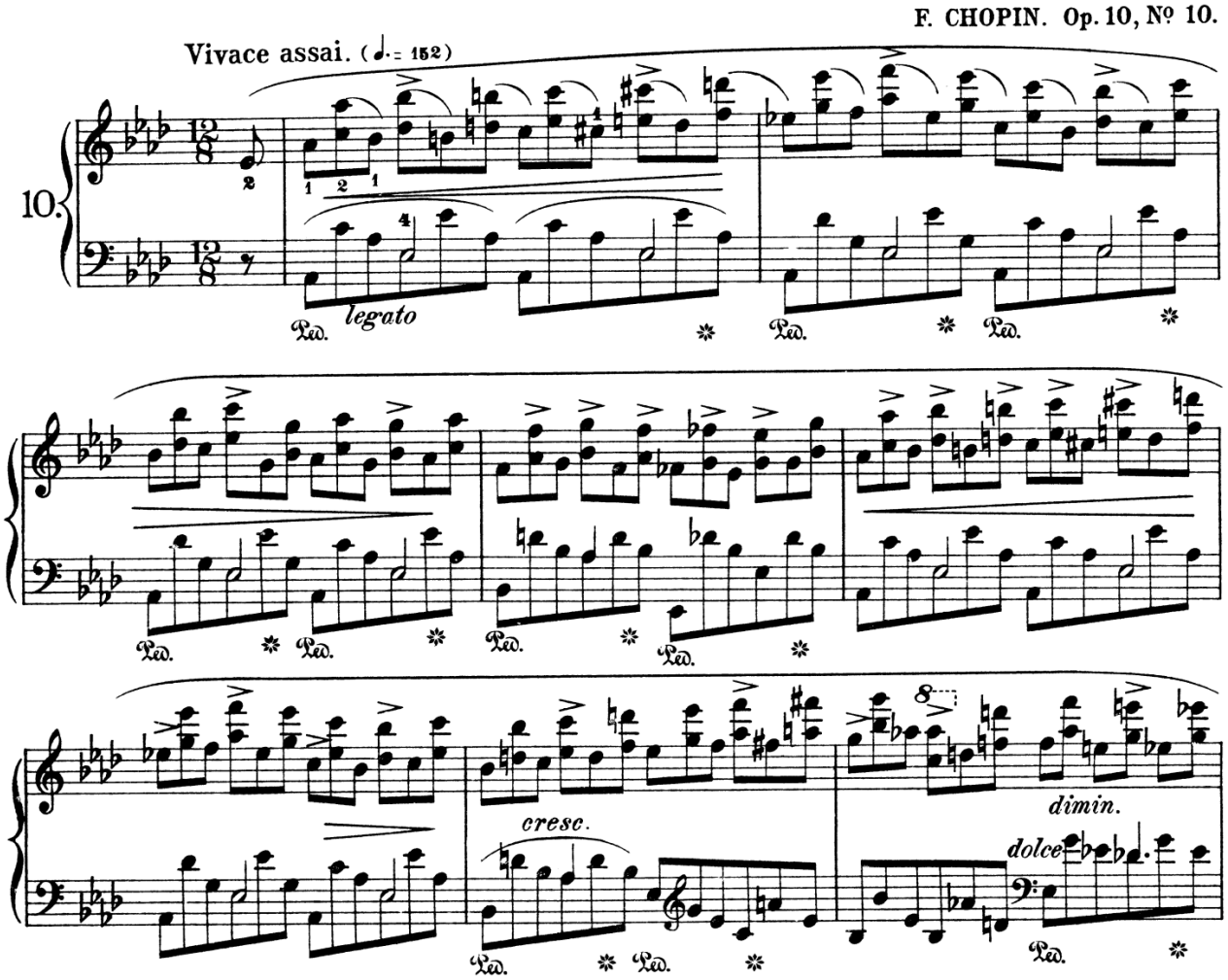
In other cases, choosing notes to play with a movement of the arm by playing from (slightly) above the key can trigger this top-down orientation. For example in op. 25 no. 12, the accents at the beginning of each measure can be taken with a separate movement of the arm. The lifting at the end of each measure and falling from above back down on the following downbeat is suggested both by the slurs and by the accentuation. This accent vertical energy provided by the mass of the arm can then be spread over the two or three notes that directly follow, removing any angularity or harshness from the sound even at a loud dynamic. The energy rebound from this all-important initial attack then provides the momentum for the passage that follows, although the accent in the middle of each measure requires much more muscle activity in terms of both coalescence and resilience since it is not preceded by a lifting of the arm, and thus cannot benefit from such a vertical drop.

15.2.5.2 Periphery to centre / Bottom-up

There are also cases where the sound-producing gesture is grounded outside of the centre of the playing mechanism - namely around points on the keyboard and in gestural

continuities that cross hierarchically similar levers sequentially, bypassing the temporal inertia of larger levers.

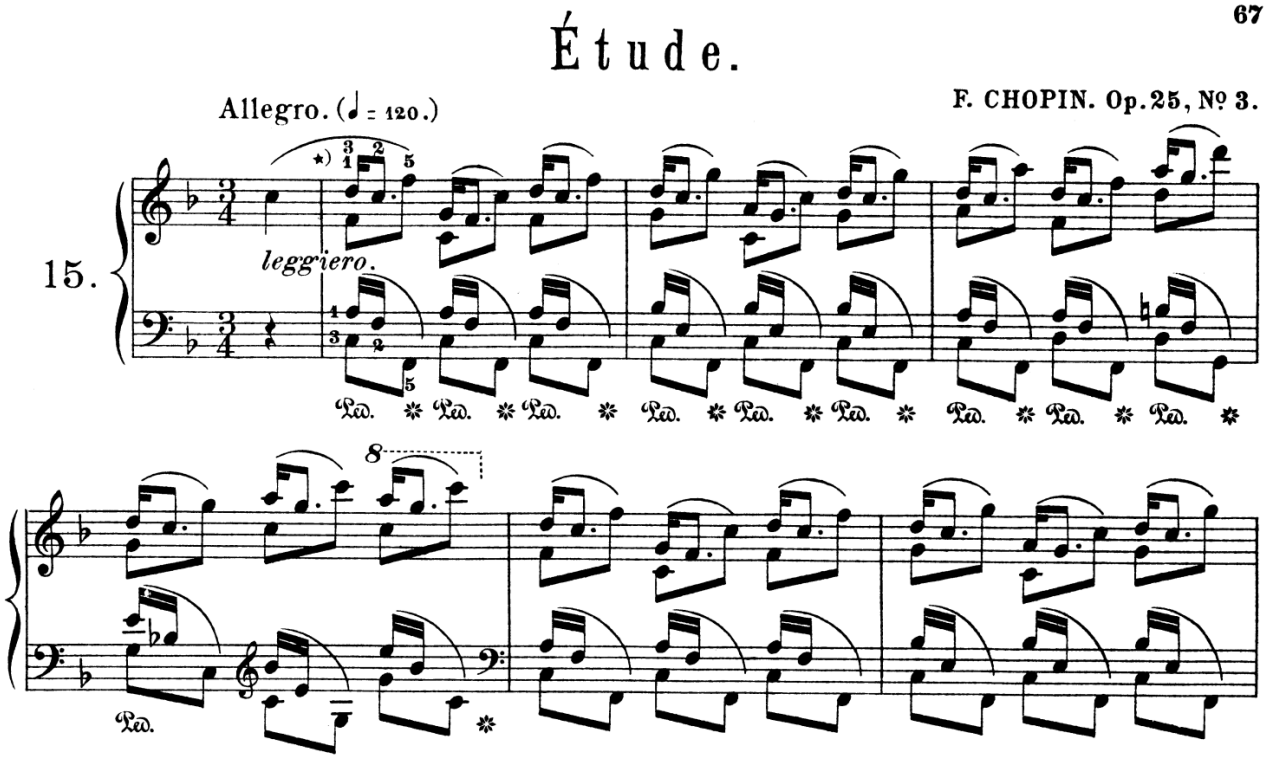
In the first case, Chopin's music is full of passages, especially in the left hand, where a pivot finger is a point of orientation. An example of this is clearly notated in op. 10 no. 10.



Example 15.13: Chopin Etude in A-flat op. 10 no. 10 (Schirmer, Mikuli, 1895)

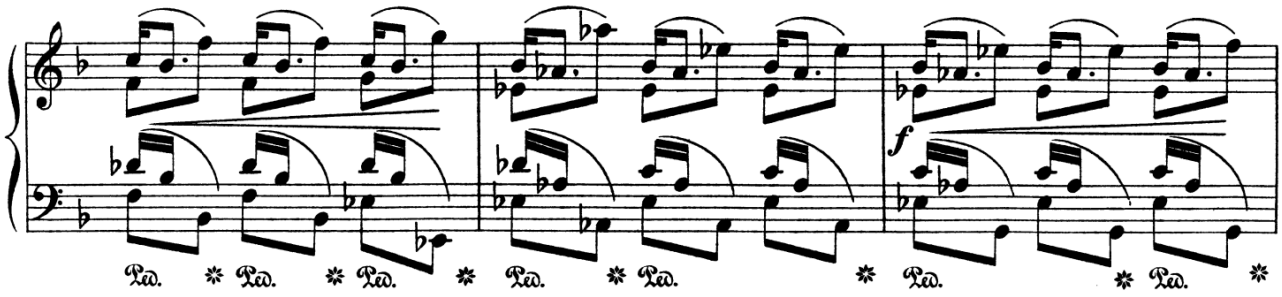
The held E-flat provides a point of stasis around which the hand pivots. Thus, the passage is guided by this external spatial point of reference, and the gesture itself is moulded flexibly around this point. While this note is actually a held note in Chopin's notation, there are many examples where the pivot note is not explicitly notated. For example in op. 25 no. 3, the pivot note of C in the left hand must be simply discovered by

playing - it quickly becomes apparent that it is the guiding gestural point of reference even though it is not actually held.



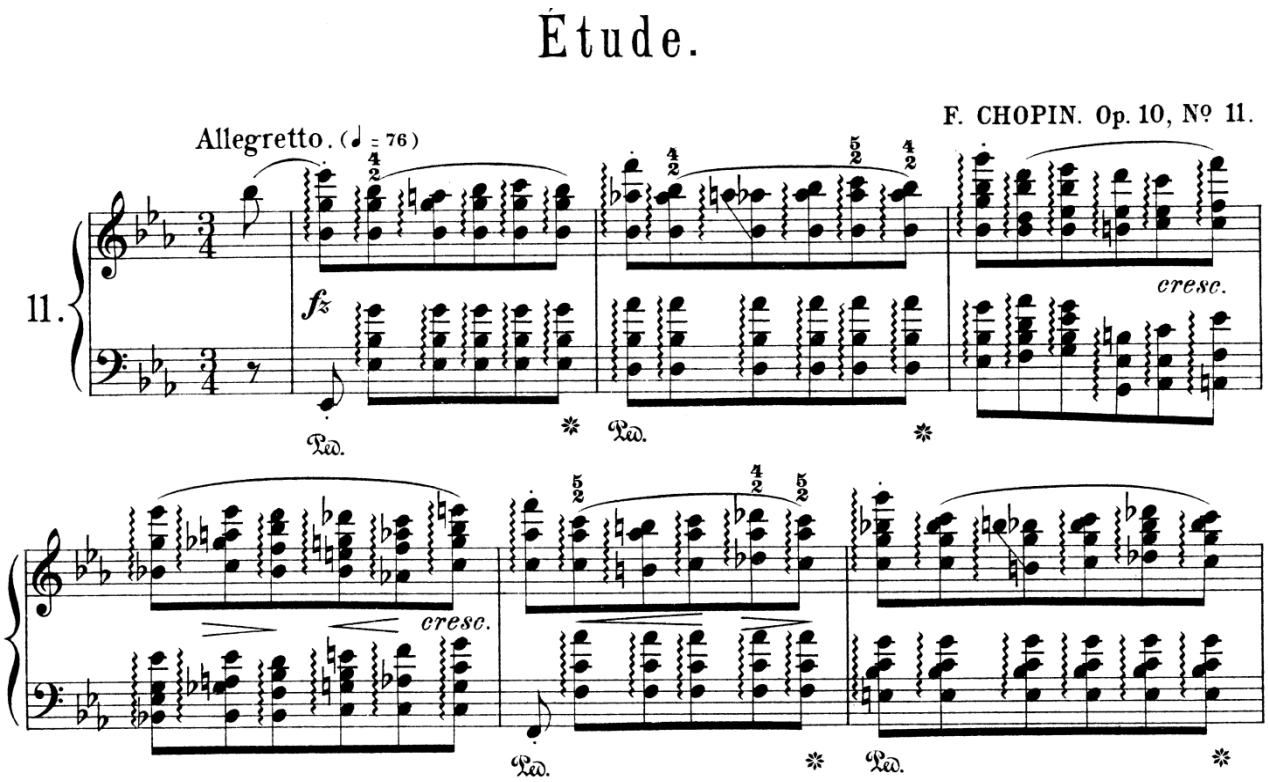
Example 15.14: Chopin Etude in F major op. 25 no. 3 (Schirmer, Mikuli, 1895)

The right hand also has a held pivot note (beginning in Example 15.14, the C in the right hand) and although at the beginning of the etude the note taken by the fifth finger is comfortably within reach, later the pivot note provides a flexible opening of the hand. In Example 15.15, this occurs on the first beat of the second measure, where the spread of fingers 2-5 is opened to the octave A-flat. It is important to realise that the piano keyboard itself opens the hand, with the gentle tactile resistance of the second finger opposed in movement by the as the arm guides the fifth finger towards the A-flat. Using the keyboard to open the hand this way, as has been noted by Taubman, allows the hand to remain soft and flexible, and the reach thus attained is greater than using the abductor muscles in the hand itself.



Example 15.15: Chopin Etude in F major op. 25. no 3 (Schirmer, Mikuli, 1895)

A more subtle form of bottom-up gesture occurs in op. 10 no. 11 (Example 15.16). The continuity of gesture across the rolled chord (the proverbial strumming of the harp) is a gesture that is entrained between the right hand and the left hand. While it is simultaneous, this gesture is bottom-up first of all because of its use of pivot fingers, but also because this simultaneous gesture is entrained between the outer, removed nodes of the gestural hierarchy *without* being felt through the connecting centre between these nodes. In other words, when I play this passage I don't feel the strumming of the harp through my torso, but it is nevertheless entrained or passed between the two hands.

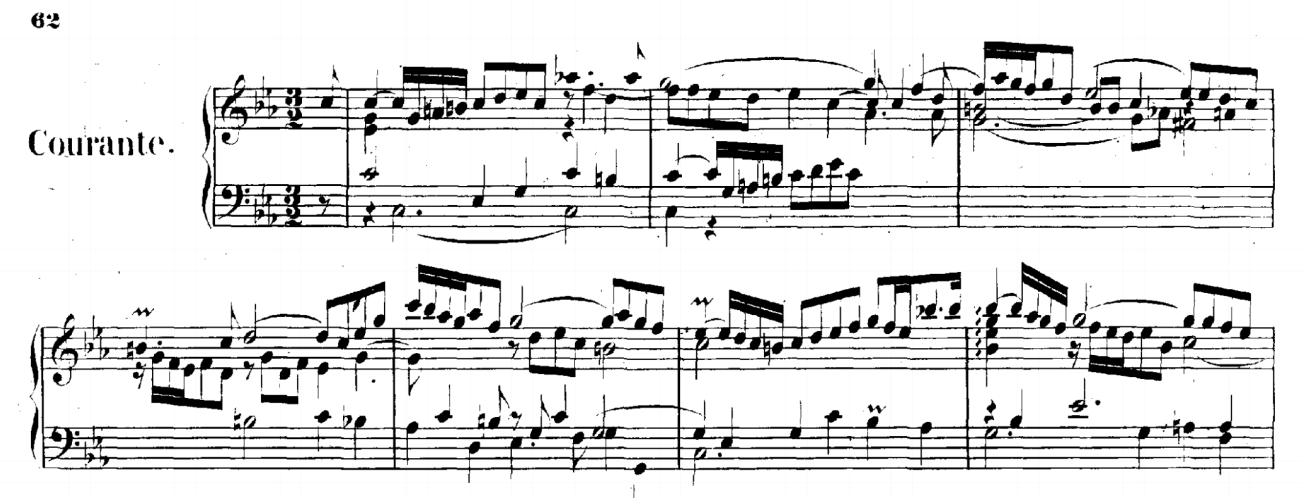


Example 15.16: Chopin Etude in E-flat op. 10 no. 11 (Schirmer, Mikuli, 1895)

Another example of bottom-up gesture occurs in the Etude op. 10 no. 8, bar 28, where the continuity of the sixteenth notes is passed seamlessly from the finger movements of one hand to the finger movements of the other hand on the timescale of sixteenth notes. The joint between the hands is audible if the left hand is motionless before the moment it has to play its first note due to the inertia of setting the arm in motion, an inertia that takes up a certain amount of time. As explained in §15.2.3.1, the felt time of initiation for this movement is immediate, but it has an actual measurement in ordinal time and by this length of time the following note will be late. The cure for this, of course, is simply to have the arm in movement *before* the left hand note and this sliver of extra time disappears. The continuity of sixteenth notes is thus preserved.

Of course it may be the case that a slight discontinuity is desired. In polyphony, this "reaction time" between voices is one of the primary expressive tools to delineate adjacent voices which otherwise might sound like one continuity. For example, in the

Courante from Bach's Partita no. 2, the reaction time between the upper treble voice and the lower treble voice makes the two-voice structure clear. This phenomenon will be discussed in greater length in the next chapter.

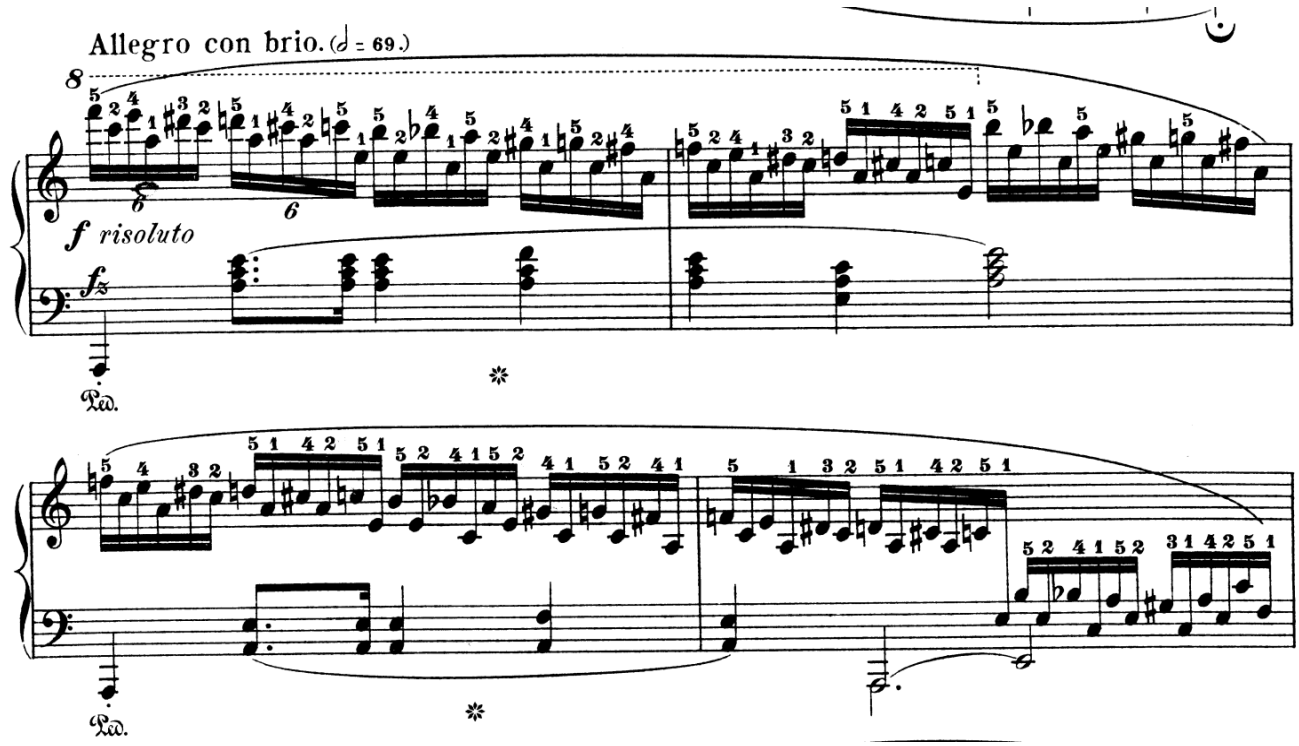


Example 15.17: Bach Courante from Partita no. 2, BWV 826 (Breitkopf, Becker, 1853)

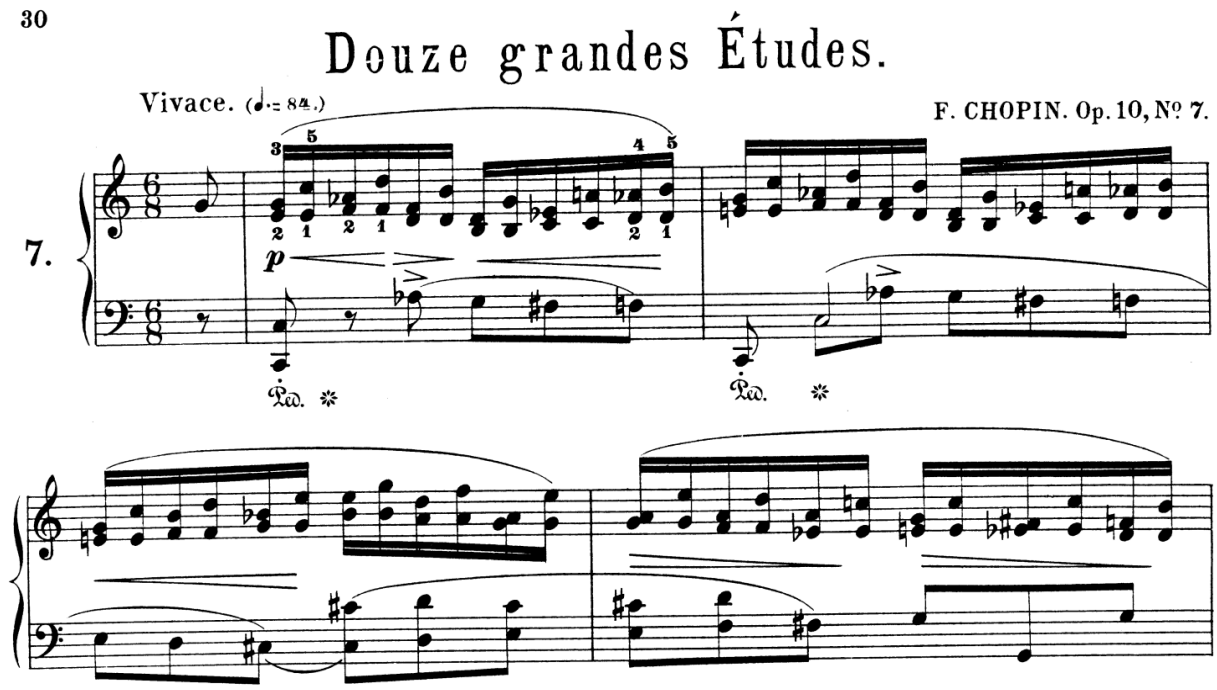
15.2.5.3 Alternation

Hierarchically removed and hierarchically similar levers can both be employed in alternation, in both cases leading to a different topology of coarticulation than the mere repetition of similar movements. In "single rotation" as described by Golandsky (2003), the alternation of left and right rotation each play one note as opposed to "double rotation" where two swings - a preparation in one direction and attack in another - play one note. When one left-right unit of rotation is considered as one gesture, and in single rotation plays two notes, this one rotational unit constitutes an overarching gesture. In the Etude op. 25 no. 11 (Example 15.18), this rotation is continuous throughout the right hand. The quality and amplitude of this rapidly occurring coarticulation is shaped by the frame in the hand (§15.2.2.1) which responds to the topography of each new pair of notes. For that reason, practicing by blocking those pairs together is key to solving the "endurance problem" of this Etude (in the style we have seen from the Cortot exercise in Example

15.2). Indeed when the coalescent frame of the hand is perfectly calibrated, this minimises the need for negotiation of topographical small distances by the rotation movement itself, and also minimises the amplitude of rotation necessary. Alternation of attack between hierarchically *removed* levers is also demanded in Chopin's writing. In analysing op. 10 no. 7, for example, Whiteside describes the alternation of attack between an arm attack and wrist attack for every dyad pair. This constitutes a coarticulation as well, since the attack of the smaller lever is subsumed or "tucked into" the attack of the larger lever.



Example 15.18: Chopin Etude in A minor op. 25 no. 11 (Schirmer, Mikuli, 1895)



Example 15.19: Chopin Etude in C major op. 10 no. 7 (Schirmer, Mikuli, 1895)

15.2.6 Topology, resonance and initiation of movement

In describing the overarching gestures that constitute coarticulation, several observations can be made about the initiation of movement, since these gestures are a convergence of several possible pianistic motivations. In the first place, movement is initiated by the topography of the keyboard and the necessity to reach the notes written in the score (described earlier as *involuntary* gesture §9.7). The contours of notes in the music trigger lateral and in/out pianistic movement across the keyboard. The qualities of these movements can be angular or expressive, but the goal points - the notes themselves as laid out in space on the keyboard - remain on the same range: on the surface area of the key. While the separation between vertical and horizontal is not nearly as absolute as this categorisation might imply, let us for now consider these topographically motivated movements as primarily horizontal. By contrast, other movements cover the key-drop or

attack of each note. These movements can be described as primarily vertical. Beyond the individual key-strokes, verticality is involved as coarticulation over groups of notes in articulating rhythm, and both horizontality and verticality are part of the pianist's embodied understanding of the feel of the musical structure.

Because of the fact that there are so many possible motivations for movement, this vertical/horizontal characterisation cannot go very far. In actual playing, all these various impulses blend into a fluency that expresses the music. From a third person perspective, it is very difficult to sort out these impulses. For example, the horizontality of navigating the topography of the keyboard seamlessly blends with the verticality of attack. Also, the vertical impulse of the finger which takes a key drop might be so forceful that it reverberates in the arm, even though the muscles that move the arm are not the point of initiation, leading the third person observer (perhaps viewing with motion-sensors) to conclude that the note is articulated with the arm when in fact it is articulated with the finger. The *initiation* of movement (which levers actually effect the movement) determines topology for the purposes of examining coarticulation.

The topology of the movements themselves from a first person perspective is characterised by the impulse towards movement and the activation of muscles that realise the movement. This means that the point of origin of movement (for example the muscles that move the finger) determines the *felt* structure of each level of coarticulation, rather than any physically observable reverberations that might result from such a movement (like the vibrations of the arm due to forceful attack by the finger which are nevertheless not initiated by the arm.) Through a combination of sonic and visual information, piano teachers can often *feel* where movements are initiated by students and how layers of movement are structured in the body, in contrast to research with motion sensors, which register every reverberation of movement. Of course in less developed pianists, the

pianistic coordination is less refined, so initiation of movement in one muscle group might anyway result in unnecessary movement in another muscle group - a sort of muscular reverberation. The fact remains that the initiation of movement can be sorted out both mentally and physically so the pianist is relatively more aware of the structure of movement during playing. Indeed, the first-person distinction between the negotiation of topographical distances on the keyboard and the attack (vertical key drop) of each individual note is a crucial part of technique that stimulates coarticulation.

16 Conclusion

In this part, I have introduced the hierarchical structure of gesture made possible by coarticulation by examining how it appears in background sources from empirical musicology and practitioner literature (§13), and then proposing an interdependent connection between musical structure and embodiment (§14). Insofar as pianistic and organistic legato depends on a sense of felt continuity of line, I have shown that this felt continuity is connected to hierarchical layers of gesture, and that these overarching continuities provide a direct connection to socially shared meaning through the concept of intonation (§15.2.1). Using the artistic project of the practising and performance of the complete Chopin Etudes, I have outlined a few aspects of this hierarchical structure in gesture, and shown how they are demanded in the performance of specific examples from the Etudes.

The kinds of coarticulated gesture that are involved in the Etudes depend on individual body schemata and training. Even though the flexible coordination of joints in an fluent performance might seem natural[66] to the observer or feel natural to the performer, they feel that way because they have been developed or mastered. Certainly, there are very talented people who have a seemingly innate natural flexibility that makes the Chopin Etudes easy, but for the vast majority of pianists the coarticulatory skills required must be developed, either consciously or unconsciously through training and practice. Speaking from my experience as a teacher, I am constantly reminded how such a simple feeling as relaxing the wrist while playing a certain passage must be developed in the student's coordination, often through several successive steps. The alternating action of the Etude in C major op. 10 no. 7 (discussed in §15.2.5.3), for example, is so extremely

[66] By natural I refer to an unforced and easy fluency of movement (for a similar definition, see Doğantan-Dack 2015: footnote to page 180).

simple to do for someone who has that capability in their body schemata, but nevertheless students struggle to coordinate the freedom of the wrist with the coalescence of the hand. In discussing this Etude, the famous Dutch piano pedagogue Jan Wijn has said that in his experience there are students who can play it easily and students who simply cannot, despite much practice.[67] The "interpreting through the body" (§7) whereby the "performative body" (§6.1) is experienced directly obviously gains a new dimension by the mastery of such body schemata. Furthermore, since the "transparent body" is given in the activity of musical imagination (§9.6), and this "transparent body" is constructed from body schemata that may or may not encompass the kinds of coarticulatory flexibility described above, the layering and sophistication of musical imagination is also enhanced through the discovery or mastery of such body schemata.

The kinds of manual flexibility and coarticulatory coordination required in the performance of the Etudes allows for a sense of musical freedom and sophistication of line in other musical examples, which may not be as demanding. Chopin playing in general (not just the Etudes) involves the whole body in creating legato continuities that are nested within each other. Shorter expressed embodied timescales are subsumed by larger ones (§15.2.1). Without these overarching continuities, the characteristic Chopin legato is more-or-less impossible, since these overarching continuities trickle down into myriad micro-details of expression - small temporal, articulatory, and dynamic nuances that are far more complicated than can be consciously grasped, but which are simple when viewed from the structure of their constitutive gestures.

Coarticulation as a felt experience is characterised by both overarching continuity (an aspect that has been discussed at length) and a also a sense of release of the individual gestures that constitute such continuities. Such release is felt both in the joints whose

[67] This was an off-the-cuff comment that I heard from him at a masterclass at the Schiermonnikoog Festival Young Talent (2013).

movement allows coarticulated gestures and in the conscious control of movement. For example, the aforementioned alternation of the Chopin Etude op. 10 no. 7 (above, and in §15.2.5.3) is felt physically as a release of the wrist, allowing the alternate dyads to "fall out" easily from the hand. Such a physical experience has its conscious correlate in the release of conscious control of movement, and this can be achieved by framing (§6.2). Words that can begin to describe the feeling of coarticulation might include "letting go," "freedom," "easiness," "lightness," "smoothness."

This chapter warrants many important disclaimers, which I have inserted in several places in the discussion and which I will now repeat. In the first place, it is neither my goal to teach anything new about the Chopin Etudes, nor to offer any general prescription for movement while playing the piano. Each observation I have made is an example of one way of playing, not a generalisation that applies to all playing. The coarticulation principles are like tools in a toolkit, and can be used whenever appropriate. For example, while I have described legato in terms of embodied continuities, this remains only one option for playing which is not suitable for all styles of music. My discussion of coarticulation is not comprehensive in many ways: a) it is not comprehensive in the presentation of background research, because despite the fact that I have examined a wide survey of sources, I have only selected the most relevant sources to discuss in this chapter; b) it is not comprehensive in the discussion of coarticulation issues; c) it is not comprehensive in discussion of the Chopin Etudes. For each of these aspects, several large volumes could be written.

My goal was rather to introduce this coarticulatory structuring to the extent necessary to ground the discussion of embodiment in polyphonic expression, which adds an additional dimension. Coarticulation shows how "interpreting through the body" can involve many hierarchically nested levels, and that as such it forms a sort of embodied

analysis through what could be called motor cognition (Godøy 2015) or corporeal-performative thinking (Doğantan-Dack 2015: 170-171) or a kinetic bodily logos (Sheets-Johnstone 2011: 424). Since expressed timescales might be embodied or disembodied (§14.3), there are various options for the structuring of the actual extensional gesture in the playing perspective (§9.6). This kind of embodied thinking remains only one option for how to play the piano, but in most cases it is the most convincing option. If playing a single legato melody optimally involves the flexible involvement of the whole body (torso, top arm, forearm, rotation, coalescence, finger) to embody continuities on many hierarchically nested timescales, the question of what happens when several melodies are played at once with differing expression remains to be answered, and that is the goal of Part IV of this dissertation.

Glossary for Part III

Affordance - the possibility of some action existing between an organism and its environment (Gibson 1979; see footnote to Introduction).

Body schemata - learned motor patterns, habits, or dispositions that require little mental effort to carry out (§5).

Coarticulation - the corporeal subsumption of smaller units of gesture under superordinate trajectory shapes of movement (§12.2).

Disembodied expressed timescale - a timescale shaped with expression in sound defining the grouping that it outlines, but without a corresponding overarching extensional gesture (§14.3).

Embodied expressed timescale - a timescale shaped with expression in sound defining the grouping that it outlines, combined with a corresponding overarching extensional gesture (§14.3).

Embodied non-expressed timescale - a timescale embodied with a physical gesture that does not result in an audible expression defining the grouping that it outlines (14.3).

Extensional gesture - musical gesture that results in actual body movement in space (§9.2).

Framing - a conscious process used to separate or insulate a part of pre-reflective experience in order to protect it from being objectified by the conscious mind (§6.2).

Gestural-sonic objects - holistically perceived chunks of musical gesture based on the convergence of movement and sound and defined by coarticulation (§13.1).

Imagination perspective - the temporal perspective involving thinking ahead in performance whereby sounds are imagined *before* their execution (§9.6.1)

Intentional gesture - musical gesture that is imagined but not realised in body movement (§9.2).

Interpretation - the act of making conscious decisions in shaping a musical performance (§5).

Intonation - a concept that connects all manner of socially-shared affective experience directly to the shaping of the most basic and irreducible units of music, a shaping that is neither only a musical image nor only a technical movement, but an organic integration of both (§15.2.1.3).

Invisible body - a pathological form of self-consciousness where the body is "absent from experience" (§6.1, Legrand 2007).

Levers - parts of the playing mechanism that are able to deliver power, including: torso, top arm, forearm, wrist, fingers, rotation (§13.2).

Listening perspective - the temporal perspective involving the performer's own perception after the notes have been played (§9.6.3).

Musical details - objectively measurable modulations of dynamics, timing, and articulation occurring on the sounding surface of the music (§10.1).

Neutral timescale - a timescale neither embodied with an overarching extensional gesture nor with expression defining the grouping that it outlines (§14.3).

Opaque body - a form of self-consciousness where the body is "taken as an intentional object of consciousness" (§6.1, Legrand 2007).

Performative body - a form of self-consciousness characterised by a "pre-reflective experience of the body itself" (§6.1, Legrand 2007).

Playing mechanism - the pianist's body, specifically the composite of levers used in playing (§13.2).

Playing perspective - the temporal perspective associated the actual moment of execution (§9.6.2).

Polyphonic expression - a performative texture characterised by simultaneous divergence in expression (§3). An example of divergence in expression is found in Example I.1. A more precise definition of polyphonic expression will be given in Part IV (§17.5).

Polyphony - a stylistic description of musical texture with counterpoint as a defining feature, characterised by its distinction from homophony (§2).

Timescale - a unit of musical time measured in the score, such as one beat or one measure (§3).

Transparent body - a form of self-consciousness in which the body is apparent in the "pre-reflective bodily experience of the world" (§6.1, Legrand 2007).

Understanding - a non-conceptual and primarily pre-reflective embodied reaction, depending on the body schemata of the performer (§5).

Part IV: Polyphonic Expression

Performance of the Chopin Etudes depends on the mastery of a sophisticated layering of coarticulation, and in a similar way the realisation of polyphonic expression depends on the mastery of certain other body schemata which structure coarticulation in a different way. Just as the body schemata developed in the Chopin Etudes give a flexibility and sophistication in coarticulatory layering that is then available to be used in the expressive shaping of any music, development of the body schemata associated with polyphonic expression provides another dimension to musical imagination. How difficult the project of learning the Chopin Etudes seems depends on the individual pianist and his or her innate capabilities, experience and training, and similarly the relative previous experience of and proficiency in polyphonic expression will vary among pianists.

To begin, in §17 I will examine some different musical examples to question what polyphonic lines can be found. This will result in my own terminological distinction between lines, which are affordances of scores, and voices, which are created in performance. Once the various embodiments of such voices are brought into the discussion, I will then characterise musical expression *in performance* as homophonic or polyphonic, and contrast homophonic and polyphonic voicing. This will lead - finally - to a gesture-based definition of polyphonic expression. In §18 I will report on a voyage of artistic experiments, reflections and outcomes on which I embarked when I began this research project. In §19 I will suggest how to use exercises for the development of the

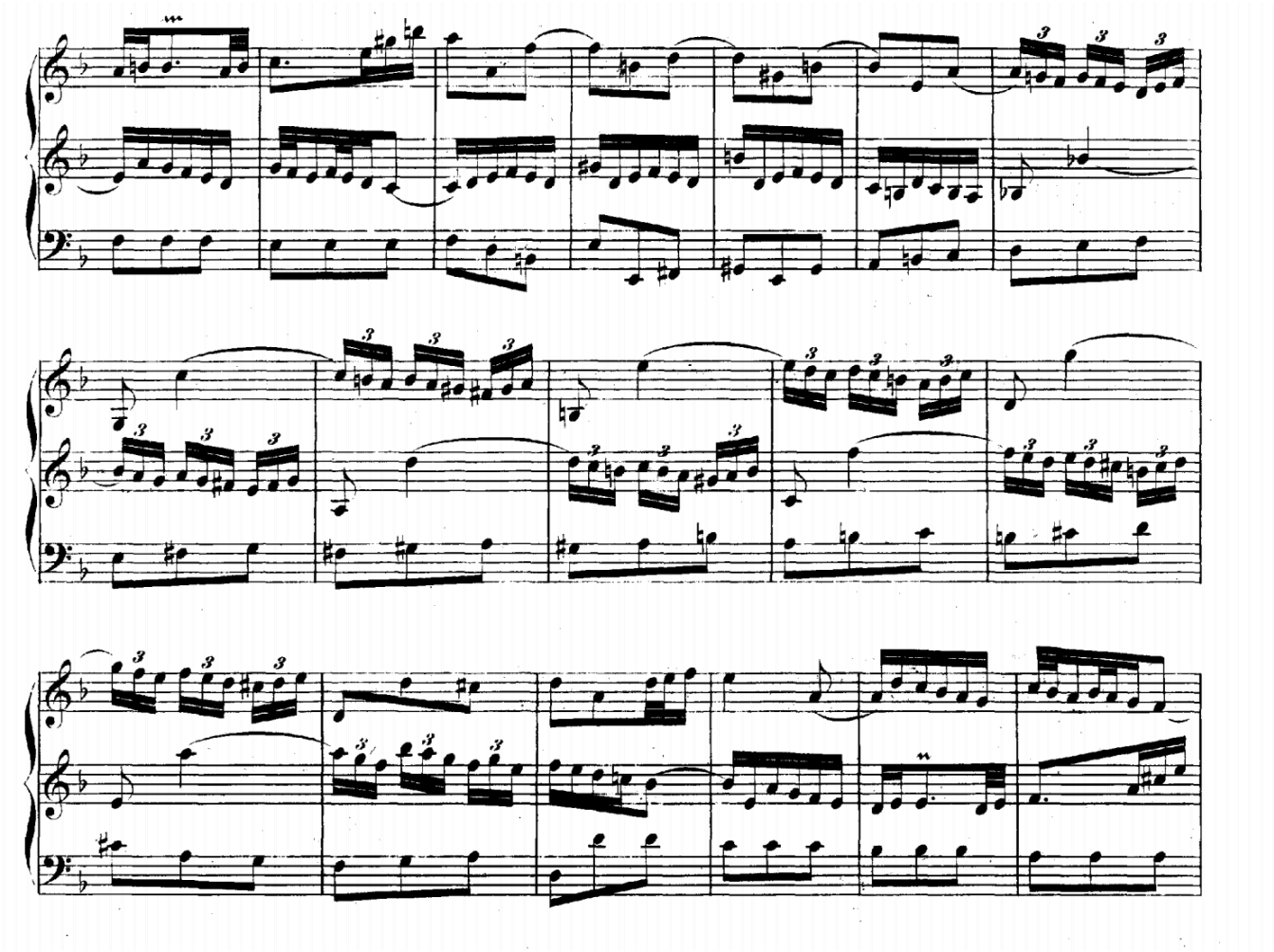
body schemata of polyphonic expression and share some other experiences that have helped me in this practice. In §20 I will turn to the preparation of a recital program, showing a few examples of polyphonic voicing in several contrasting works.

A few disclaimers are in order. First, the definition of polyphonic expression I give here and the practice that it represents remain only one possibility which, when mastered, is available for use in performance. Many other important expressive possibilities for the performance of polyphony remain for future research. Aspects of historical informedness such as style, applicability on period instruments, and conformity to existing performance traditions are extremely interesting to consider in relation with polyphonic expression, but I leave these aspects for other research. The artistic choices I have made in the examples presented are based on my own experience and taste, which is also continually in development.

17 Voices

In the performance of vocal polyphony, the separation between voices is relatively clear: each voice is sung by one person or one section. In performance, the colour and spatial location of each individual voice is different, so the delineation of voices is rather audible, and in the score the notation of who sings what is rather unambiguous. In keyboard music, finding and delineating voices is often a crucial constitutive element of individual interpretation. For dividing a musical score into separate lines, the clearest examples are the most contrapuntal: fugues, or imitative counterpoint of any kind.

However, even the clearest examples afford possibilities for hearing voices resulting from the crossing or interference of two lines or from the division of one line into multiple voices. In the first case, consider this passage:

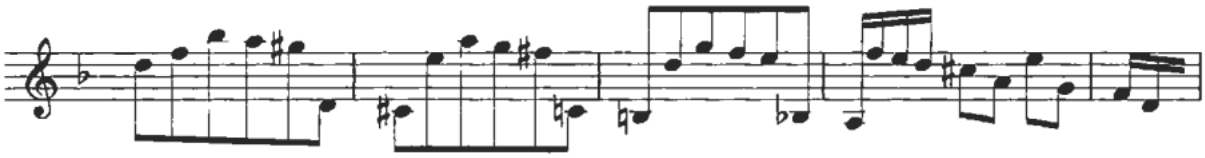


Example 17.1: Bach Trio Sonata in D Minor, BWV 527 - Third Movement (Breitkopf, Becker, 1853)

Despite a difference in timbre between the three voices (which is dependent on registration) an emergent ascending line is apparent, constituted from the quarter notes starting with the B-flat and ending with the A. This line borrows notes alternatively from two voices, creating the impression of another voice that temporarily subverts the prevailing division between the two voices played on the manuals. Similarly, the triplet sixteenth notes form their own sort of continuity, which can be perceived as a voice. The perception of this particular effect of voice crossing is of course to some extent dependent on registration, since when the primary octave is perceived to be different, the effect is greatly diminished.

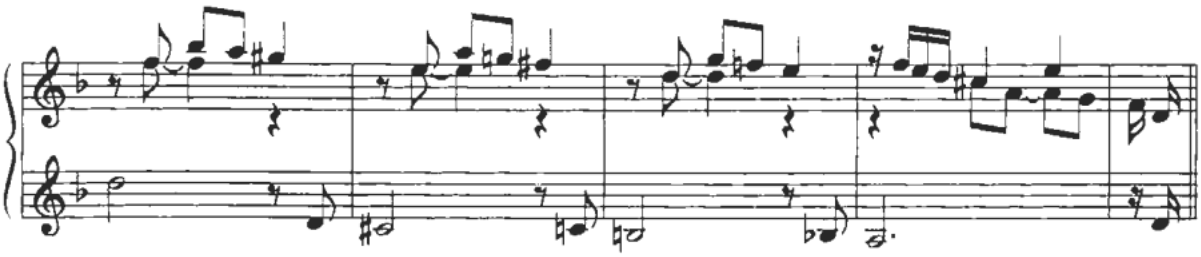
On the contrary, one line can outline several voices in different registers that are heard as continuities in voice leading, despite the gaps that might separate one note or group of notes from the next. Music theorist Kent Kennan uses this example to explain what he calls "compound melodies":

Example 10 BACH: Chaconne



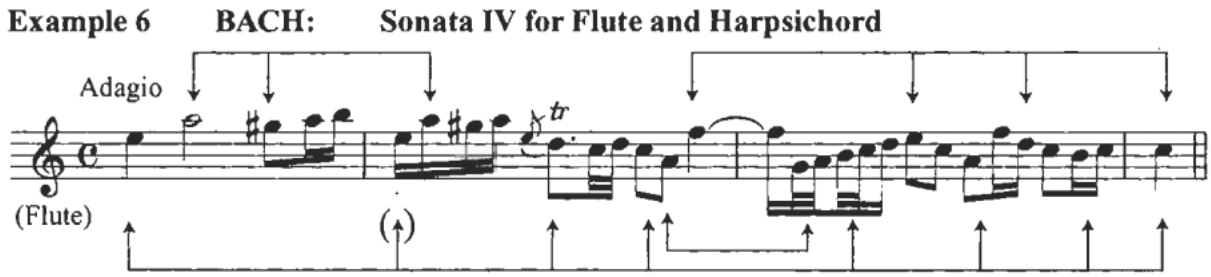
If the three lines implied in this passage were written as such, they would look approximately like this:

Example 11



Example 17.2: Compound melody analysis of Bach's Chaconne by Kennan (1998: 12)

Kennan also shows how melodies can be composed around implied pitch progressions of a second which he calls "step-progressions." These progressions can be seen or heard as lines despite their separation by intervening notes.



Example 17.3: Step-progression analysis of Bach's Flute Sonata no. 4 by Kennan (1998: 10)

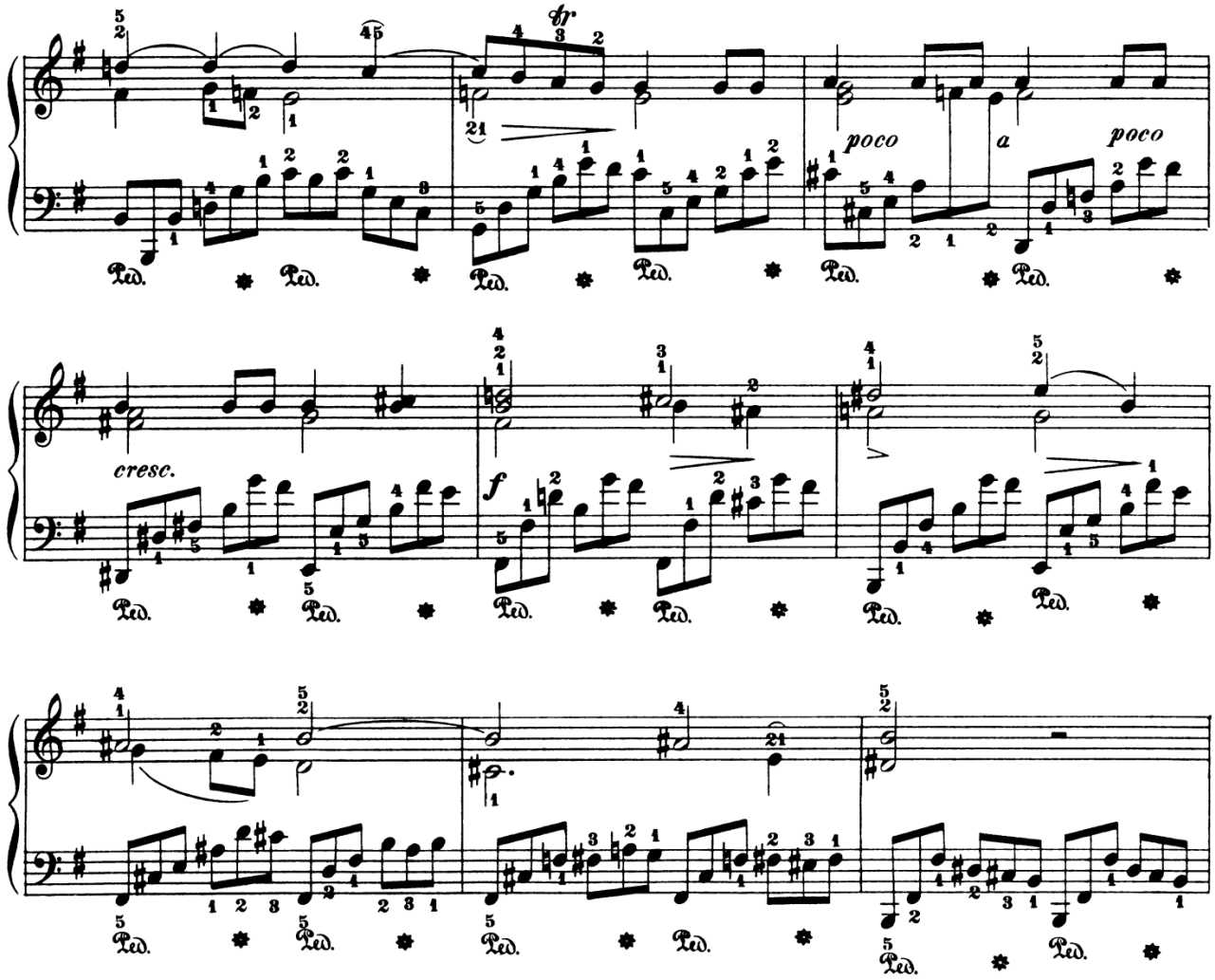
In performance, how such compound lines and step-progressions are heard is to a certain extent up to the performer, since he might emphasise the compound nature of the melody by differentiating its constitutive elements. In the case of step-progressions, gravitation around the register of one or the other progression can bring out or colour the hidden line. This colouring and shaping need not occur as an act of conscious interpretation. Step-wise progressions are often clearer to the ear than to the eye, and are emphasised by the physical location of the notes on the instrument, so they are built into the kinaesthetic "feel" of the melody. For both performer and listener, the perception of continuity in lines is based on a pre-reflective gestural understanding of the lines. In explaining how this understanding might work, music researcher Alicia Peñalba Acitores describes a theory of musical perception based on two layers of consciousness: "*primary consciousness* takes place in the perception of sensory stimuli while *higher-order* consciousness is concerned with the perception of self" (emphasis mine, Peñalba Acitores 2011: 215). She connects these two levels of consciousness to what she calls "grabbiness" and "bodiliness," respectively.

> Human beings, within the process of perception, switch constantly from bodiliness to grabbiness. Bodiliness implies awareness of our own body - observing how it has an influence on the perception of stimuli - whereas grabbiness relates to the capacity of environmental stimuli to attract our attention - in relation to the bodily responses in us that they elicit (Peñalba Acitores 2011: 224).

Explaining further, she writes, "grabbiness […] captures the idea that the environment guides the subject in perception. Certain features in music are more likely to draw our attention - to make us move internally - than other stimuli, although this may be different for each person" (Peñalba Acitores 2011: 222). In describing how bodiliness and grabbiness mediate the perception of step-wise progressions, she writes:

> The phenomenon known as pseudo-polyphony, found among other places in J.S. Bach's solo violin and cello music, consists of the creation of two or more concurrent contrapuntal lines (or streams) using a sequence of single-sounding tones, produced by the rapid alternation of pitches separated by relatively large musical intervals. According to bodiliness, when we listen to one of these passages we are unable to sing along to the literal succession of pitches, because of its speed and pattern of intervals. As a result, we tend to 'sing' (internally, virtually) a melody consisting of either the higher or the lower pitches. The fact that we sing only certain pitches (a factor of bodiliness) makes us perceive the high pitches as belonging to a single line, even though they are interleaved with lower pitches. High pitches may also constitute grabbers since their salience (grabbiness) makes us focus our attention on them when they appear (Peñalba Acitores 2011: 223).

Consider the following passage from Chopin, which exemplifies all of the devices so far discussed:



Example 17.4: Chopin Nocturne in E Minor op. 72 no. 1 (Schirmer, Mikuli, 1895)

The flow of *all* the eighth notes forms a real continuity of line because of the coarticulatory shape that is inevitable in its execution, forming waves of gesture on the timescale of the half measure. On the other hand, their status as one voice is challenged by the grabbiness of the step-progressions that they outline. The eighth notes in the left hand form step-progressions that connect non-adjacent notes, most obviously in the ascending chromatic bass line. Making matters even more interesting, the last two eighth notes of each half measure (beginning with the *poco a poco cresc.*) form a step-progression with the ensuing lower half note in the right hand.

17.1 Focus of attention

These possibilities exist as affordances in the score that the performer can decide to bring out. While the grabbiness in pseudo-polyphony referred to by Peñalba Acitores functions regardless of performance expression (even, for example, in a MIDI playback), the performance itself can highlight or suppress grabbiness of many other lines or step-progressions that may not be characterised by "rapid alternation of pitches separated by a relatively large interval" (Peñalba Acitores 2011: 223). There are in fact two layers of grabbiness in a performance: a) the grabbiness of the lines in the score and the unfolding of their embodiment in performance, which feature in the perception of the pianist in all three time perspectives (imagination, playing, listening §9.6) and depend on his individual body schemata, and b) the grabbiness of the voices as perceived by the listener. If the "constant interchange between bodiliness and grabbiness provides one way to understand individual difference in the experience of music listening" (Peñalba Acitores 2011: 223), then this same interchange can explain differences in the pianist's musical perception of the score. What comes up to the level of awareness for the pianist is a series of line possibilities that are based on this pre-reflective understanding, possibilities which may be supplemented through conscious analysis and which may be brought out in performance.

The question remains as to what this "bringing out" of a step-progression actually means. It would be rather difficult and pointless to pinpoint the details of expression involved (such as playing this note louder, or that note later) since those details will always be in flux. It is clearly a question of *hearing, listening to* and *embodying* the progression, all of which involve the direction of attention. In the following paragraphs, I will examine the direction of attention through discussing a particular (but not uncommon) pedagogical scenario. In doing so, I will again refer to the three perspectives in time: the *imagination*, *playing*, and *listening perspectives* (§9.6).

Imagine a somewhat less talented student who comes to his piano lesson with the the Chopin Nocturne in E minor op. 72 no. 1 (Example 17.4) after having learned it well enough to play the notes. In his first performance of the lesson, he plays what is written on the page as understood through his own particular musicality, but in this passage he does not hear the connection between the last two eighth notes of the half-bar in the left hand and the ensuing quarter note in the right hand. The teacher knows that the student does not hear this connection because the line, formed between the two hands, lacks continuity of gesture in the student's performance, thus it lacks grabbiness in the listening experience. In this state the student *hears* the notes in terms of sound waves passing into ears, but does not *hear* (or *embody*) the line in question as a gestural continuity.

Now the teacher points out the affordance of this line in the score to the student, and asks the student to *listen* to it. The student plays the passage a second time, this time playing the line in question louder. The teacher explains that this is not what he meant, and asks the student to try the passage again returning the dynamic level of the line to where it was but still *listening* to it. The student follows the teacher's instructions and delivers a third performance in which the line in question is well shaped, but in which the soprano melody is not. When the teacher points out this insufficiency, the student remarks in frustration that he cannot *listen* to both at once. The teacher tells the student to practice it a couple of times, and after a short while the student plays the passage for a fourth time simultaneously *hearing* the inner line in question and the soprano voice (as well as, perhaps, other step-progressions like the chromatic ascent of the bass or interactions in inner voices).

The activity of *listening*, then, is distinct from *hearing* in that it is consciously focused. This conscious focus has been described by psychoanalyst and art-teacher Anton Ehrenzweig as "differentiation," a term which he applies both to seeing and hearing. This

term follows from Sigmund Freud's evaluation of dreams, which holds that the chaotic structure of dreams is due to a lack of differentiation in opposites, in time and space and in other attributes which might lend a firm structure (Ehrenzweig 1967: 3-7). A differentiated attention, then, separates figure from background or in other words assembles a gestalt impression that can be consciously grasped (Ehrenzweig 1967: 22). An undifferentiated attention takes in the work as a whole without consciously grasping or fixing on any gestalt impression. These two kinds of attention are described by Paul Klee, who describes how lines outline what can be considered an inside area (endotopic) and an outside area (exotopic) (Klee 1961: 50-60, Ehrenzweig 1967: 22). A differentiated view can grasp one or the other area, or can alternate between the two. An undifferentiated view of both at once requires the scattering of attention, which is considered impossible by gestalt theory. "According to gestalt theory we have to make a choice; we can choose either to see the figure; then the shape of the ground becomes invisible, or else - with an effort - to scrutinise the negative shape cut from the ground; then the original figure disappears from view" (Ehrenzweig 1967: 22). According to Klee, artists can choose either this endotopic/exotopic differentiated focus, or an undifferentiated focus on the whole. Ehrenzweig goes on to use the example of creating visual "counterchanges" like this one:

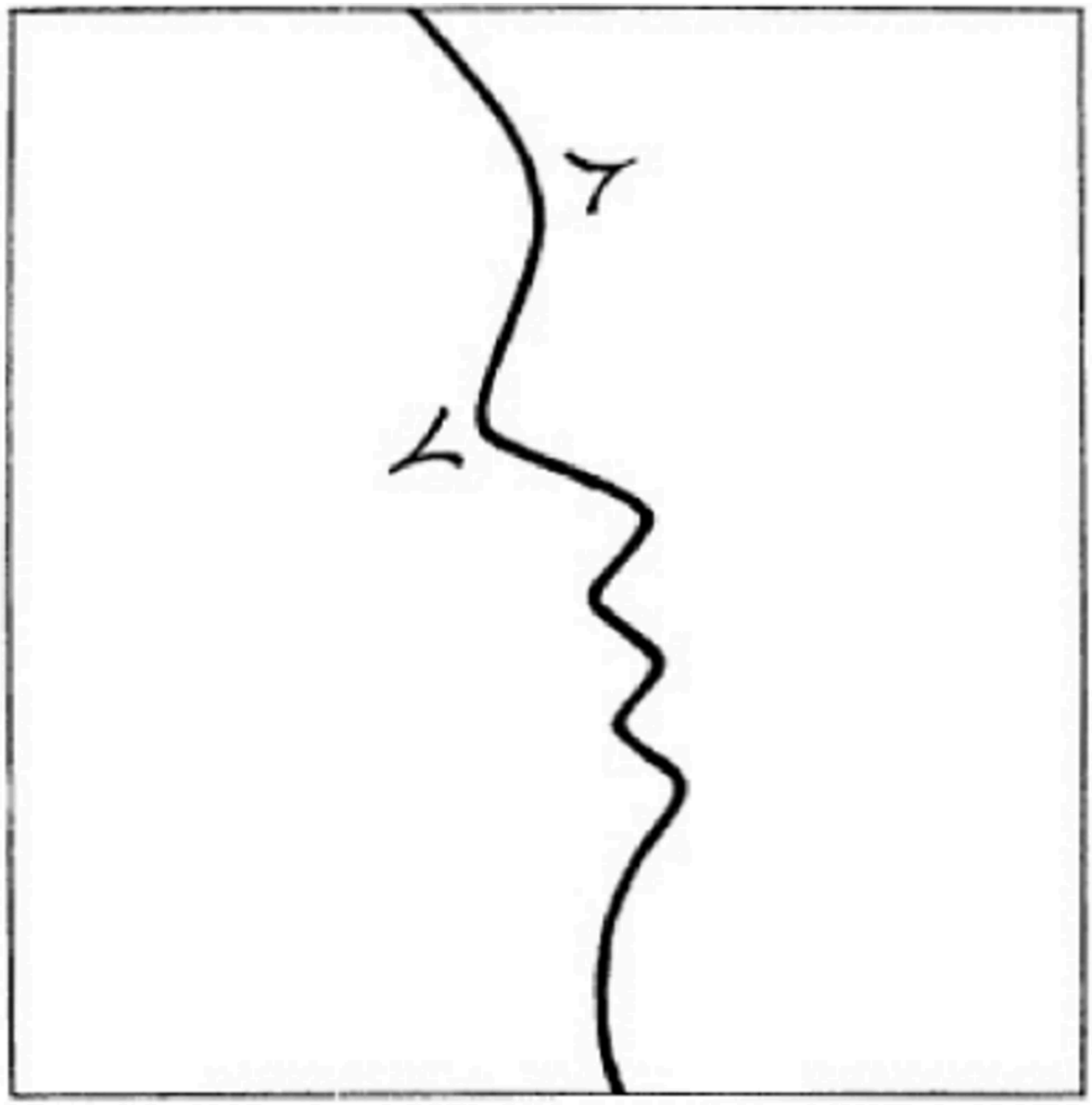


Figure 17.1: A visual counterchange (Ehrenzweig 1967: 24

He argues that successfully *creating* such counterchanges does not involve alternating between the view of one figure and the view of the other, but rather a simultaneous view of both.

> What, of course, is needed is an undifferentiated attention akin to syncretistic vision which does not focus on detail, but holds the total structure of the work of art in a single undifferentiated view. Introspection will fail us. The content of this

> scattered attention appears essentially blank and empty to conscious memory (Ehrenzweig 1967: 23).

Returning to the pedagogical encounter of Chopin's E minor Nocturne, the difference in attention between the student's first performance and his second and third performance is quite clear: in the first performance, he was not particularly attentive to anything at all (besides perhaps playing the correct notes) but in the second and third performance his attention was focused in a differentiated way on the particular line pointed out by the teacher, to the detriment of the other lines. In his fourth performance, the student returned to an undifferentiated focus in which he could grasp and hear the lines simultaneously. The difference between the first performance and the last performance is a certain continuity in the simultaneous lines. This continuity is felt in the imagination perspective and in the playing perspective as a continuity of gesture. This gesture *embodies* the line in question in the sense that whether it begins in the imagination or playing perspective, through its grabbiness and bodiliness (Peñalba Acitores 2011) in the repetition of practicing it eventually permeates all three perspectives (§9.6). Just as grabbiness functions pre-reflectively, this physicality of embodying the line does not always rise into awareness. One must not forget that the process that occurred between the student's first performance and his fourth performance included both directed attention to the line and repetition, which in combination inevitably activate some kind of continuity of movement in the hands. The passing off of the line between the hands can be compared to the passing of the baton in a relay race: the runner taking over begins to run before he receives the baton in order to preserve the continuity of movement. Similarly, the continuity of line is passed between the hands, regardless of whether such physicality arrives in conscious awareness (the physicality of this passing off has been discussed in

§15.2.5.2). These pathways of continuity remain and easily coexist in hand and ear in the fourth performance without the need for differentiated attention.

A similar physicality underlies Ehrenzweig's psychoanalytic account of attention. He emphasises the importance of brush strokes, scribbles and handwriting. "Indeed the great emotional power of spontaneous handwriting testifies to its hidden meaning and symbolism" (Ehrenzweig). He repeatedly and noticeably refers to differentiated focus as "rigid" and to undifferentiated focus as "flexible," connecting bodily and psychological states. He characterises the healthy fluctuation between differentiated and undifferentiated states of attention as possessing "rhythm" (Ehrenzweig 1967: 21-31). Throughout his text, however, he seems to view the physical gestures such as brush strokes, handwriting and inadvertent inflections as reflections of unconscious thoughts. The paradigm of embodied cognition (as introduced in chapter two) might suggest, on the other hand, that such physical gestures actually constitute the thinking rather than merely reflecting it insofar as we tend to offload cognitive tasks onto the environment (§7).

While in our example, the student became consciously aware of the line pointed out by the teacher, such conscious awareness is not always necessary. The physicality of playing the passage, especially multiplied by the repetitions in practice, represents its own kind of thinking which coordinates many elements of the music-making without explicit conscious awareness (without, in other words, differentiating attention). However, such physicality is inextricably entrained with the kind of comprehensive hearing associated with undifferentiated attention - the hearing of actual sounds from the listening perspective. In our example, the teacher appealed to the student's conscious attention (the imagination perspective) by pointing it towards the line in the music. By doing so, he awakened in the student the differentiating kind of attention that, while pinpointing one voice, neglects the others. After some practice, the student was able to return to a more

undifferentiated kind of attention. This process could be greatly simplified if the teacher addressed the problem through the playing perspective, by pointing out the physicality of passing the voice between the hands. Such a direction, because it encourages flexibility and continuity in movement, does not trigger a differentiated focus of attention on one voice. Because of the imbrication between embodiment (the playing perspective) and hearing (the listening perspective), which I have previously outlined (§9.6), the undifferentiated *hearing* of this line as a continuity would automatically occur, making it available to the imagination as an option for future performances. Thus, using language associated with this physicality enables the teacher to skip the misunderstandings evident in the student's second and third performances.

While working out gesture that follows lines in the playing perspective can be productive, it depends on careful listening by the performer to the actual sound of the instrument (that is, from the listening perspective rather than the imagination perspective). If the quality of this listening is undifferentiated, inner voices and associations emerge and rise into awareness as if by themselves because of their grabbiness, which itself depends on learned body schemata. This kind of emergent awareness can be described as an act of understanding rather than as an act of interpretation or analysis. Interpretation and analysis remain useful as another pathway towards awareness, but it is a pathway that depends on a different kind of attention.

17.2 Perception

It is relevant to consider how polyphonic expression is perceived by audiences of non-musicians, since reaching and communicating with such audiences is obviously an important over-arching goal of performance. In this research, I have not conducted any structured experiments with non-musician audiences, but from my own practice as a

concert pianist, I have continual feedback from such audiences, both in the comments I receive after concerts and in the presence or absence of small sounds during the concert itself: coughing, rustling of programs, loud breathing, applause. While neither category of feedback includes precise information about perception of polyphonic expression, I am extremely well-attuned to whether the audience is engaged and attentive, and I am able to grab the audience's attention when I feel it slipping away. To some extent, every successful performer has this connection with the audience, which is difficult to explain but easy to feel. In the normal course of performing, this feedback helps to shape performances, and the ideas presented in the performances can be "tried out" for how well they work with the audience.

From such a context of performing practice, I feel almost certain that even non-musicians perceive polyphonic expression at a gestural level, even if they cannot articulate what it is they hear. Music students spend time developing their ear, for example singing parts in choirs, taking polyphonic dictations in ear training classes, tuning chords in a string quartet. That such skills of hearing pitches must be expressly developed suggests that non-musicians do not possess them. The question of what non-musicians actually hear remains. While my answer to this is speculative, the background research presented thus far in this dissertation supports this answer: non-musicians perceive the gesture that the performance communicates, and when such a gesture is polyphonic, the polyphonic nature of the music is felt. Perceiving gesture through sensorimotor mirroring (through the activation of mirror neurons) is an innately human ability learned from birth onwards during normal development (§9.1, Lepage & Théoret 2007), and even though instrumental musical training will enable the perceiver to be more closely attuned to the technique of playing, gestural qualities such as smoothness, angularity, tension and rhythm are universally perceived, according to the sensitivity of each individual, even when gestures

are layered polyphonically together. As discussed earlier (§15.2.1.3), the theory of intonation further connects these gestures and their felt qualities with socially constructed experiences of the world.

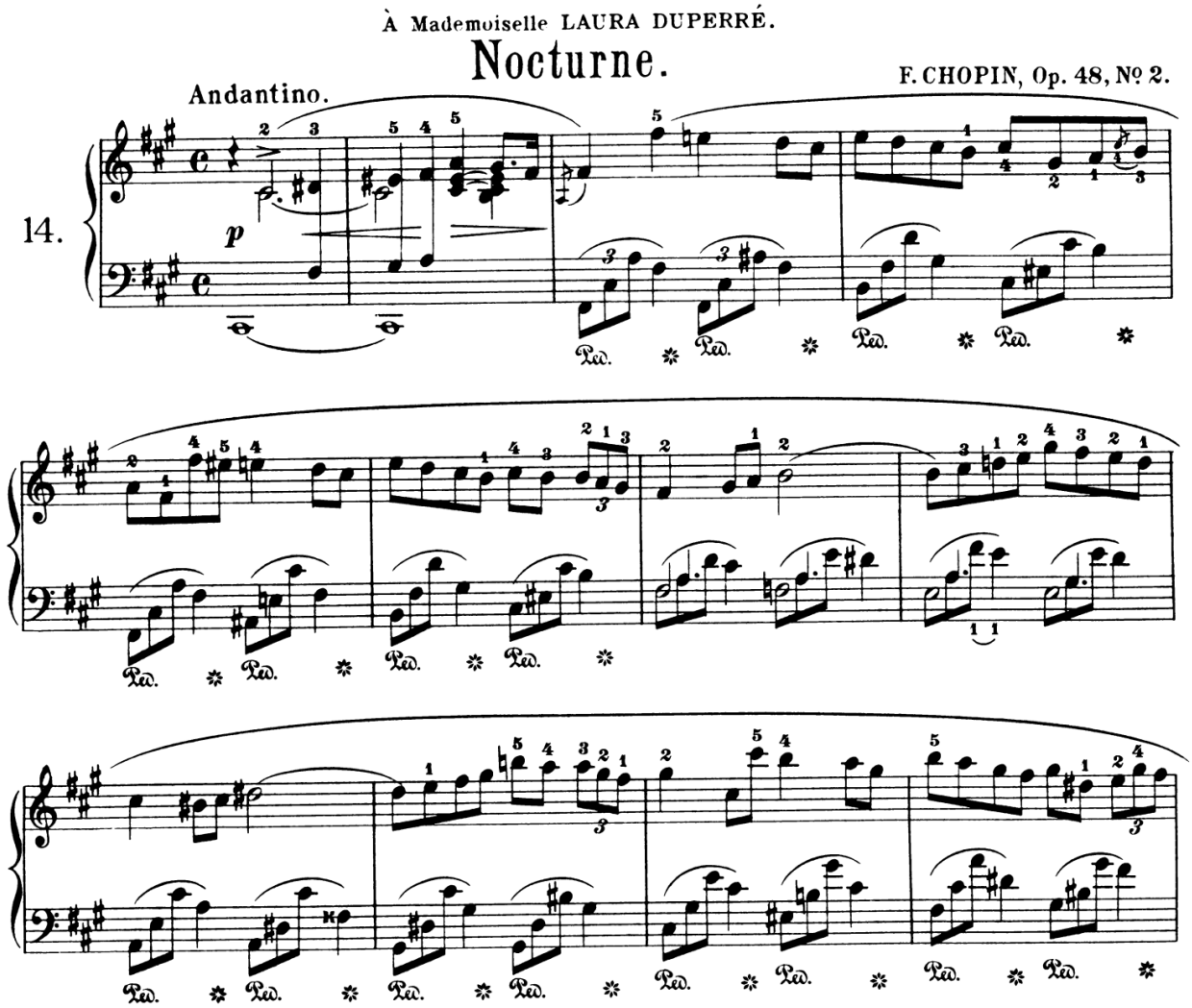
This gestural hearing, described above by as the interaction of grabbiness and bodiliness (§17.1), can coincide with various levels of ability in polyphonic pitch perception. Alongside musicians, non-musicians can develop a sense of polyphonic pitch hearing. In folk cultures that emphasise part-singing, for example, the ability to sing one's own part while hearing the others is possessed by all who participate in such a tradition. Musicologist Izaly Zemtsovsky created the useful term *homo polyphonicus* to describe such people (Zemtsovsky: 2002). Undoubtably, both people with such cultural backgrounds and musicians hear polyphony with a sharper perception of the individual pitches in a vertical sonority. For experienced and non-experienced listeners alike, however, attention can be drawn to the individuality of each simultaneous line through what I will call voicing.

17.3 Voicing lines

Lines as found in the score are possibilities or affordances. In the case of our Chopin Nocturne student (§17.1), he became aware of a certain line and ultimately played it with a sense of individual continuity that coexisted with the soprano line. The structure of such continuity is nuanced by coarticulation, and thus may be a hierarchical nesting of continuities. The local continuity between two eighth notes and the ensuing half note is superseded by an overarching continuity across the whole sequence (*poco a poco cresc.*), a continuity that is shared with the other voices. The act of investing a line (which, to repeat, is merely an affordance of the score) with such continuity of gesture by *hearing* it as a line, by *listening* to it as a line or by *embodying* it as a line is what I will call *voicing*. The resulting

sound can be perceived by the listener, starting with the performer himself, as a gestural continuity because of its increased grabbiness (§17.1). Therefore the distinction between lines - which are mere possibilities - and voices - which are embodiments of such lines in gesture and sound - puts the responsibility for voicing completely on the performer.

If voicing is an act of investing a line with a sense of felt continuity of gesture, then one might wonder what a non-voice would sound like in performance. In the case of the student, the non-voiced line in the first performance showed a sort of discontinuity that betrayed the fact that the student did not hear the notes in question as a line. But to give a more general example, consider the soprano melody from Chopin's Nocturne in F-sharp minor op. 48 no. 2. The melody is full of corners, for example across the bar line between measure three and four. In a simply digital performance (that is, using only the fingers with a rather fixed hand and wrist) these corners are heard as abrupt or angular, destroying the overarching continuity that is suggested by the long slur. As I have explained before (§15.2.1.1 and §9.3), the physics of the change in direction in gesture ask for a rounding of the corner if it is to be perceived as a continuous voice. This rounding of the corner can most easily be created by a rounded coarticulatory gesture of the hand and wrist, which in turn influences the timing and dynamics around the corner. Such a rounded quality is readily perceived by the listener. In a good voicing of this soprano line, this quality of continuity should be felt also at the overarching levels of the sub-phrase and at the level of the whole phrase, continuities which may be felt physically in the arms and torso as well as in the build-up of visceral intensity.

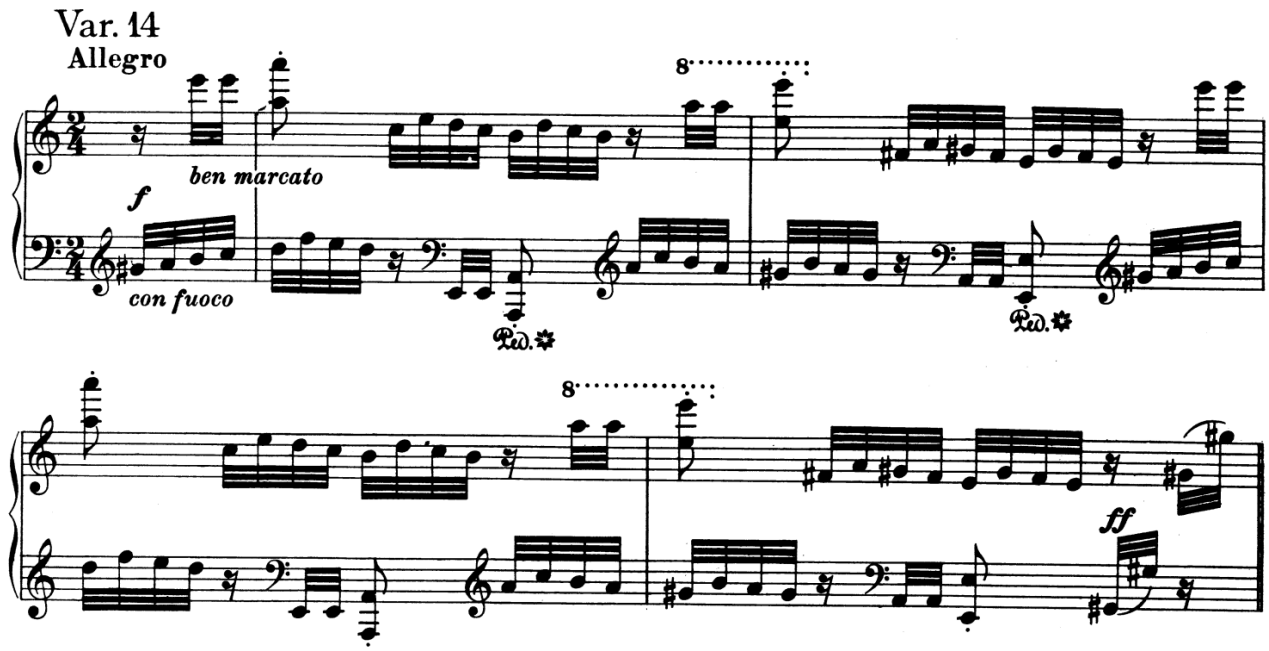


Example 17.5: Chopin Nocturne op. 48 no. 2 in F-sharp minor (Schirmer, Mikuli, 1894)

What this example suggests is that there are various degrees of voicing organised around three poles: (a) which and how many hierarchically nested timescales are voiced; (b) whether the voicing occurs by means of *embodied expressed timescales* or *disembodied expressed timescales* (§14.3); (c) whether the voicing is *involuntary*, *allowed without being willed, willed,* or *willed and overt* (§9.7). In other words, voicing may be structurally sophisticated, including several such layers of expressed timescales, or it may be simple. The effect of voicing can be achieved through the imagination perspective by manipulating timing, dynamics and articulation to give the impression of continuity of gesture without actually following with physical movement in the playing perspective (*disembodied expressed*

timescales) or as continuity of gesture that is both imagined and physically felt (*embodied expressed timescales*[68]). Moreover, the voicing may emerge involuntarily (§9.7) without awareness as a gestural topological response to the topography of the keyboard (*involuntary*), it may be allowed to emerge similarly but with awareness (*allowed but not willed*), it may be superimposed (*willed*) or it may be superimposed in such a way as to call the conscious attention of the listener (*willed and overt*).

The imagination perspective remains crucial in voicing lines that are divided in the playing persepective. Consider this example from Brahms' Paganini Variations:



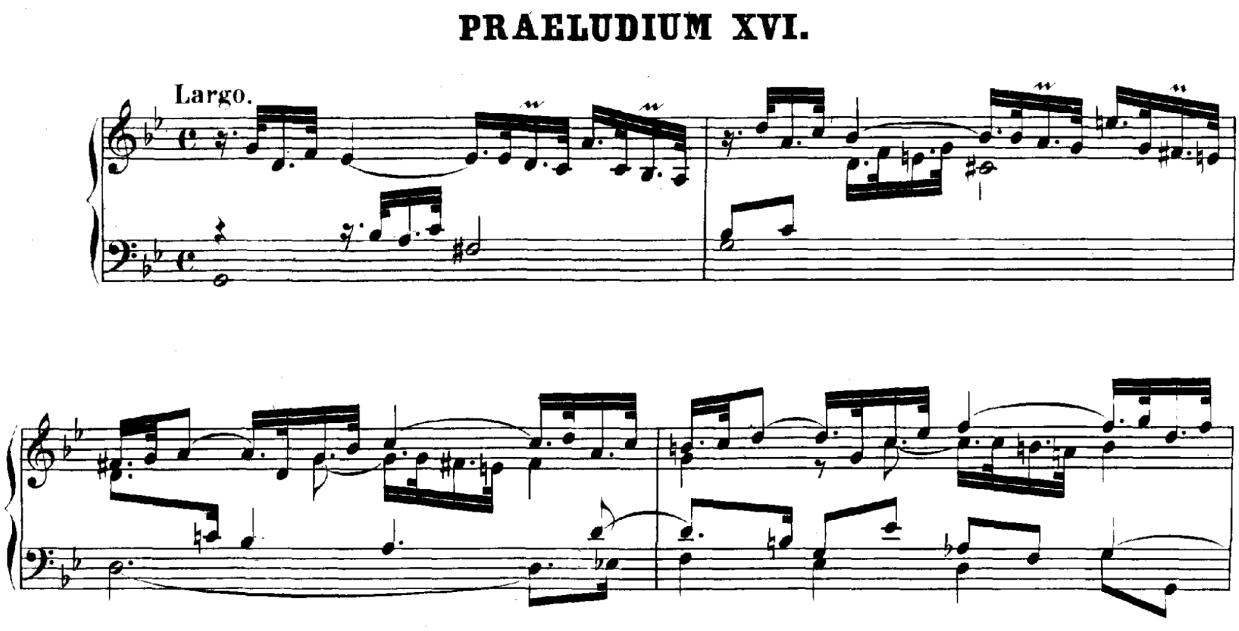
Example 17.6: Brahms Paganini Variations op. 35 (Breitkopf, Mandyczewski, 1926)

One clear line is formed by the continuous thirty-second notes that are passed between the hands. This line, starting from the first full measure, outlines a descending scale pattern on the timescale of the eighth notes. The coarticulation of the groups of thirty-second notes remains always in one hand or the other, while the continuity of the whole two-measure phrase is passed between the hands. The continuity on the two

[68] As I have argued in Part II and Part III, embodied expressed timescales are to be preferred.

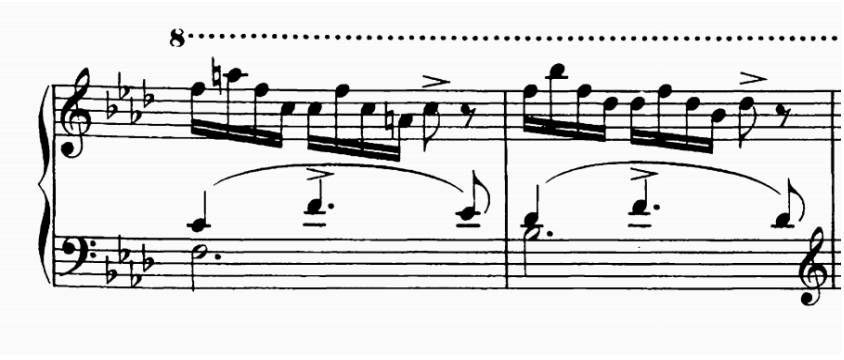
measure timescale is heard as a gesture in the imagination and listening perspectives, but occurs as separate gestures in the hands. If the continuity on the eighth note timescale and the continuity of the two-measure phrase are both voiced, the option still remains to voice the grouping found on the quarter note timescale (whether lining up with the division between the hands or not).

Boulez defines voices as constellations or recurring patterns of elements in music (Boulez 1971: 117). If we broaden the idea of voicing beyond the embodiment of lines and step-progressions, myriad possibilities for voicing emerge. A rhythmic pattern migrating between lines, when executed with a particularly close attention to continuity or similarity, becomes a voice in performance in the sense that the persistence of its expression draws attention. Consider, for example, the dotted rhythm in the Prelude in G Minor of Bach, BWV 885. Most performances do not realise the dotted rhythm with mechanical accuracy, but rather with a somewhat shorter thirty-second note. This provides a very particular rhythmic signature, felt as a repeating gesture, which when continued identically or in a progression between lines becomes in and of itself a voice.



Example 17.7 Bach: Prelude in G Minor from the Das wohltemperierte Klavier II, BWV 885 (Breitkopf, Kroll, 1866)

Similarly, patterns of accents distributed between voices can be emphasised as recurring patterns, and thus voiced. In the case of this example from Schubert, the continuity between the implied accent on the first beat and the accents on the second and third beats, each part of a different line, can be voiced.



Example 17.8: Schubert Impromptu op. 90 no. 4 in A-flat (Breitkopf, Epstein, 1888)

One might ask if it is possible to perform such a passage correctly playing the accents, but *without* voicing the accent pattern. Clearly the answer is yes, since the precise

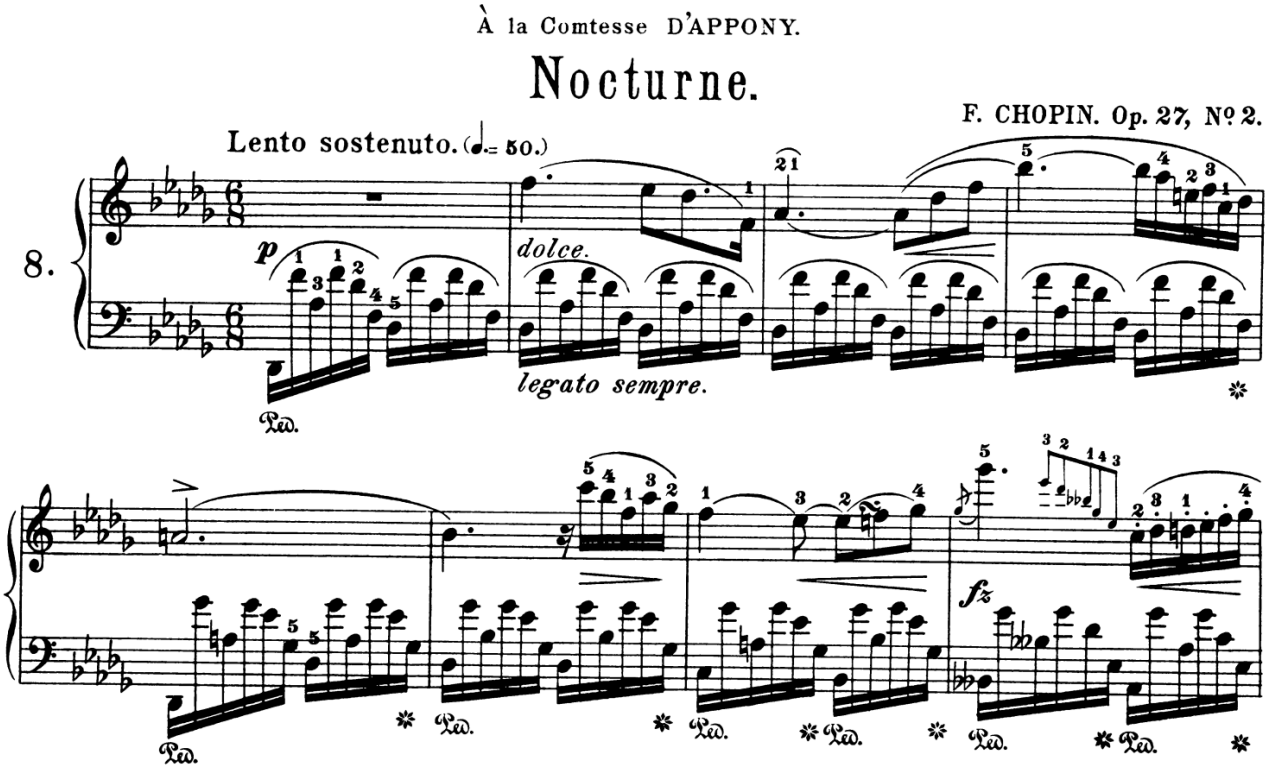
continuity of timing, the dynamic balance between accents, and the felt quality of gesture suggested by the accents all must conspire to create such a voicing, and if any of those elements is sufficiently askew, the voicing is lost. In this way, the attention of the performer in the sense of how he *hears*, *listens*, or *embodies* a voice is communicated to the audience. Of course whether such a voicing is desirable is an entirely separate issue.

In summary, various recurring or continuing elements in the score, such as lines and patterns, can be thematised or brought out through voicing. The process of voicing increases the grabbiness of the line or element voiced, making it resonant with listeners at a bodily level. To the extent that listeners are attuned to their own bodily experience (bodiliness), these voicing can then rise to awareness. Compound melodies, hidden step-progressions, rhythmic accents or gestures, lines created using alternating fragments of other lines all can be voiced. The expression of such voices is conditioned by the hierarchical nesting structure of expressed timescales, and thus each voice has such a hierarchical structure, whether it has few or many layers. This gestural structure can be heard through details in the sounding surface of the music, whose grabbiness communicates the experience and structure of such voicing to the listener. The degree to which voicing occurs is variable in that it may be conscious and planned or rather inadvertently physical, but the more structurally sophisticated the voice is, the more likely coarticulation will be needed to simultaneously express each level of the voice's hierarchical structure.

17.4 Voicing homophony

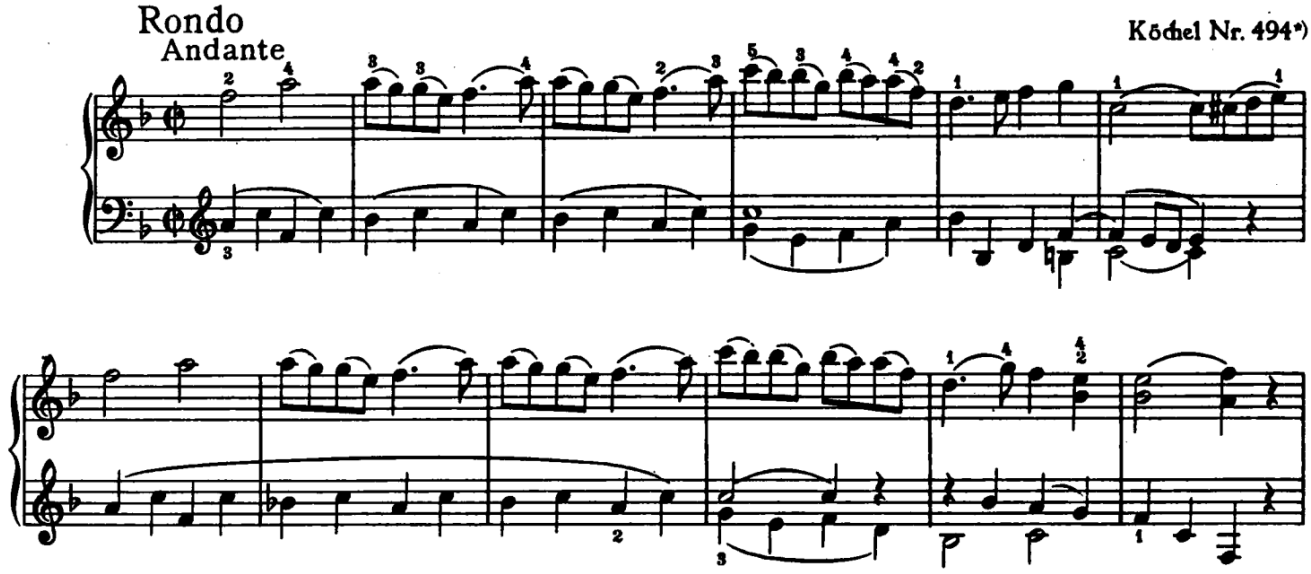
Due to the decay in sound of single notes on the piano, voicing long lines that contain long notes can be challenging. Playing the melody from Chopin's Nocturne op. 27 no. 2 by itself, even with the most elegant intonation and phrasing, is unlikely to achieve

the same degree of voicing that is possible when combined with the accompaniment. This is because the accompaniment, quite apart from the acoustic constructive interference of harmonics, provides one level of support in the hierarchical filling-out of gestural continuity of the melody. The movement of the sixteenth notes coalescing into the movement of the half measure provide the fundamental continuity onto which the overarching continuity of the melody (felt on the timescale of the whole measure and of several measures) can be painted. The accompaniment pattern *explains* the gesture of the melody in that it can be manipulated to show direction (slight and gradual progressions in tempo and dynamics) while still maintaining the continuity of its undulating pattern of sixteenth notes and half bar groupings. The hierarchical gestural structure of the melody, then, is splayed out asymmetrically across the two hands.



Example 17.9: Chopin Nocturne in D-flat op. 27 no. 2 (Schirmer, Mikuli, 1894)

This asymmetrical mapping across two hands is also often reversed in the sense that longer continuities in the accompaniment hold together shorter segments in the melody which otherwise might sound fragmented. Similarly to the above example, the timescales nest within each other.



Example 17.10: Mozart Rondo in F major K. 494 (Peters Urtext, Martienssen & Wiesman, ca. 1938))

In this example, the left hand in the first phrase voices continuities of one measure, and in the second phrase one long continuity of four measures. The right hand voices timescales that nest within the longer timescales of the left hand. Taken alone, the right hand would sound jumpy in gesture and the left hand would sound rather static in gesture. Together, the two hands build a much more fuller spectrum of voiced timescales: individual notes (eighth notes, quarter notes, half notes, whole notes), groupings on the timescale of quarter notes, half notes, whole notes and four bars as well as the general phrasing over six bars and the period over twelve bars.

In expression, performances of both of these examples as I have described them typify what I will call *homophonic voicing*. The accompaniment and melody parts nest within each other hierarchically in timescale relationships that are reducible to a whole integer over one (2:1, 3:1, 4:1, etc.). While the gestural expression of the melody and accompaniment parts are realised on different timescales, the hierarchical "nestability" of these timescales into each other allows them to be felt and perceived as belonging together to the same voice. This homophonic voicing can be distinguished from *monophonic voicing,* where the gestural content of both voices coincides in the same expressed timescales.

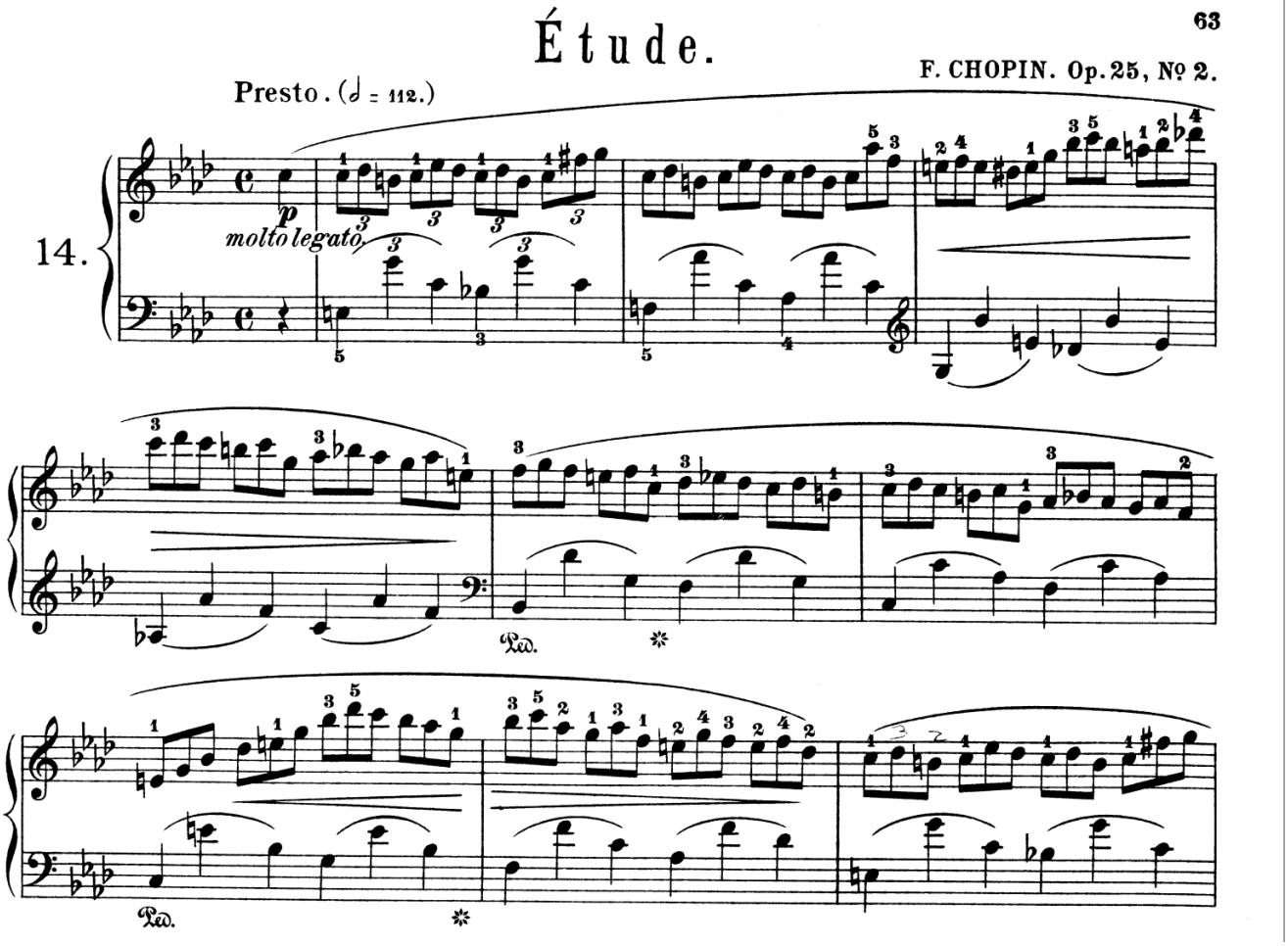
It bears emphasis that voicing, and therefore the homophonic voicing and monophonic voicing discussed in this section, happens in performance and not in the score. The slurs in the preceding examples of Chopin and Mozart may be interpreted in other ways (see discussion of §15.2.1 and §16). I chose these examples since the slurs demonstrate the timescale relationships between the melody and accompaniment. In the Mozart example, the last F in the left hand in measure five begins a slur that spreads over the timescale of four quarter notes, a timescale which does not nest without remainder in the timescales of the other voices. This phrase ending is an example of *polyphonic voicing*, which I will introduce in the next section.

17.5 Voicing polyphony

Gestural polyphony, which results in polyphonic expression, is characterised either by simultaneously voiced timescales that have a non-divisible or fractional relationship (2:3, 3:4 etc.) or by simultaneously voiced timescales that are similar but in which the direction of the gesture is dissimilar.

17.5.1 Fractional timescale relationships

In the Mozart Rondo discussed previously (Example 17.7), a fractional relationship in timescales can be observed in the last two measures. This phenomenon is commonly seen at the level of individual notes, and can be seen in the following example from Chopin:

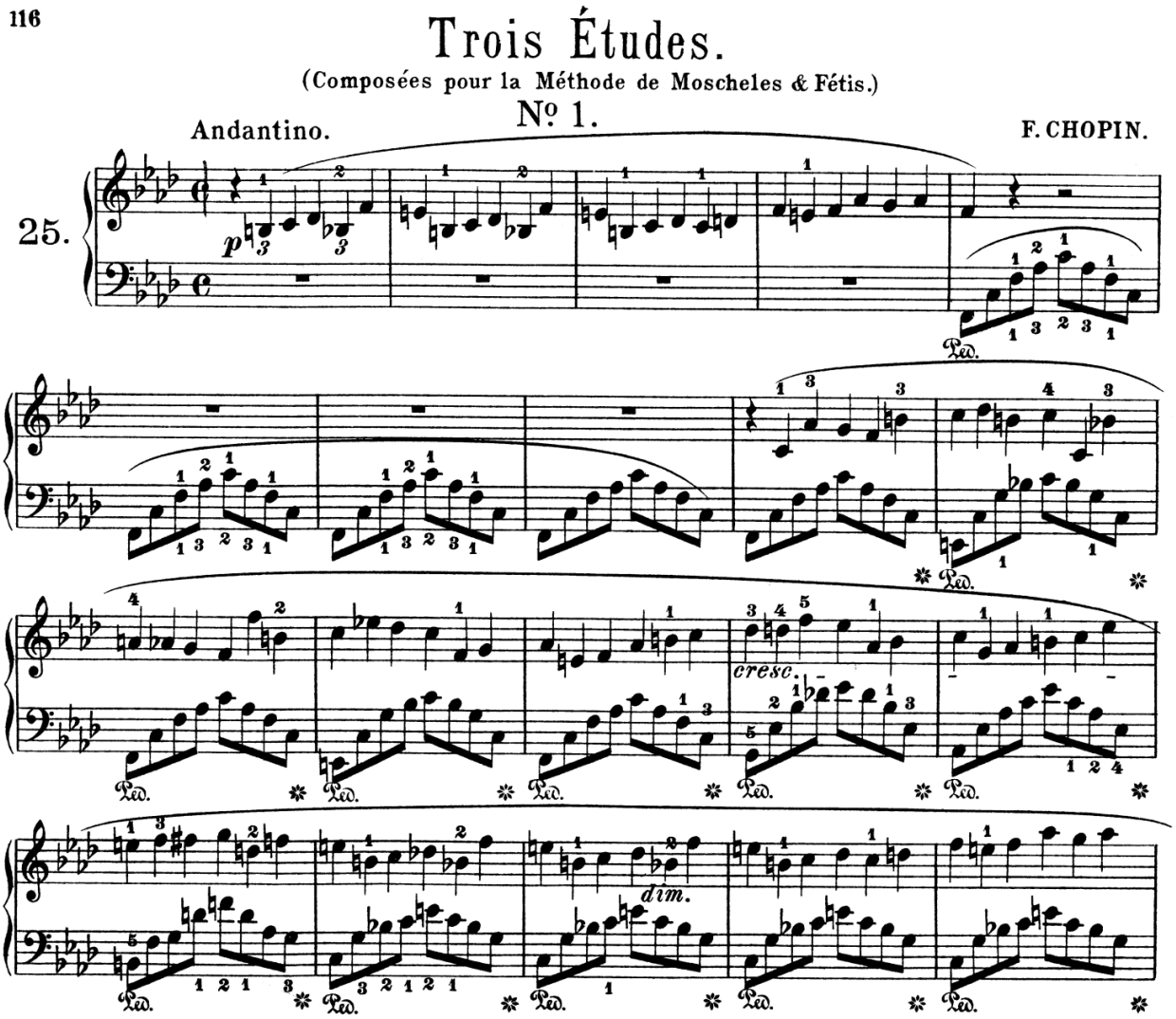


Example 17.11: Chopin: Etude in F Minor op. 24 no. 2 (Schirmer, Mikuli, 1895)

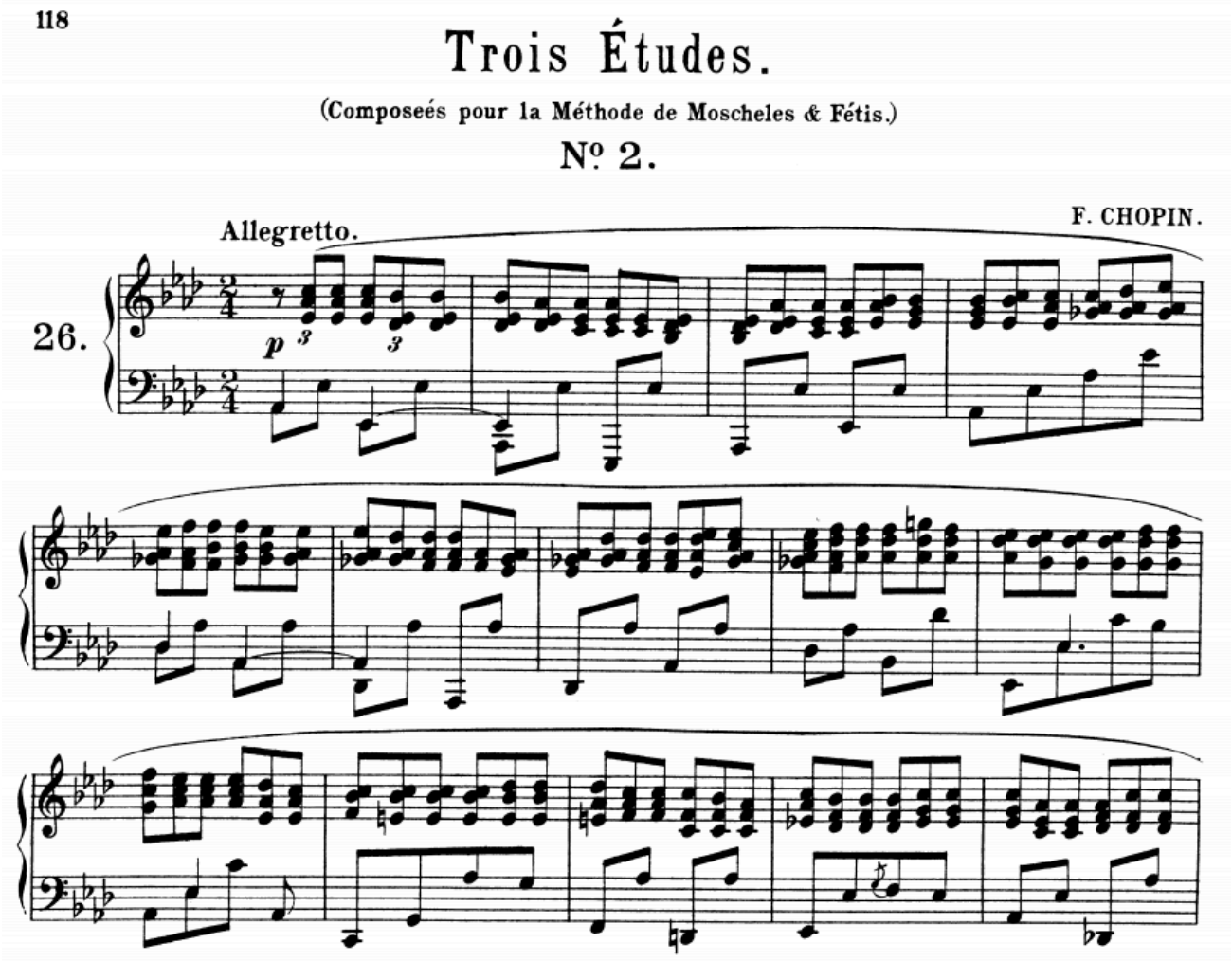
The intonation of the right hand is indicated by the beaming of the notes in groups of three, which has a fractional relationship to the left hand quarter note triplets. Some pianists gloss over this by grouping the right hand notes in twos, so they do dissolve into the left hand in a non-fractional relationship (which is a homophonic voicing). An

interpretation might also combine both possibilities in different measures, depending on the ways the figuration circles around its central note (in groups of three or in groups of two). Which interpretation is better depends on whether one prefers homophonic voicing or polyphonic voicing, but all aesthetic considerations aside, the gesturally homophonic version might seem slightly easier to play since the body schemata underlying homophonic voicing are rather more deeply ingrained for most pianists, so it offers the path of least resistance. In my opinion, the grouping of right hand notes shown by the beaming should be voiced, and the resulting polyrhythm seems to be one of the central characteristics of the Etude.

In the last Etudes Chopin wrote (from the *Trois nouvelles études* written for the Fétis and Moscheles method book), polyrhythm is of primary importance. Its use, as I will explain, emphasises the coarticulated overarching gesture.



Example 17.12: Chopin Etude in F Minor op. Posthumous (Schirmer, Mikuli, 1895)



Example 17.13: Chopin Etude in A-flat op. Posthumous (Schirmer, Mikuli, 1895)

For experienced musicians, it is easy to forget how even the simplest polyrhythm (two against three, or three against four) depends on embodied knowledge. In teaching, we may introduce a strategy that subdivides to the lowest common multiple, for example a two against three would subdivide the timescale into six. Counting in such a way - interpolating the notes of both lines onto one stream of subdivisions - voices the two lines together into one continuity. Unfortunately, the gestural continuity of each *individual* rhythm then feels disjunctive, as the felt common subdivisions - and perhaps even the felt gesture of the note in the other line - interrupt the smooth passing from one note to the next.

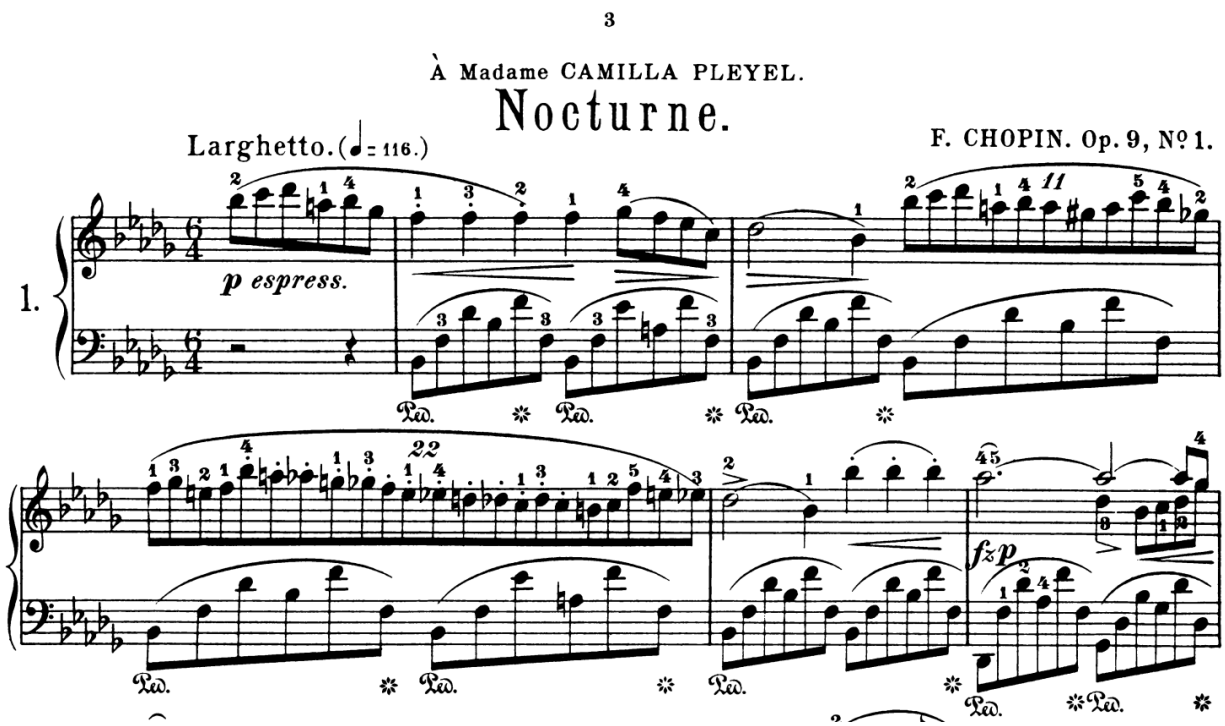
Subdivision to the lowest common multiple is only one of several possible heuristics, each of which may approach mathematical rhythmic accuracy while depending on the unification of hierarchical rhythmic pulse into one line instead of two. When I was taught four against three, I was taught the phrase: "eat your goddamn spinach!"

Subdivision:	1	2	3	*4*	5	6	*7*	8	9	10	11	12
Four:	Eat			your			damn			ach		
Three:	Eat				god-				spin-			

While this helps to approximate the mathematical layout of one rhythm against the other, the word "your" interrupts what should be a gestural continuity between "eat" and "god-." Attention hops back and forth between each line. The point is that any such heuristic eliminates polyphonic gesture by reducing two lines into one rhythmic voice. The use of such subdivisions is readily audible. The heuristics can be practiced until the overarching continuity of gesture of each line is felt, and when the heuristics are then discarded the gesture becomes polyphonic. This is an embodied knowledge (because it depends on felt continuity of gesture rather than mathematics). The embodied side of execution of such rhythms can remain unnoticed - after all I can *imagine* such rhythms quite easily - but for me it came into focus most dramatically when I tried to execute such rhythms on the organ pedals, either between two feet or between manuals and pedals. Three against four for my hands is a well-trodden path, but for my hands against my feet it had a decidedly different feel. I found myself needing to use the heuristics of subdivision, long since unnecessary for my hands, to teach my hands and feet the rhythm. Some repetition later I could discard the heuristic and execute the rhythm with its appropriate continuity for both voices.

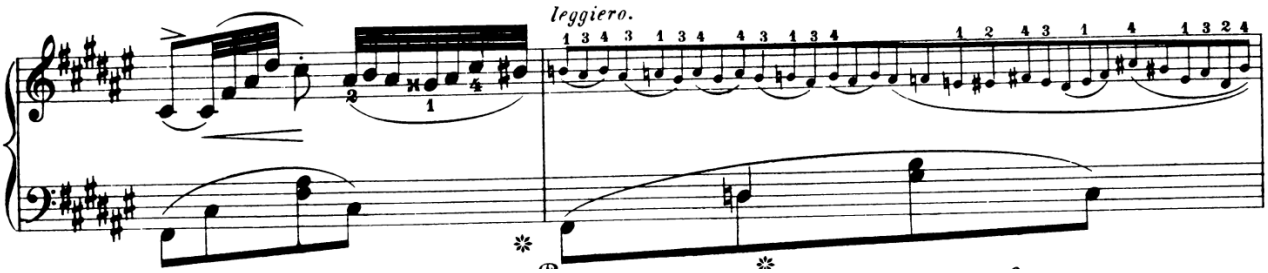
If the subdivision approach is used in either of the Nouvelle Etudes shown above, they sound plainly non-legato (legato being understood in the sense of "in a smooth and flowing manner" §15.2.1). Such a performance would sound unmusical to even the most novice ears, since the grabbiness of the melodic line as a continuity is obvious and such subdivisions would be felt as interruptions of this continuity. By setting up this situation, Chopin cleverly forces the student to focus on the overarching coarticulated continuities. It is a general principle that divergence on a lower hierarchical level tends to emphasise the continuity of superordinate trajectory shapes. This becomes easily apparent in the application of divergence to other musical examples, where it is not suggested so clearly by the notation, and I will provide some examples in §20.

Chopin's music is full of florid passages where the mathematical relationship in notes on a given timescale is not divisible without a remainder. In such passages, a fluent execution almost always presupposes polyphonic gesture on at least the lowest level in the hierarchical structure of gesture (the individual notes).



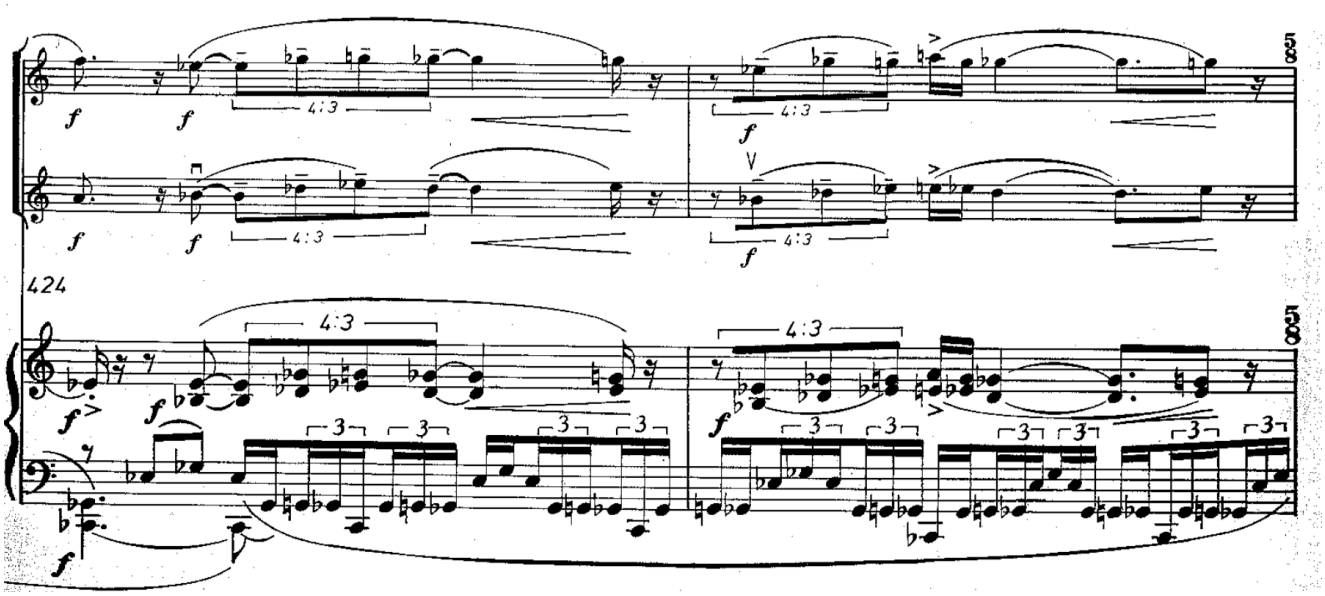
Example 17.14 Chopin Nocturne in B-flat Minor op. 9 no. 1 (Schirmer, Mikuli, 1894)

Chopin's lines often suggest groupings within such florid passages, which can be voiced with coarticulation. In the following example from Chopin's Nocturne op. 15 no. 2, groupings in the florid passage are explicitly notated with slurs, and these intonations remain free from the rhythm of the eighth notes in the left hand. The voicing of these groupings through coarticulation results in a polyphony of gesture on a higher timescale than individual notes. If finger attacks articulate individual notes, coarticulation of the wrist articulates the small groupings and the top arm, for example, provides the continuity of the longer overarching grouping at the end, all of those levels of coarticulation can be said to diverge from the left hand on every timescale less then the full measure.



Example 17.15: Chopin Nocturne in F-sharp op. 15 no. 2 (Schirmer, Mikuli, 1894)

Chopin's arabesques are quite flexible and free in their temporal unfolding. Such fractional integer relationships can also occur on hierarchically higher timescales in more rhythmically precise passages, as is shown in this excerpt from the Trio for Clarinet, Viola and Piano by the Dutch composer Rudolf Escher (Example 17.16). The time signature is 9/8 and the piano part by itself demonstrates four against three in which the three is further subdivided into two and three. The three is thus one hierarchical move away from the foreground.

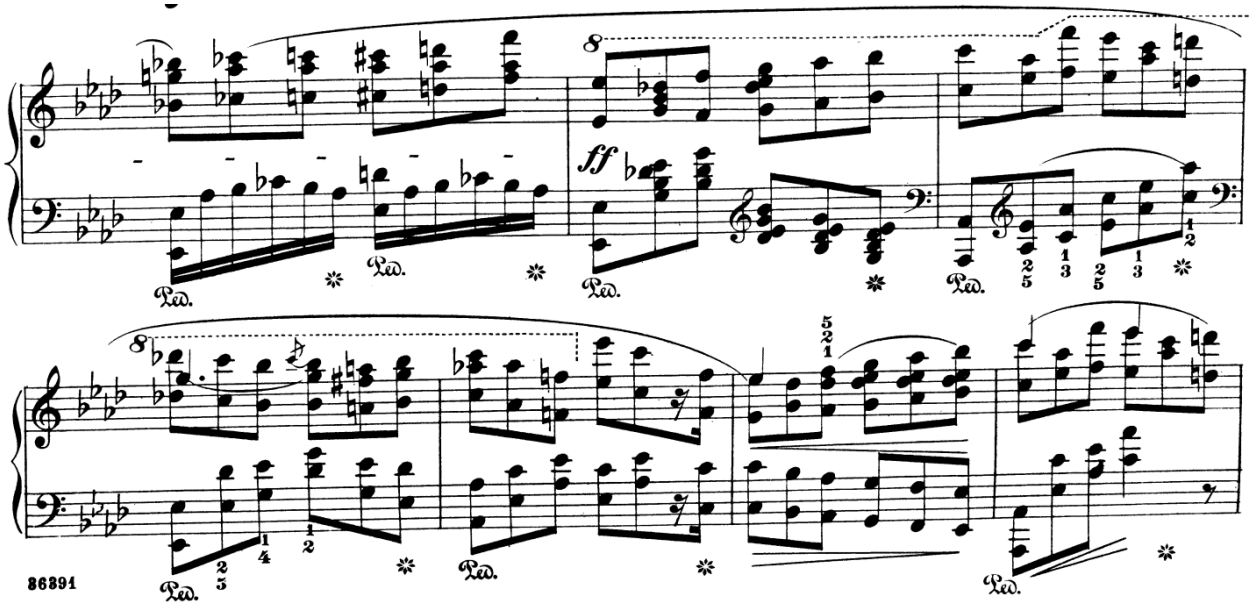


Example 17.16: Rudolf Escher: Trio for Viola, Clarinet and Piano (Edition Donemus, 1981)

Executing the passage requires both feeling the three against four and subdividing the three correctly. Because of the changing subdivision of the three (which is subdivided into two on beat three and into three on beats three and four), a strategy of interpolating the right hand notes approximately between or over the left hand notes is destined to fail. If the passage is to be played with the correct rhythm, the intonation of the rhythm in the left hand must be first practiced in and then this gestural feeling of three can be set up against the four, instead of the individual sixteenth notes against the four.

17.5.2 Divergence in direction

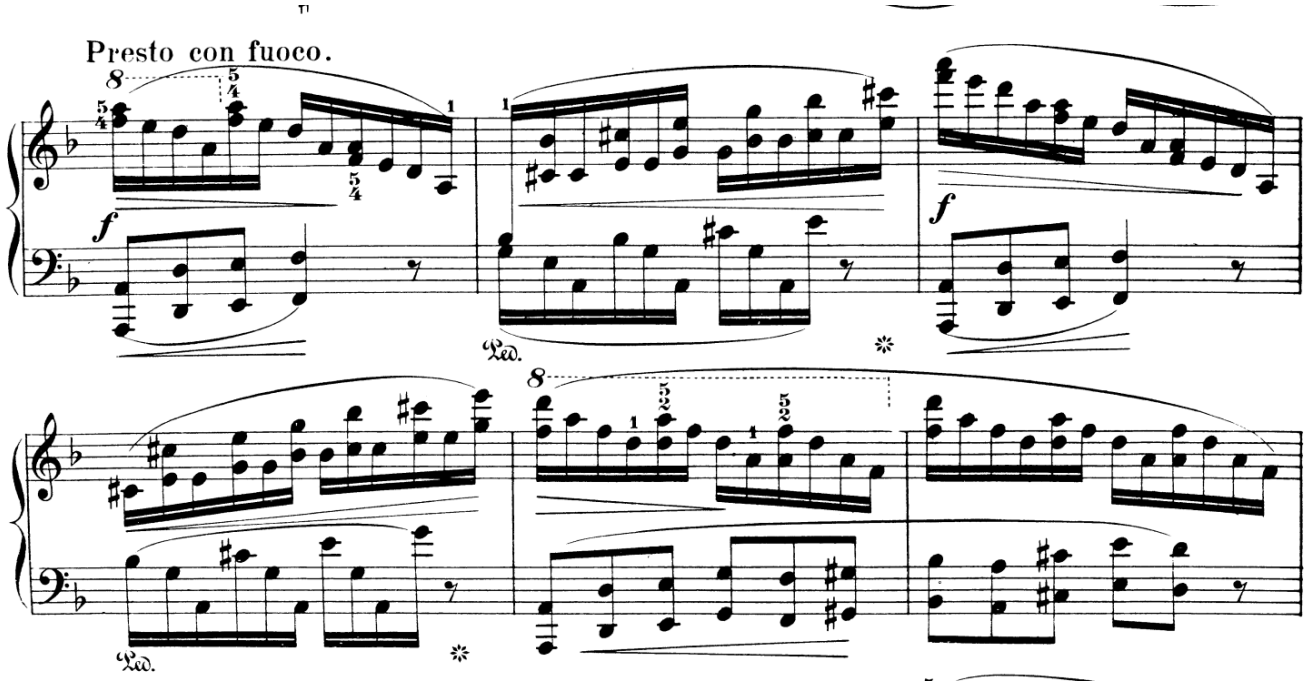
In §10.1 I characterised gesture with direction, which can be explained with the distinction between *prefix,* which leads towards a point of emphasis and *suffix,* which comes away from such an emphasis. When one timescale is voiced with two simultaneous directions (*prefix* and *suffix*) the underlying gesture can be said to be polyphonic. It was with such an example I introduced polyphonic expression in the introduction to this dissertation:



Example 17.17: Chopin Ballade No. 3 in A-flat, op. 47 (Schirmer, Mikuli, 1894)

In the third bar of the second line, such a divergence in gesture is represented by the simultaneous crescendo and diminuendo. In fact, since *prefix* and *suffix* gestures often occur together around a point of emphasis, taking a timescale in which these two phases diverge tends to divide the gestures, rather artificially, into parts. The benefit of such division, however, is that it provides a clear timescale on which divergence occurs, and therefore can serve as a constitutive part of our definition of *polyphonic expression*.

Written indication of divergence in expression is relatively common in Chopin's music compared to the scarcity of such notation in the music of other composers. In this passage, for example, the repetition of such divergent expression shows its deliberateness.



Example 17.18: Chopin Ballade no. 2 in F Major, op. 38 (Schirmer, Mikuli, 1894)

Even though it is not often notated, music of all time periods has affordances for polyphonic voicing. Through the experiments and examples that follow, it is my goal to develop awareness of these affordances in order to explore the possibilities for polyphonic expression.

17.6 Voicing and performer's choice

In the sense of the word that I have developed in the last section, *voicing* occurs in the domain of performance rather than in the score. The score provides affordances for various voicings which even in the simplest musical textures provide many options, considering that voicing can operate on many hierarchically nested timescales, between step progressions hidden within a melody, between lines, or it can bring out motivic and rhythmic patterns.

Indeed, considering the broad definition of voicing and the possibilities it entails, the musical score is teeming with affordances that go far beyond what is explicitly notated, or what is suggested by analysis. Many possible voicings that are not suggested by the notation also do not go *against* what the composer wrote, leaving a wide space for creativity. In this sense, the musical score has far more possibilities for the performer than for the analyst, who must justify his conclusions with what is written. The contrast between homophonic and polyphonic voicing, described above, explains one such option - an option that exists in performance but not in the score.

Should voicing every timescale of every voice, every pattern, every step progression and so on be entirely up to conscious acts of interpretation in the moment of performance, performing would be either be nightmarishly complicated, or the result would be musically fatuous. Luckily, voicing happens naturally at many sites of the pianist's inner experience. In the first place, voicing most often happens through a continuity of gesture in the playing perspective, a continuity that is simply taken for granted and noticed only when it is missing or when it goes wrong during the course of the performance. This continuity *embodies* the lines in the scores. This is closely entrained to *hearing* the lines, which constitutes the rising into awareness of a voice with an

undifferentiated focus. Of course the pianist can also *listen* to the voice, which brings it into conscious awareness with a differentiated focus, or at least its most salient hierarchical layer of expression.

One must not infer from this discussion that hearing and listening are always built onto a substrate of gestural embodiment. Listening, especially in pedagogical settings, often starts with a conscious awareness, which gradually inspires extensional gesture (as exemplified in the pedagogical Chopin Nocturne story above). This can also be thought of as continuity beginning with the imagination perspective, which often is answered by continuity in the playing perspective. But the overlap between these continuities is not to be taken for granted. While talented students spontaneously develop such fluidity of movement that gives continuity to lines, less talented students must be taught this fluidity. Experience builds such continuity into the instrument-specific habitus of the performer, and such pre-reflective gestural know-how is both the primary way of understanding the score and the first tool for voicing. For every consciously worked out expressed timescale (§14.4), there might be several timescale expressions that happen automatically due to the pre-reflective ecological relationship to the instrument. These less salient expressed timescales certainly rise to awareness, but they emerge as *allowed but not willed* (§9.7). When such conscious willpower is used, it is often focused on the most salient hierarchical layer of expression, while the subordinate and superordinate layers remain at the periphery of awareness.

18 Experiments - layered recordings

Since voicing in general is at least partly a result of embodied knowledge and the habitus of performer in relation to the instrument, it follows that reducing the issue of polyphonic expression to a purely mental act of interpretation oversimplifies what is in fact a process that involves the pianist's whole self. Each line in a multi-voiced texture feels different when played in the context of the whole texture or when played alone, since the embodiment is different. Even when the same fingering is used, the feel of the voice in the hand is different when played alone, since the various tensions, stretches and competing pulls of other notes is removed. In this way, particularly when the fingering is allowed to be free, playing voices individually allows for a different voicing than playing them within the whole texture.

Playing voices individually is an important and universal practice habit, which allows the pianist to listen to each voice and to shape it without the constraints of polyphony. This can be thought of as a horizontal simplification. As discussed in §13.2, a parallel vertical simplification is found in Whiteside's technique of "outlining" (Whiteside 1998). Such horizontal and vertical simplification techniques allow a freedom of both movement and expression and call forth a broader palette of gesture, involving the undivided musicality of the whole self. Through practicing in such a manner, the pianist can pull himself up by the bootstraps, recreating the natural response to the simplified texture in the expression of the voice within the whole texture.

What this suggests, conversely, is that the embodiment of several voices at once is limited compared to the embodiment of each voice played diachronically (one-after-another). If it is true that musical expression emanates from embodied knowledge and the gestural habitus of the performer in relation to the instrument, then the nature and role of this embodied knowledge can be elucidated by comparing expression of voices when

played diachronically to their expression within the polyphonic texture played synchronically (all together).

If recorded separately, individual voices will thus display greater autonomy of expression. The research evaluation of such expression should occur in perceived sound, rather than by measuring the dynamic and temporal contours. A quantitative approach using measurements of timing (and possibly dynamics) could possibly compare the diachronic and synchronic recordings of individual voices, but such an approach would reduce gesture into its sounding details, while neglecting to consider their psycho-acoustic impact, or how they are perceived by a human listener (§10.1, Eitan & Granot 2006). The focus on details rather than gesture leads the performer to a cerebral orientation, where interpretation is a series of *conscious* choices that override the kind of thinking-in-movement that is suggested by the phrase "interpreting through the body" (§7). For these reasons, such approaches do not lead to the kind of artistic results that I seek. On the other hand, simply playing each voice individually and critically comparing it to a full-textured performance relies on memory - which may be faulty - and on an objectification of details through the linguistic analysis. The best elucidation is through the actual sound recordings, whereby differences in expression caused by differences in embodiment are readily audible, and which can be understood first on their own terms - in sound and gesture - and later reflected upon through verbal analysis.

Recording multi-voiced textures in layers allows for the synchronous playback, which juxtaposes separately recorded voices. Instead of measuring the timing of each voice in milliseconds - which would be holding the voice up to the measuring stick of world time - layered recordings allow each voice to be held up for measurement against its neighbouring voice, which can be thought of as felt time, conditioned by musical gesture. The divergence in gesture between the two voices is thus highlighted.

In such layered recordings, there are a number of trade-offs. In the first place, the separation into layers rigidifies the conception of what the voices might be in the score. As discussed previously, the possibilities for voicing the score go far beyond the obvious separation of lines that an analyst might see. This complexity is thus sacrificed in the layered recording, where the decision of which notes belong to which voice is fixed in the design of the experiment. Also, the interaction of voices with each other is severely limited, depending on the setup of the experiment (see §18.2). For music originally written for the piano, the unifying effect of the pedal and the sympathetic resonance between the voices is lost.

The benefit of allowing each voice to speak as an individual, however, is that such a layered process dramatises the divergence in expression between voices. The degree of divergence can be scaled depending on experimental design, ranging from slight divergence to utter chaos. This experiment, a deconstruction of sorts, brings out the polyphonic tension in expression between voices that is normally minimised by the unifying factor of simultaneous embodiment.[69] Since the underlying gesture causing the divergence can be expressed in three different kinds of detail (temporal, dynamic, articulatory) the divergence, which in the temporal sense causes the texture to fall apart in the diachronic recordings, can be translated into dynamics and articulation, which can then be incorporated into synchronically-played concert performances.

18.1 Goals and expectations

In the initial stages of planning this experiment, I envisioned it as a way to abstract the musical expression of each voice from what I viewed as the physical and mental constraints of playing several voices at once. As I began the research trajectory, I quickly

[69] This unifying factor results from the phenomenon of bimanual interference, which will be discussed and explored through exercises in §19.

realised the faulty thinking behind this conception. Like many pianists before me, I was presupposing a separation between musicality and technique, whereby technical constraints were to be overcome to allow the more perfect expression of some ideal imaginative interpretation. What I quickly realised was that the much more relevant issue was how the embodiment of the music coloured both my image of the sound (imagination perspective) and my perception of the sound (listening perspective). This highlighted the importance of embodiment as not an obstacle to be overcome in expressing some ideal sound picture, but as a constitutive element in the sound picture itself.

Before beginning this series of experiments, I thought through what I expected to happen. I expected to be able to work out, through repetition, a way of achieving an artistically convincing result through mixing the separately recorded voices. As the experiments proceeded, the results diverged widely from my expectations. Thinking through the experiments and actually doing them proved to be incredibly different. Indeed, throughout my entire research trajectory, the difference between thinking and doing has been striking, which is perhaps inevitable in any research with an embodiment focus. It is precisely this reduction of music to propositional thought that is favoured by score-based musical discourses such as musicology and music theory. This reduction obviates the role of the performing body, and therefore the central topic of this dissertation. As I have argued in previous chapters, the gestural content of performance is a primary site for working out the artistic result, which explains why conducting the experiments in thought alone might be so different from the actual experience of doing. Though I perhaps cannot convince the reader to recreate the experiments for himself, I hope that the recorded traces that I present alongside this dissertation will give a vicarious taste of what happened.

As I have mentioned, I expected to be able to achieve (through successive diachronic recordings of the same example) an artistically convincing result, and one which would transcend the limits of embodiment inherent in simultaneous execution. I expected, for example, that when prompted by a small auditory incipit to set the tempo, voices would diverge only slightly, since I assumed my sense of rhythm would hold the texture at least approximately together. In fact, many such assumptions proved to be false, and many other unexpected experiences and perceptions emerged.

18.2 Method

The experimental setup involved many parameters, which in successive iterations I could manipulate to control the amount of divergence in the end result. Such decisions that had to be made for each experiment were:

-Would I hear playback of one voice while I recorded the next? For the third voice, would I hear a mix of the first two?

-If not, how would I set the tempo? Would I set it by a metronome reference or by an auditory incipit?

-Would I use video for playback?

-Would I use pieces that are already in my repertoire, or would the fact that I already knew the full texture bias the results unconsciously towards convergence?

-What sorts of musical examples would I use?

I chose to use only audio recordings in order to focus on heard gesture (as opposed to seen, see §9.1). I will present here three examples, showing three different experimental

settings. For each example, I will describe the experimental setup and process, followed by a sound recording, which is the result. With a second sound recording, I will also show how the divergence, which in some cases is extreme, can be voiced into a synchronic performance (that is, one that involves playing all voices at once in the manner customary to concert performance). In making this second recording, I observe the details of temporal disjunction in the diachronic recording and translate them into dynamic and articulatory divergences. Rather than doing this literally, I do it with a liberal sense of artistic license. The process as a whole, while simple, allows many points of reflection along the way.

For the experimental recordings, I used the open-source audio editing program Audacity, which easily allows multi-track layering of recording. I connected a Zoom H6 audio recorder to my laptop via USB. One of the difficulties of layered recordings is the multiplication of static noise with each added layer. I decided not to filter out static noise since I wanted to be sure not to subtly interfere with the dynamic profile of each voice. When using playback, I experienced some latency issues with the default settings in Audacity, but trial and error helped me to minimise that effect. The setting of a latency adjustment of -305 milliseconds worked for my particular setup.

The selection of musical examples was an important beginning point. While the scope of this dissertation covers almost all piano music (since almost all piano music affords a polyphonic voicing), for these experiments I focus on examples with clearly notated contrapuntal lines. In order to open the field maximally, I used organ examples as well as piano examples.

18.3 Experiments

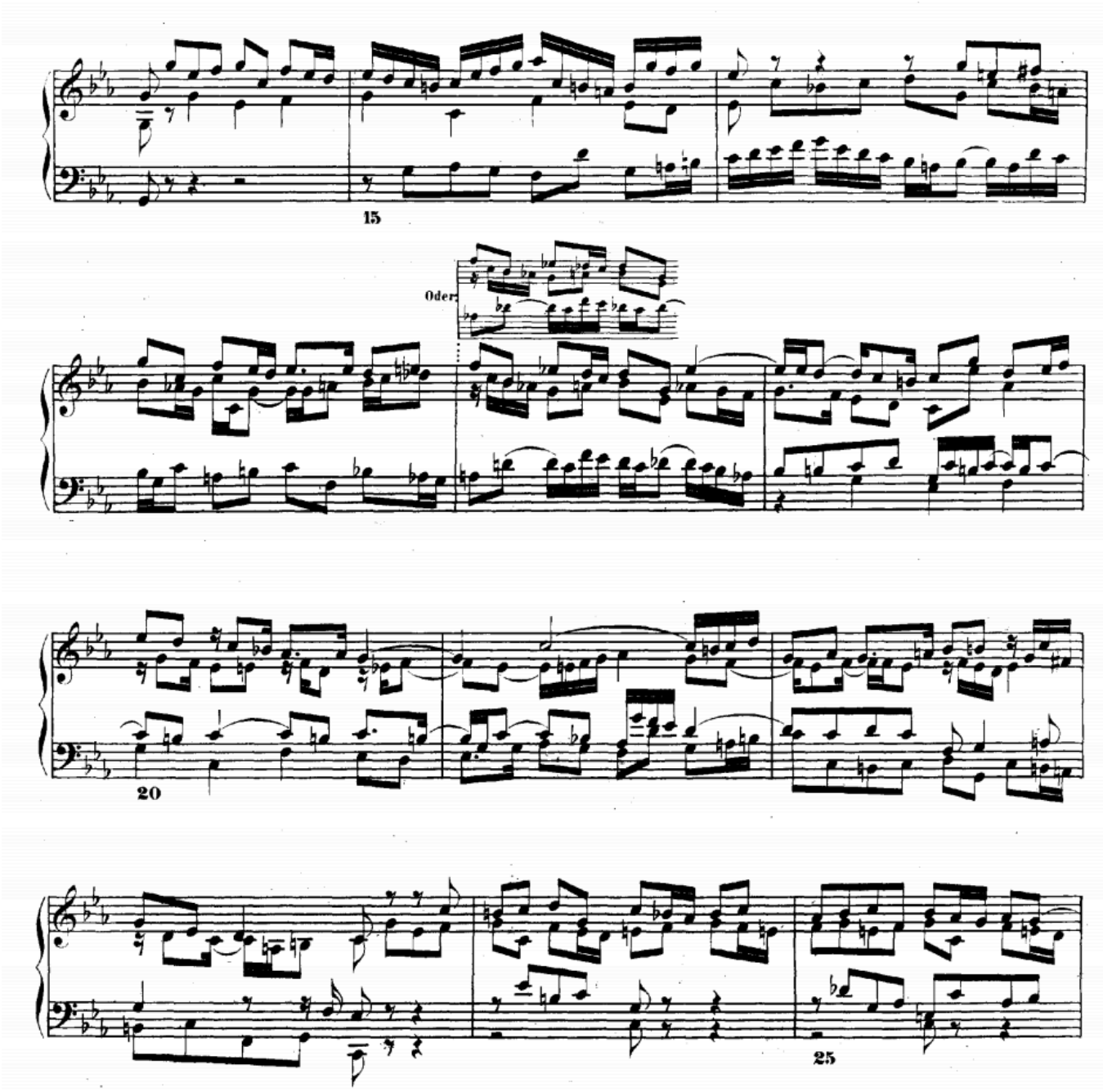
In presenting these experiments, I will discuss findings pertaining specifically to each experiment in the section about the experiment. I will present more general reflections pertaining to all of the examples in the following subsections.

18.3.1 Bach: Prelude and Fugue in C Minor, WTK II

For the first example, I chose J. S. Bach's Prelude and Fugue in C minor from *Das wohltemperierte Klavier II*, which is part of my repertoire and thus deeply familiar to me. Having studied it before the beginning of my research trajectory using the normal practice tricks (such as playing individual voices or pairs of voices, singing one voice playing another, for example), I wanted to find out if I could find something new even on this familiar terrain. Would I find polyphonic voicing that I had not previously considered? How would I perceive the agency of individual voices when "frozen" by the recording process, and how would this freezing of interaction affect the sense of legato in each voice? Would recording individual voices prompt me to hear the other voices, in which case would the hearing of these other voices normalise the expression of the voice being played, and thus limit divergence in the end result?

Though in the first trials I began with the first half of the fugue, the example I will present here is from the second half, beginning in bar 14 and ending at the cadence in bar 23. The reason for this is that this selection has four lines (the first half has only three), and also the augmentation of the subject provides an interesting complication. I experimented with different orders of recording the voices, and here I will include a recording of the order: soprano, alto, tenor, bass. In the first case (Audiovisual Example 18.1), I experimented with playback (listening to only the first voice recorded), deliberately allowing voices freedom to diverge in time. In the second case (Audiovisual

Example 18.2), I created an audio incipit to set the tempo for each voice, and then recorded each voice separately, *without* listening to the previously recorded voices on each successive voice after the first. In order to time the bass entry in bar 19, I "shadow-played" the soprano part after the incipit, touching the surface of the keys without sound. The second recording was thus a "blind" recording, designed to maximise divergence. Finally, I recorded the section synchronically (Audiovisual Example 18.3)



Example 18.1: Bach Prelude and Fugue in C Minor, Das wohltemperierte Klavier II BWV 871 (Breitkopf, Kroll, 1866)

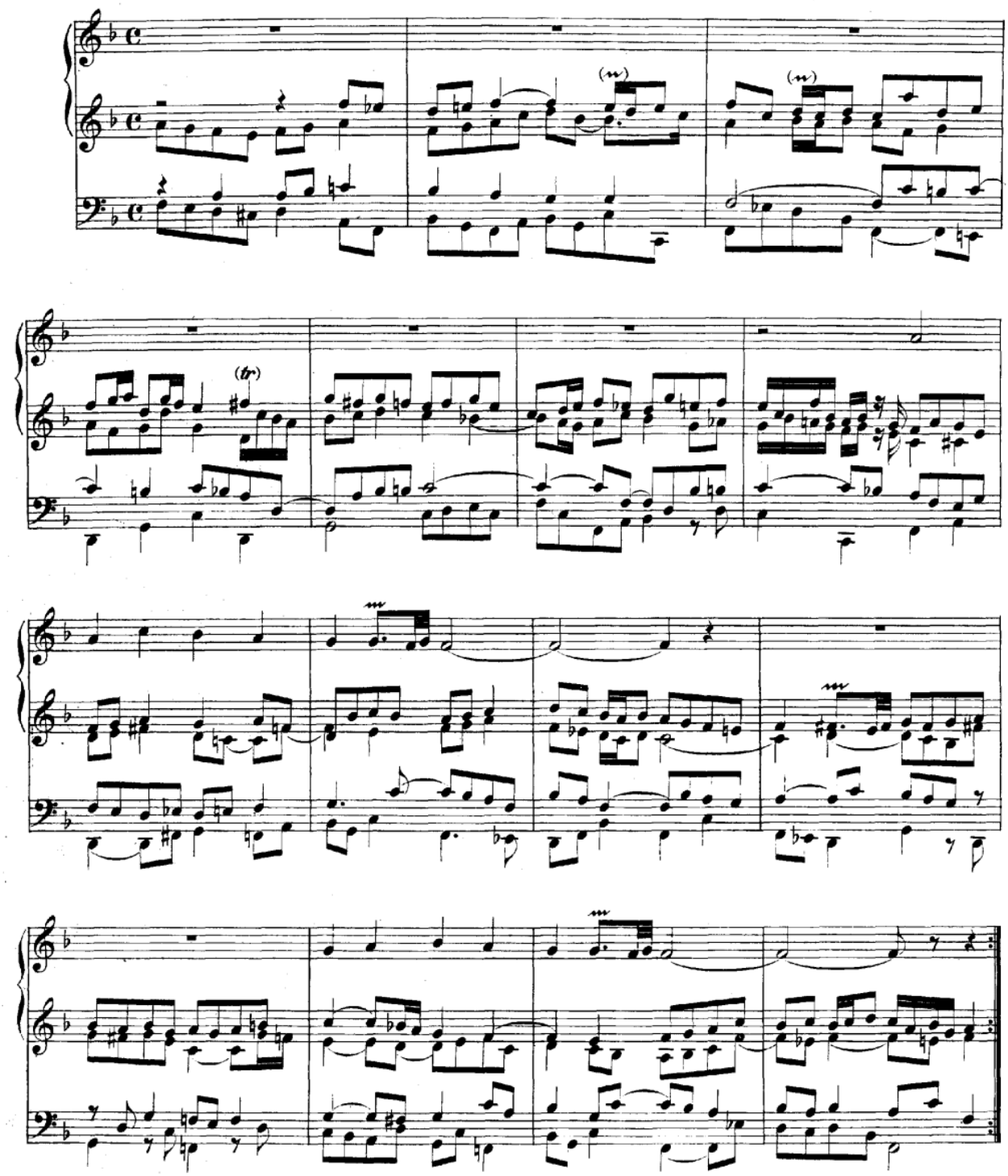
In listening to the "blind" mix (Audiovisual Example 18.2), I was initially quite surprised at the degree of divergence. It seemed as if my sense of rhythm - which I had not really ever questioned - was much less stable than I could have predicted. Voices, which began together, fell completely apart already by the second measure. The degree of divergence measured in timescale ranged almost up to a half bar. However, the

divergences were actually more organised than first impression might suggest. Remarkably, the divergence happened *more* on shorter and medium length timescales and *less* on longer timescales. The recording begins with voices together, and as the recording plays the voices quickly diverge. What is surprising is that by the end, at the final cadence, the voices come together again. This finding not only reinforced the idea of longer overarching continuities, but it showed how relatively accurate the timing and direction of such long overarching continuities could be compared to shorter timescales. The sense of rhythmic freedom apparent on shorter timescales was local and formed part of a very accurate overarching temporal unity.

18.3.2 Bach/Krebs: Wir glauben all' an einen Gott BWV 740

As one of the organ examples, I was keen to include a piece with a double pedal part. Apart from the fact that the physicality of navigating divergent intervals is a vivid embodied experience, due to the size of the pedal keys, the balance on the organ bench, and the relative weight of the legs, I also was curious if the voicings emerging from my feet would be rather different than from my hands. In order to examine this, I also made a recording using the hands to play the pedal parts. Because of the length of notes in the cantus firmus, it was clear that this had to be recorded last. The fact that this reverses the compositional process - which begins with the given cantus firmus - is interesting but irrelevant. This piece was not new to me at the beginning of the experimental process, but it was much less familiar than the prelude and fugue discussed above. The work is sometimes ascribed to Bach as BWV 740 and sometimes to Krebs.

For all of these recordings, I used an audio incipit to set the tempo, and proceeded to record each voice without playback (Audiovisual Example 18.4).



Example 18.2: Bach/Krebs Wir glauben all' an einen Gott (Breitkopf, Naumann, 1893)

Because of the jumps in individual pedal voices, and the widely agreed-upon idea that in performing Baroque organ pieces, one must primarily use the toes (due to the shortness of pedal keys on the relevant historical organs), the individual voices of the feet have wide "holes" in the legato. Taken alone, each voice gives a rather jumpy impression.

Together, the alternation of moving eighth notes and longer note values between one foot and the other foot allows for a grounding of the texture, both in terms of the sound picture and in terms of the physical experience of playing. This concept of balancing articulation between voices emboldened me to magnify the articulatory differences between the voices in a final, synchronic recording (Audiovisual Example 18.5). In this final recording, I experiment with how big I can make the holes in the legato without destroying the continuity of the whole.

18.3.3 Grieg: Fugue in G minor

In the previous examples, I had already heard and played the polyphonic texture as a whole before making the layered recordings. In contrast, I had never heard nor even *seen* the sheet music for Grieg's Fugue in G minor, which I asked a colleague to transcribe into a set of parts. In such a way, I could not know for sure how the parts would combine, and they would be recorded each on their own terms. Playback was not used, and I set the tempo by looking at a metronome pulse before playing. After recording each voice in the passage, I synchronised the recording (Audiovisual Example 18.6). I then did a second layered recording, knowing from the experience of the first approximately how the parts would combine, and listening to a playback of the first voice for all subsequent voices (Audiovisual Example 18.7). In this second recording, the process of attunement between voices began to take place, but only in sound and not in embodiment. I consciously allowed each voice the freedom to create divergence. Finally, I practiced the passage normally to be able to play it as written (Audiovisual Example 18.8).

The difference between attunement of one voice to another - in this case a voice fixed by recording - and *mutual* attunement, in which the voices subjectively interact was striking. Even though I could listen back and follow my own musical intentions in the first

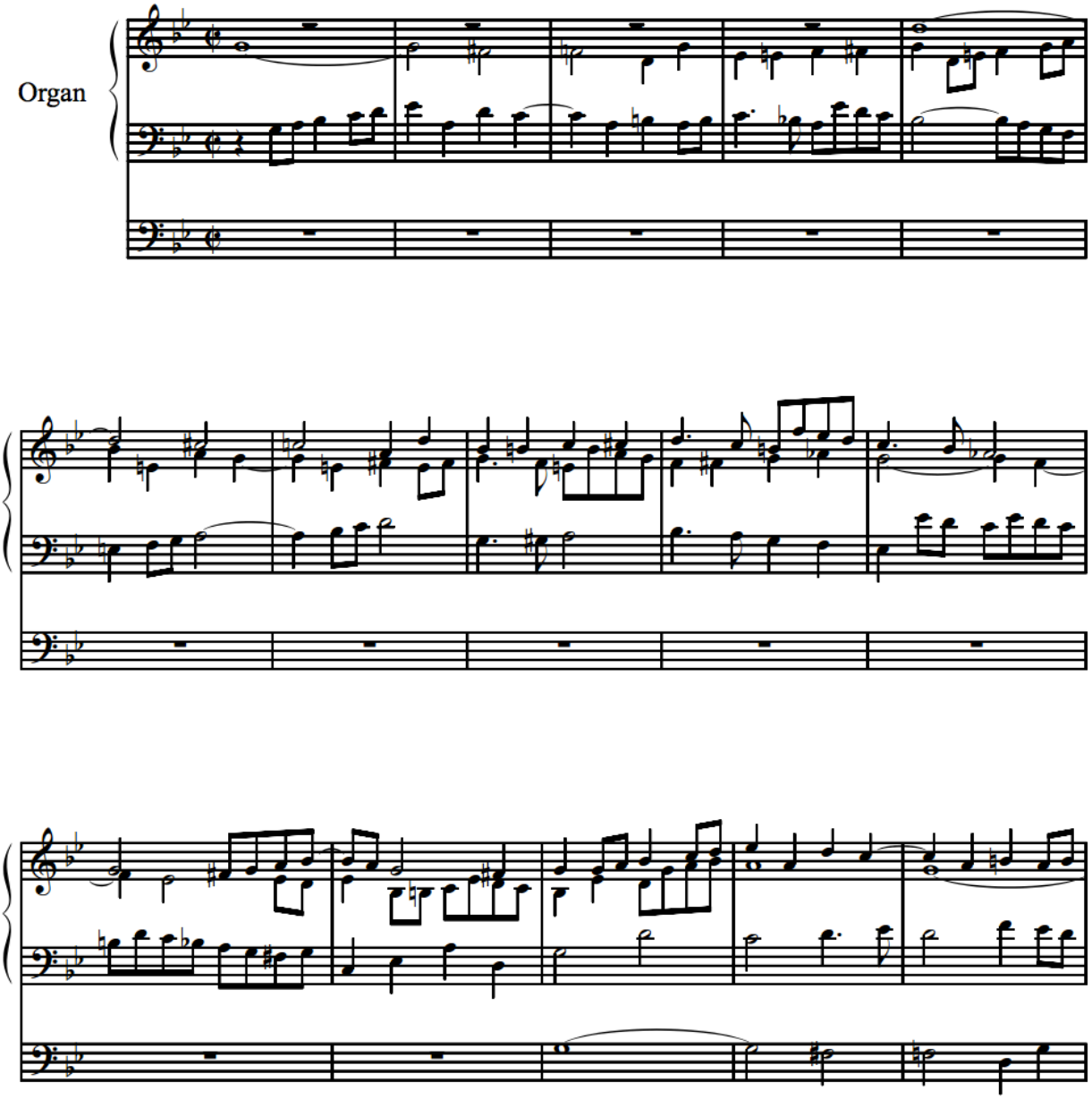
voice, I found it difficult to try to attune the second voice to the first. While I have participated in a couple of contemporary music projects that feature recordings as part of the performance, I had never felt before how difficult it is to relate strands of counterpoint when one voice is fixed. The musically subjective experience of apprehension of a pre-recorded voice as a fixed object in the experiment was an interesting departure for reflection, and I will come back to this idea in the following section.

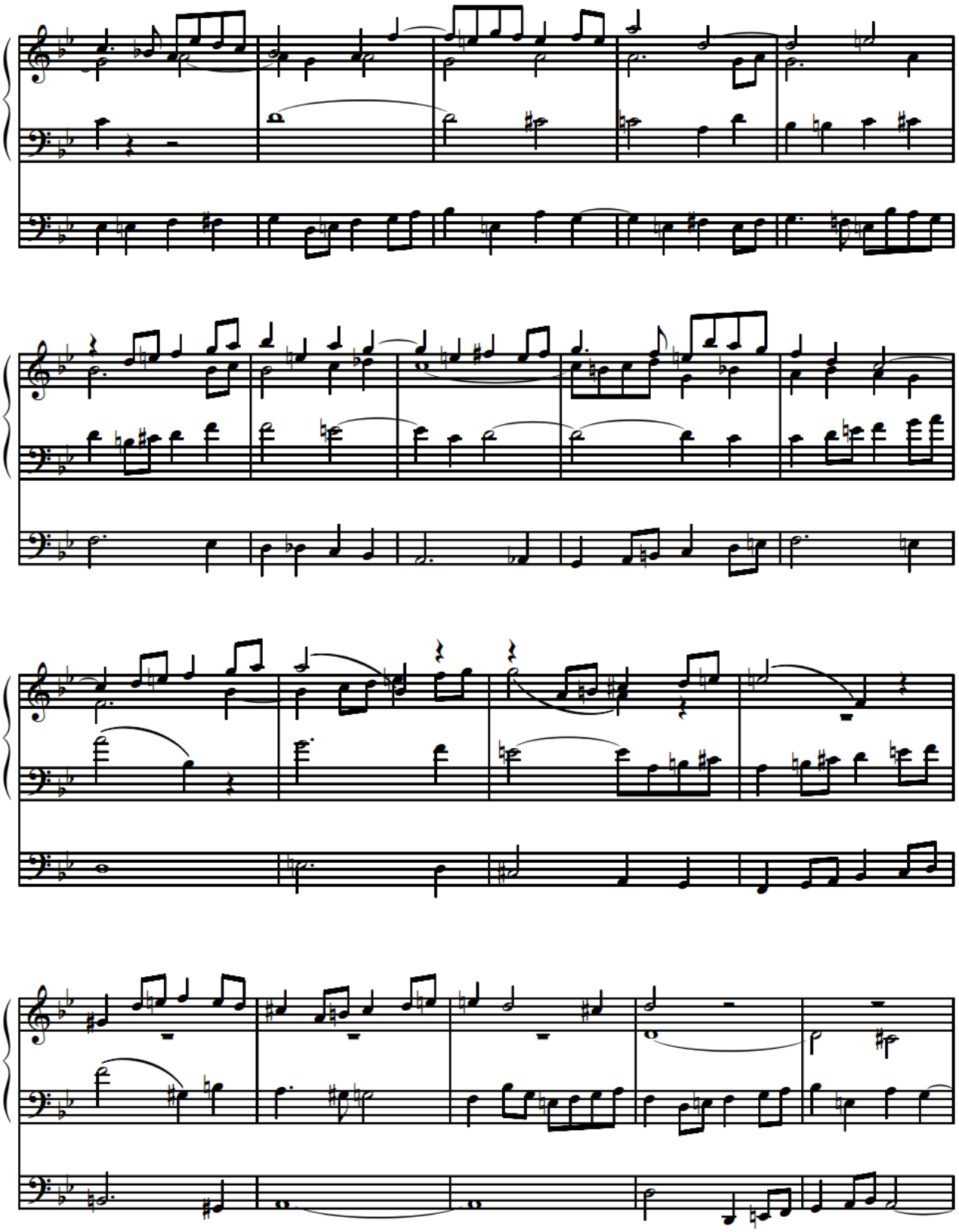
In my first recording, I tried to test whether I could "blindly" achieve similar results as in the Bach Fugue (§18.3.1) in the sense of arriving at the end of the passage with the voices ending together. Since I did not have the piece already "formed" in my imagination (as it was my first recording, it was completely unfamiliar to me), my ear was not filling in the other voices while I played each voice. However, I used my left hand to conduct while playing, and this helped to stabilise the sense of tempo. Periodically during the recording of each voice, it occurred to me that my tempo was a bit too slow or fast, a feeling that arrived in awareness as a vague sense of having time as credit or deficit. This awareness came from the listening perspective as I reacted to what I had just played. At the end of the two pages, the top three voices came together but the bass voice ended somewhat too early.

Double Fugue

Andante non troppo

Edvard Grieg





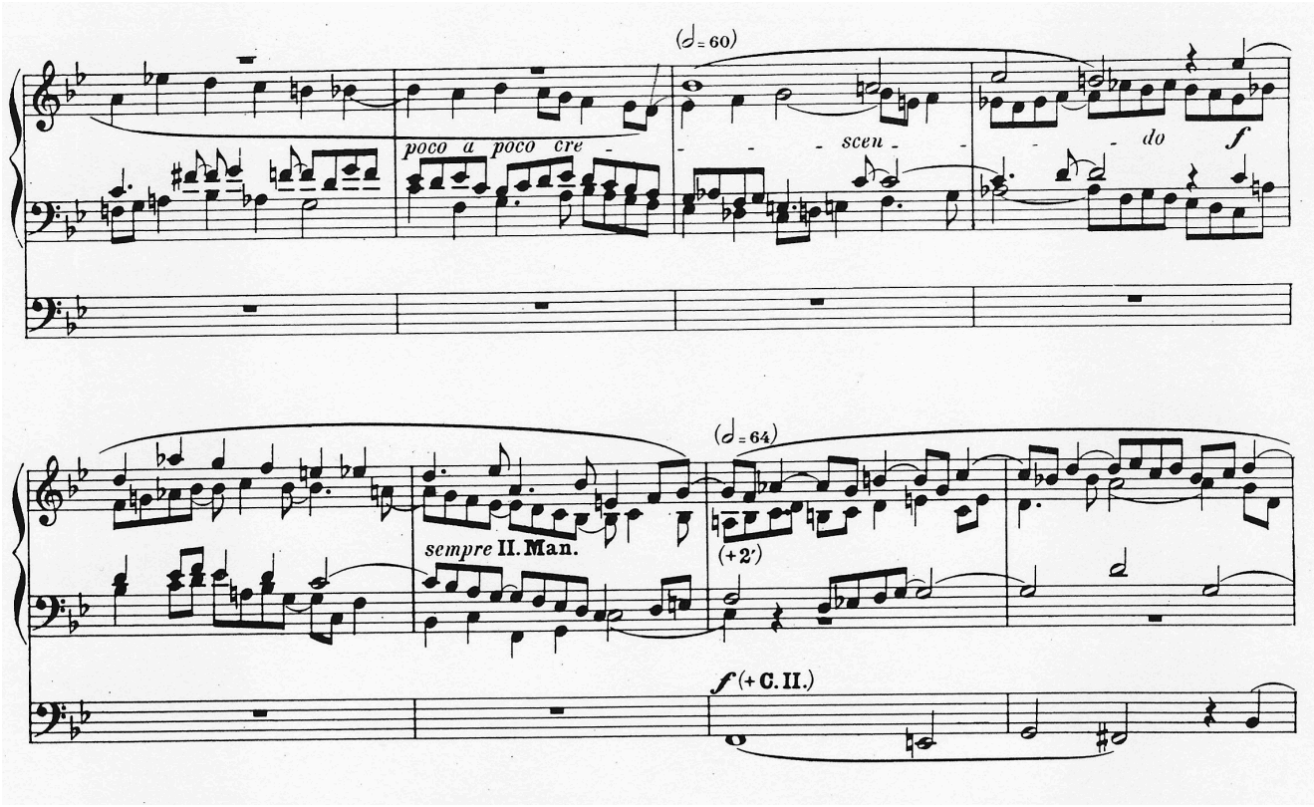
Example 18.3: Grieg Fugue in G minor (Abra, published on www.imslp.org)[70]

[70] <http://imslp.org/wiki/7_Fugues,_EG_184_(Grieg,_Edvard)> accessed Feb. 28, 2016.

18.3.4 Reger: Phantasie und Fuge über BACH

The fugue from Reger's Phantasie und Fuge über BACH op. 46 provides an interesting example for layered recording because of its slow, almost static opening which gradually evolves into a vigorous sense of gesture as the fugue progresses. It must be mentioned that there is vigorous debate surrounding the tempo of this work. The metronome mark seems quite fast considering the proportional build-up of tempo from the opening sostenuto to the end of the fugue. One solution to this "problem" by organist Marcel Punt (formerly known as Henrico Stewen) suggests that the metronome marks are to be interpreted as double-beat metronome notation, which in a nutshell means that the tempo should be half as fast (Stewen 2009). The result is an extremely slow tempo. In my view, neither interpretation of the written metronome mark works very well. The artistic image that attracts me to this fugue is the evolution from gestural stasis at the opening to a clear sense of movement and direction as the fugue progresses, and I choose a tempo that supports this image.

The passage that I chose for the layered recordings experiment begins with the measure marked with metronome 60 (Audiovisual Example 18.9). For this layered recording, I used a playback, beginning with the bass and moving upwards (tenor, alto, soprano) before finally adding the fifth voice in the pedals. After this, I made a synchronous recording (Audiovisual Example 18.10).



Example 18.4: Reger Phantasie und Fuge über BACH op. 46 (Universal, Aibl, 1900)

At this point in the fugue, the tempo is sufficiently advanced that even the subject has a feeling of overarching gesture, in contrast to the first statement of the subject at the beginning of the fugue where the combination of a slow tempo and absence of other voices create a feeling of stasis. In this example, the moving lines underneath the subject represent an interesting mix of gestural timescales, and through doing this layered recording experiment I was able to shed light on how these moving voices influence the timing of the subject itself.

18.4 Reflections

Through the experience of making these layered recordings, I was able to take a view at the embodied experience of polyphony from a different perspective. This perspective entailed first the abstraction of the individual voice from the complete texture, but also the abstraction of the musical expression from its embodied polyphonic dynamic.

The divergence inherent in this polyphonic dynamic was then foregrounded in the synchronised recordings. This specific process brought several reflections about polyphonic expression into focus. I will list these reflections in no particular order.

18.4.1 Reification of expression

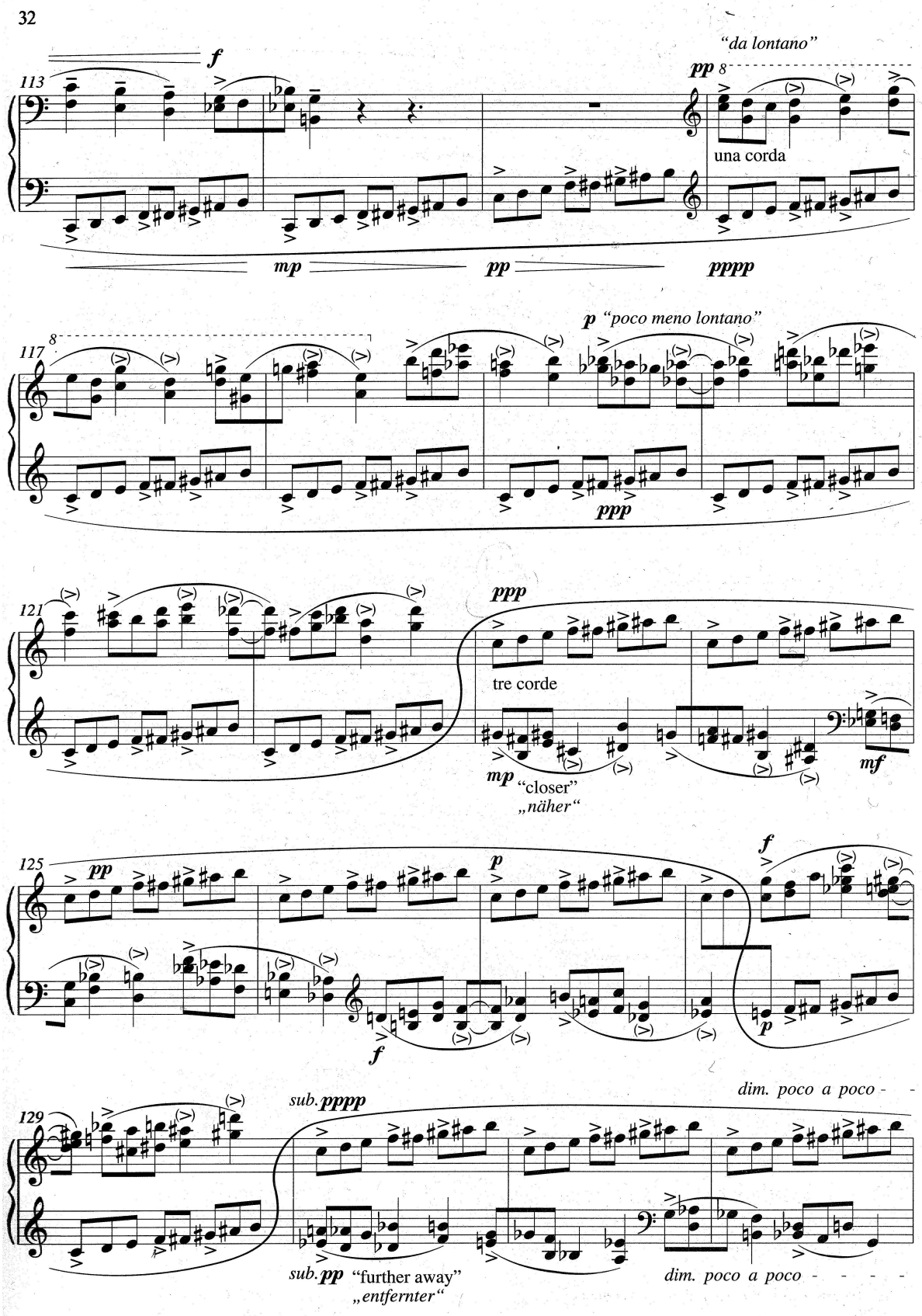
When I made my first recording using playback (that is, listening to the first voice while recording the second) I was immediately struck by how different it felt to play with a recording of myself compared to a live chamber music partner. While I could recognise my own musical tendencies in the recording, its fixedness made it very difficult to understand. I tried to fit in the second voice around the timing of the first, and as it became clear I was not succeeding very well, I tried to follow the recorded voice, vertically lining up simultaneous moments. The closer I listened to the first voice, the more unnatural the musical expression of the second. Listening with a more distant perspective allowed me to focus on rather larger timescales and on important "goal" moments towards which both voices aimed. Such a strategy resulted in somewhat greater divergence on the short timescales but also greater musicality.

Even though the time between recording the first voice and listening to its playback was short, my perception of how it felt was quite different. This perception was coloured by the activity of playing the second voice. When taken alone, this second voice involved rather more movement of the body in the activity of expressive shaping than would be felt in a performance of the same voice surrounded by the rest of the musical texture. For this reason, the body was not fully "available" to understand the first voice - in other words, to feel the gesture of the first voice in sympathy. The entire structure of the playing mechanism - from torso to fingertips - was employed with the second voice,

whereas in simultaneous performance the voices co-inhabit gesture of the larger levers, forming a unity on larger timescales. I could limit movement of larger levers while freely using smaller, more peripheral levers (forearm, wrist, hands) and thereby lessen this effect, but since my goal was to show how the body mediates polyphonic expression, I found it most useful not to limit movement and thus to allow greater divergence.

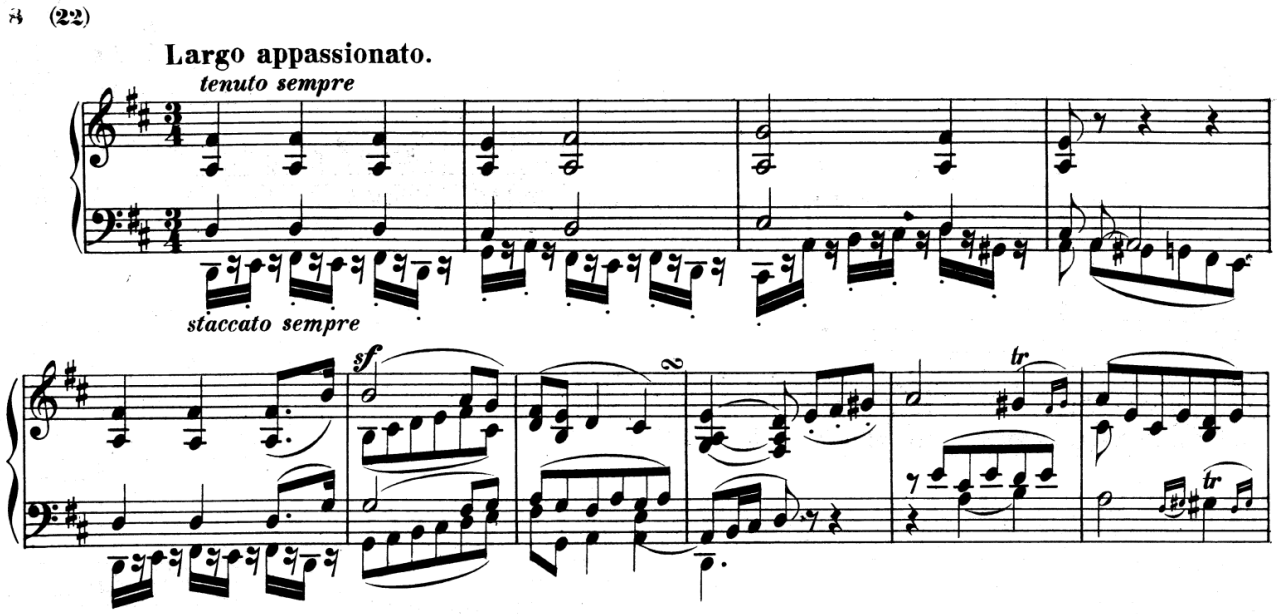
An awareness of this relationship in the embodiment of distinct voices becomes quite useful in music of rhythmic complexity. In the Etude *Fanfares* by György Ligeti (Example 18.5), the "African" rhythm of 3 + 2 + 3 eighth notes is shared by both hands during the first section of the piece. At bar 91, the hands begin to diverge in the sense that the groupings of two and three eighth notes no longer line up. At bar 116, a 24 bar passage begins during which the both the hand with the ostinato and the other hand articulate continuous eighth notes, the ostinato in a pattern of eight (3 + 2 + 3) and the other hand in a pattern of seven (3 + 2 + 2) in double notes. The accents marking the beginning of each pattern of seven are full accents, but each subdivision of the seven-note group is articulated by an accent in parentheses. In playing this passage, I use double rotation (§15.2.2.2) and barely-legato fingers for each double note. When practising the double note hand alone, my reflex is to use a subtle articulation of the torso for the beginning of each group of seven. When combining this embodiment with the ostinato voice, this subtle articulation is likely to interfere with the incisiveness of the accents. If this were the case, the stream of power from torso to fingertip would only be compatible with one of the two rhythmic patterns. Because the torso is anyway connected to both arms, the arm playing the ostinato pattern would have to flexibly adapt around this external torso articulation and to neutralise it with the elbow and shoulder joints acting as shock absorbers. However, if when practicing the double note part alone I guard against using any participation of the torso, this sort of subtle interference is eliminated, and as a

consequence the simultaneous embodiment of both voices feels somewhat easier or simpler.



Example 18.5: Ligeti Etude Book I no. 5 "Fanfares" (Ligeti, Schott)

For comparison, I tried recording an example in layers for which I designed a convergence in expression. I used the second movement from Beethoven Sonata op. 2 no. 2 . As I predicted, it was much easier and more natural to achieve vertical alignment between voices (Audiovisual Example 18.11).



Example 18.6: Beethoven Sonata in A major, op. 2 no. 2 (Breitkopf, 1862 [reprinted Kalmus 1933])

A similar comparison can be made between making chamber music with another person and making chamber music with a recording (in this case with myself). Responsiveness between live players is multi-directional, even when one player is "leading" and another is "following." In playing with a string player, I feel in my own arm that the attack of a simultaneous entrance is activated by the attack in the bow arm of my partner. It is as if we become entrained at a level far below consciousness. I prepare the attack, I aim it within a small window of time, but the actual energy and precision of the attack happens intersubjectively between the bow arm of the partner and my hand. The more I understand the quality of the attack the partner wants to use, the easier it is to

follow, since the quality of attack - sudden, cantabile, fragile, vehement - suggests the gesture from which the attack is born. Of course this is only one example - the experience of following the string player's vibrato, the flute player's breath, the singer's diction are all similarly physical.

The shaping of phrases is similarly intersubjective, in that the direction of the phrase - the leading up to or away from a moment of arrival - is easily felt from another player, and, absent any other conscious or textural intervention, a well-trained chamber musician is likely to follow or co-create such a shape. In explaining polyphonic divergence to a class that I teach at the Royal Conservatoire of the Hague, every year for the last two years I have assigned the students to prepare duets. Then in the class, in front of the other students, I ask them to create expressive divergence. To do this, I work with each player to find points of arrival in their part, around which they can shape (using dynamics, timing, vibrato, or whatever else their instrument allows). I ask them to try the parts individually, to confirm that the points of arrival "make sense" and "feel right" both to the player and to the observing students. Then I ask them to play together, and to maintain the divergent shapes we have agreed upon, and I ask the observing students to give feedback about whether the divergent shapes are audible. Invariably, in the discussion that follows such an experiment, students express their surprise regarding two aspects: a) to what degree they have to shape their part to make the divergence audible and b) how uncomfortable it is to go against the instinct to shape together, even though the resulting performance is rated as musical by the observing students.

The traps of "over-following" (where concern for vertical alignment of every note interrupts musicality of gesture) and "over-thinking" (where a conscious placement of attack trumps the physicality of entrainment) are similar for chamber music and for making layered recordings, but in the latter case they are far more noticeable. After a voice

is recorded, its fixedness and resultant lack of responsiveness makes it feel foreign and unwieldy. The absence of a responsive partner, and the embodied intersubjectivity that such a partner offers is intensely felt. This typifies the difference between first person, second person and third person perspectives in music making. In the first person (subjective) perspective and in the second person (intersubjective) perspective, the understanding of the music is readily accessible since it is mediated by musical gesture. In the third person perspective, when the recording or performance is assessed as an object, it becomes at once much more complicated and at the same time loses its resonance in the "weave of life" (Wittgenstein 2009), or in its socially constructed resonance of intonation (§15.2.1.3).

18.4.2 Agency of voices

In piano playing, unlike in for example a string quartet, the illusion of legato for one voice relies on the use of other voices to create a sustaining sense of gestural progression. This happens to some degree consciously and to some degree automatically. One voice in a multi-voice texture, then, uses the gestural shaping of other voices in order to emphasise its own shape. The expression of this voice is thus included in the mix of factors for shaping the other voices. Each voice is a site of negotiation for all other voices, and the balance of agency between voices is tilted towards voices that are considered most important or salient in expression. The affordances for expression for each voice are then automatically conditioned by the whole texture. This web of interaction is highly embodied and becomes most apparent when it is missing.

Notice that this web of embodied interaction describes points to the agency of individual voices, and how that agency is balanced in performance. Cone asked the question: "if music is an utterance, then who is speaking?" (1982: 1). This seems to be a

question running parallel to the consideration of agency. Unlike in a string quartet, where it is easy to ascribe a separate "persona" to each voice, these examples point to an intensification of personal agency by its division into several contrasting streams. These streams are characterised by streams of gesture local to each voice as well as the apprehension of other voices.

The process of making layered recordings with playback should favour the first voice recorded in giving it the most agency over the flow of the whole texture. This is of course partly true, but not to the degree I expected. Because I played the second voice at a different time, the first voice recorded could not "use" the second voice for its own expressive purposes. I could intentionally try to shape the second voice around the first one, but the kind of shaping that would happen in a normal performance is far more subtle and complex than can be modelled by intentions. Furthermore, the absence of such affordances given by the other voices changes the shape of the first voice.

18.4.3 Musical tension

Playing synchronically with divergent expression creates a strong feeling of musical tension. However, when listening to the layered recordings, it is striking how little musical tension is felt, even though voices diverge dramatically. Because of the lack of mutual responsiveness and engagement, the voices seem to "talk past" each other. Perhaps what causes the feeling of mutual responsiveness and thus musical tension is the subjective apprehension of one voice to another. Divergence in this embodied apprehension is responsible for the feeling of musical tension in the result. Voices strive to escape from the hegemony of the vertical sonority, and the quality of relatedness - of striving against something, in this case at a very physical level - creates the feeling of polyphonic tension.

By contrast, in layered recordings the voices coexist but do not have the feeling of straining or striving - they simply sound unrelated. Because the meeting of voices at the level of gesture is missing, both in terms of mutual responsiveness and in terms of gestural divergence, musical tension is absent.

In thinking of musical gesture, one can localise one sort of musical tension in the hierarchical structure of coarticulation. The prefix and suffix of gesture describe an overarching push forward towards a goal and relaxation afterwards. Within the push forward of an overarching gestural prefix are many foreground intonations or phrases each requiring specific expression and timing for their articulation. The contradictory forces - pushing forward toward a climax, and taking time to articulate foreground - create their own sense of musical tension. This tension is vertically situated in the hierarchy of coarticulated gesture.

Musical tension in the polyphonic sense is horizontally situated. Rather than the opposing forces on hierarchically removed timescales, polyphonic musical tension incorporates the resistance of one voice to another in expression. Because the act of embodying such polyphonic expression inevitably involves some physical experience of divergence, which in turn is a form of tension, polyphonic musical tension results from normal performances - where voices are played simultaneously - but not from layered recordings.

18.4.4 Spatiality

Sound sources are perceived in space relative to each other by our native capacity to distinguish the very small distinctions in time that provide a stereo comparison between the two ears. Whether a sound reaches one ear or the other first helps us to locate the

sound, and various sound sources in our environment help us to create a sense of "sound space" or a subjective grasp on where things are based on sound sources.

Sound space in concert halls depends on the sound sources as well as the acoustic of the hall, but can also be manipulated by the performer. With a large orchestra, the sound sources are spread across the stage, and the attack of the orchestra, whether more or less together as measured against objective time, has a spread based on its spatial coordinates. We might perceive it as being together but at the same time we perceive it as being spread across a sound space, as being three-dimensional.

A similar spread in sound space is created by large organs. For the player, the time between playing the note and hearing it sound from the pipes is dramatically different for different manuals - if the pipes are close it is relatively immediate and if they are far it is relatively delayed. This spread in time of attack gives a strong spatiality to the organ sound when perceived from the middle of the church or hall, but can sound distractingly disjointed from the acoustic perspective of the player on the organ balcony. In addition to this spatial spread, the sound of mechanically coupled manuals often creates an additional spreading of attack. In well-regulated mechanical organs, pressing one note on the first manual with all couplers active gives first the sound of the first manual, and as the key goes deeper the coupler for the second manual and third manual activate. The attack is spread thus not only in space, but also over the relatively short time of the keystroke.

By contrast, pianos are a relatively small sound source when placed in a big hall. A chord played together on the organ or by the orchestra gives a spread in sound that gives the sense of a three dimensional sound space. On the piano, this chord sounds like it is

coming from one point. However, *ꝺpreaꝺing*[71] of the attack alters the piano sound and gives it spatiality.

There are a few important considerations in such chord spreading. The first is the order of the notes. As most keyboard players will know, playing a note slightly early is a way of making it heard, of giving it prominence. Very generally speaking, it seems that pianists during the nineteenth century tended habitually to play with the bass note first, but now one hears more commonly the top note first. Arguments for both approaches can be made based on the sympathetic resonance between the bass and other notes, and how this resonance can help sustain melody notes. Of course, playing an inner voice early can also help to bring out the inner voice. In all cases, the question is: to what *ꝺegree* can a chord be spread? In the subtlest examples, the chord still seems to sound together, but the note that sounds first seems to be slightly more prominent. As the spread becomes wider, it can be heard as a spatial spread similar to the spatial spread of an orchestra or large organ. At this level, the sound space of the piano seems to open from being relatively small to filling a much larger space in the hall. This illusion of spatiality, however, fades when the spread becomes too large.

What characterises the boundary between a spread that is perceived as "spatial" and a spread that simply sounds disjointed? Such judgments are difficult to pin down, since they depend on acoustics, distance, instrument, the perception of the player and many other factors. They are also inherently personal aesthetic judgments. Despite these disclaimers, I would argue that this boundary is not best characterised by a limit in the number of milliseconds across which the chord is spread, but rather by the embodiment

[71] Other words can be used for the same phenomenon, but "spreading" reflects spatiality in the best way. "Dislocation" tends to imply a more extreme temporal divergence, while "rolling" implies a harp-like strumming, and "fringing" (Newman 1995) recalls a historical Baroque practice from harpsichord technique.

with which the spreading is created. The question is, does the chord *feel* like it was played together, even though it might seem to be spread in "sound space"?

The artful spreading of chords allows for an untangling of the individual notes, which by the spatiality it suggests helps to differentiate various lines or voice-leadings that might connect chords. Voicing such inner lines with spreading constitutes a temporal divergence between such lines, even though the spreading might be slight. While in the layered recordings presented here, the dislocation of verticals is so extreme that the music seems to fall apart, the same order of voices sounding in a vertical moment can be preserved while reducing the dislocation to a subtle spreading, thereby taming the divergence for use in normal playing.

18.5 Conclusion

Experimenting with layered recordings is an activity that helps to unpack the experience of embodiment in polyphonic voicing by taking it apart. The influence of embodiment on musical shaping is best felt when this influence is drastically altered by such a total shift in parameters. In this case, the voicing became monophonic during the diachronic recording process. Such a shift allows voices to speak (or sing) autonomously, although their interdependence for expression becomes clear by their musical insufficiency when heard alone. This process, while not a scientific experiment, proved to be a springboard for reflection.

19 Exercises for pianists

While in the previous section (§18) I purposefully avoided the simultaneous embodiment of polyphonic expression in order to focus on the independent expression of each voice, in this section I will focus on the synchronic embodiment aspect. The reason divergence in expression can seem difficult to execute is hard-wired in certain features of our sensorimotor system. Much empirical research has examined a phenomenon known as *bimanual interference*, which documents the deleterious effects on the operation of one hand by the simultaneous performance of a task in the other hand. These effects have been measured in increased reaction time to stimuli and a strong tendency towards symmetry of movement (Albert 2007, Diedrichson 2001, Mechsner 2001, Ohbi 2004, Ohtsuki 1994, Kennerley 2002, Hazeltine 2005, Obhi & Goodale 2005). This performance deficit has also been observed in experienced pianists. Psychologist Michael Peters, in testing pianists for bimanual interfence, observed:

> There was interference between the hands in general, and, specifically, more interference when the nonpreferred hand took the rubato. These findings support the contention that the central nervous system, when guiding different motor activities at the same time, can only issue one basic chain of timed commands, into which other activities subject to separate time pressures must be fitted. (Peters 1985: 481)

Because of bimanual interference, the execution of polyphonic expression is cognitively more expensive than homophonic expression. Despite the fact that bimanual coordination is developed continually throughout the learning trajectory of piano students, the cross-talk between movement patterns remains a unifying force on the expression of simultaneous voices. Bimanual coordination improves with practice, and in this section I will explore several pathways for the development of the specific body schemata involved

in polyphonic expression. While these are directed specifically at pianists, some of them may be used with some adaption by organists.

If the question is, how should a pianist be trained in order to play with polyphonic expression, the popular reflexive answer is: "play Bach!" However, the choice to play highly polyphonic music and the minimal ability to play it do not necessarily guarantee polyphonic expression in the definition I have suggested (§17.5). Bach can be played without any polyphonic expression (and often is). In order to make this point clear, I propose a list of competencies which might in real-life run together, but for the purposes of this argument clarify a series of stages which lead up to polyphonic expression but do not include it. I will emphasise that these steps are not really separate, but they are useful to distinguish here in order to make the point that many competencies may be involved in playing contrapuntal music, but that these competencies should not be confused with polyphonic expression. If one were to imagine the competencies involved in playing a Bach fugue, for example, one might include these categories:

1. Basic technical skills: fingering, playing the notes, memorising the notes.

2. Aural skills: Listening to all lines, being able to hear all lines at once.

3. Stratification in voicing: Voicing one line louder than the others (let us say for example the top voice throughout). This stratification might involve several layers.

4. Alternate stratification: Voicing several lines louder alternatively (for example the tradition of emphasising the subject wherever it occurs).

5. Oblique divergence - shaping one line independently from the others (a very common state of affairs where one line is shaped and the others remain flat).

None of these skills describe polyphonic expression. Furthermore, polyphonic expression is subject to faulty sensory feedback. Because the underlying gesture is cognitively more expensive, it is often the case that simply imagining polyphonic expression does not result in audibility. The imagined experience of polyphonic expression can then overwhelm accurate sensory feedback; the pianist may hear the polyphonic expression in his own playing simply because he imaginatively projects it onto the sounded result. Often when pianists think they are accomplishing polyphonic expression, a close listening to the sounding result would reveal that it is more akin to oblique divergence where one voice is shaped and the others remain flat. There is nothing particularly wrong with this performance texture, and indeed it describes the predominant texture I hear in most performances of the Bach's *Das wohltemperierte Klavier*. It is also true that the competencies listed above are of vital importance for the development of every piano student. However, with the kinds of exercises proposed here I will focus much more specifically on the embodiment of polyphonic expression, which can be viewed as the step beyond these competencies.

In order to get a firm grip on polyphonic expression, students consciously need to know what it is, in a clear definition like the one I have provided (§17.5). Then it is helpful to have a few kinds of exercises that bring to the fore the very physical experience that it entails. Pianists and piano teachers often have a negative view of exercises, since in their traditional form exercises seem to promote mechanical, inexpressive playing. This is also reflected in the scores of exercises, which often present notes without expression markings. In the kinds of exercises I will explore here, the expression is the topic of the exercise, so such concerns should be at least partly allayed.

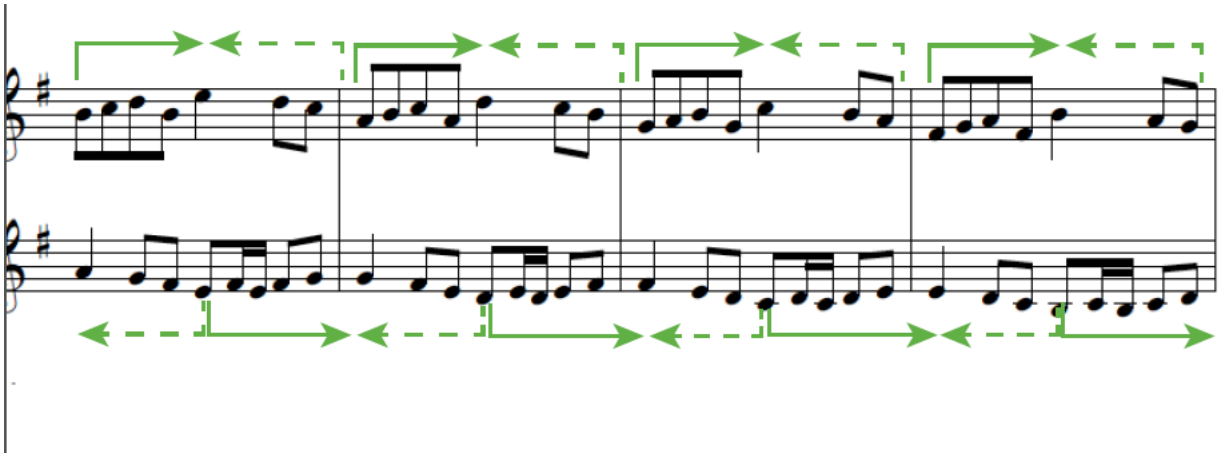
I will list here some examples of types of exercises that are useful. With a clear goal in mind, students must find their own pathway in creating exercises in these categories

that fit their own level of development. I think the primary function of these exercises is to raise awareness, and even the process of considering each category will already be a step towards such awareness.

19.1 Duets for one hand

Practicing the polyphonic expression in two parts for one hand is useful for providing a focus specifically on the divergence *within* each hand. When playing such two part exercises as the duet below (Example 19.1), I find that using two hands to model the sound I want to achieve is a good starting point, after which I play the exercise with each hand in turn. Exaggerating the polyphonic expression at a slow to medium tempo helps to highlight the embodied knowledge necessary for such an exercise, but at a slow tempo the felt continuity of over-arching gesture must not be lost. Indeed, the whole point of the exercise is to practice the simultaneous embodiment of the gestures shown. Thus, the green arrows should be realised as *embodied expressed timescales* rather than *disembodied expressed timescales* (§14.3).

In this and subsequent examples, I use the green arrows with a solid line to represent the prefix phase of gesture and the arrows with dotted lines to represent the suffix (§14.4). The culmination or highpoint of the gesture is represented between the two arrowheads, although of course all such transitions (both the high points and the low points between arrows) can be spread over several notes. The notation is sufficient to show the divergence in gesture, while remaining open to realisation through any sort of musical detail (articulation, dynamics, timing). It should be noted that while I have notated only the levels of coarticulation salient to the polyphonic expression that I wish to communicate, other levels of coarticulation on nesting timescales coexist.



Example 19.1: Exercise in the form of a duet

This exercise is just one example, and every pianist can create his or her own such duets. In fact, there are many ways to use this exercise, and by exploring these different ways of playing it, the pianist can get a lot of mileage out of it. First, it can be continued in a similar fashion over several octaves. It can be transposed to other keys, to feel the different angles created by the patterns of white keys and black keys. The expression can be accomplished with dynamics, articulation or by temporal dislocation. All of these experiences shed light on slightly different aspects of the embodiment of polyphonic expression.

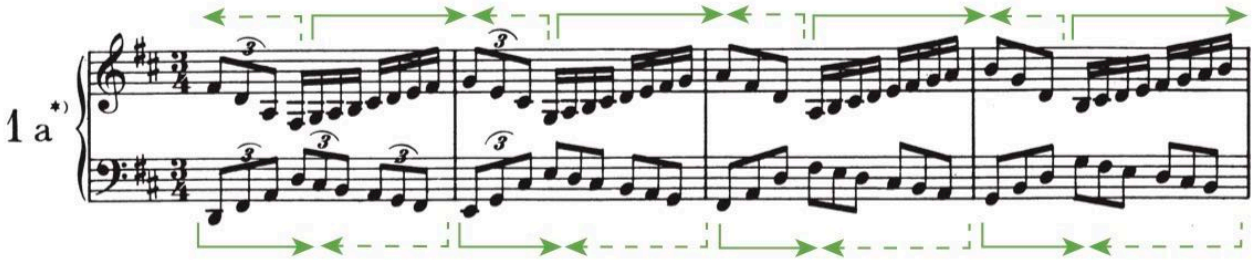
19.2 Polyphonic use of existing exercises

Playing existing exercises with polyphonic expression highlights the fact that polyphonic expression can be used even when it is not written. It is relatively easy to find polyphonic affordances of existing exercises. In some cases, polyphonic expression is already suggested by the contour of the notes, and in other cases, it can be applied over the notes variably. The exercises can be made at every level of difficulty. In my teaching practice, for example, I use Hanon to teach the students to find intonations in response to contour and rhythm. The youngest students, when taught the first exercise hands

separately and subsequently asked to play it hands together, often will spontaneously play it in contrary motion, which is probably a demonstration of a perceptual bias towards symmetry caused by bimanual interference (Hazeltine 2005). After having experimented with intonation in a few exercises, I have the students play one exercise in one hand and another in the other, keeping the particular intonation of each exercise intact. It must be noted that simply playing the expressionless notes of the two different exercises at once, while itself a kind of bimanual coordination, is far easier from performing them together *each with its own particular intonation*. But these are only the very first steps, and I will present here some examples from the Brahms exercises, which are substantially more difficult and lend themselves to polyphonic expression. These examples only serve as models, and pianists will find that most exercises can be used in a polyphonic way.

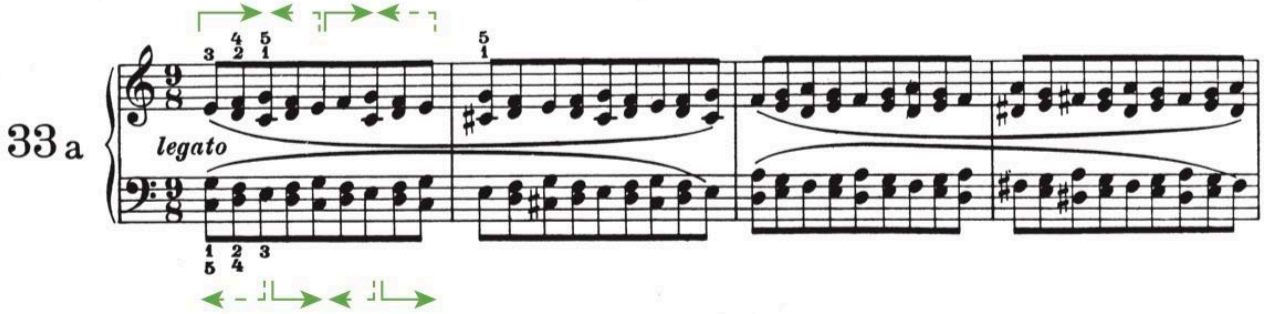
It should be noted that in all the exercises presented here, the goal is to master polyphonic expression through focus on the embodied experience that makes it possible. The exercises are most effective when played with very clear (perhaps even exaggerated) divergence of expression. The performer may decide to use any mix of details for any exercise (articulation, dynamics, timing) provided that the polyphonic expression is made audible. Exaggerating polyphonic expression is highly useful, and provides a vivid experience of the embodied feel of this practice. The presentation here shows a progression of difficulty from Example 19.2 to Example 19.5.

In the first Brahms exercise (and in its variations) the contour of the notes suggest polyphonic expression. The polyrhythm adds to the suitability of this exercise by emphasising the coarticulation of groups of notes suggested by changes in direction.



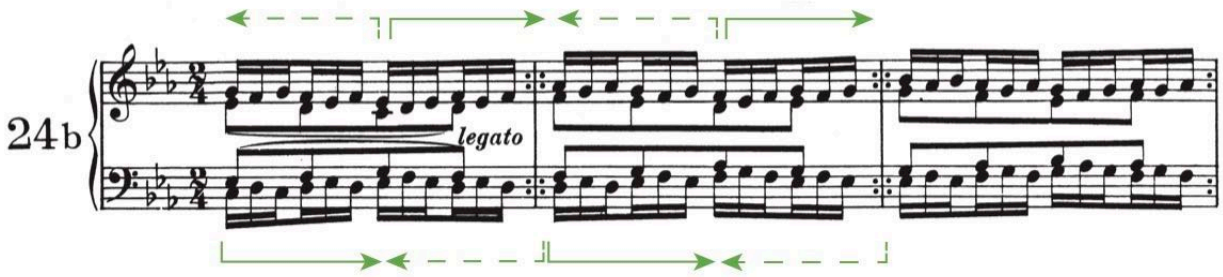
Example 19.2: Brahms Exercise no. 1a WoO 6 (Breitkopf, Mandyczewski, 1926)

It is important to emphasise the importance of including exercises with double notes. Double notes are coarticulated differently than single notes in the sense that the articulation of each individual verticality is often higher in the playing mechanism than for single notes (§15.2.2.2). This has the helpful effect of focusing divergence in gesture higher in the playing mechanism, giving such exercises a different feel.



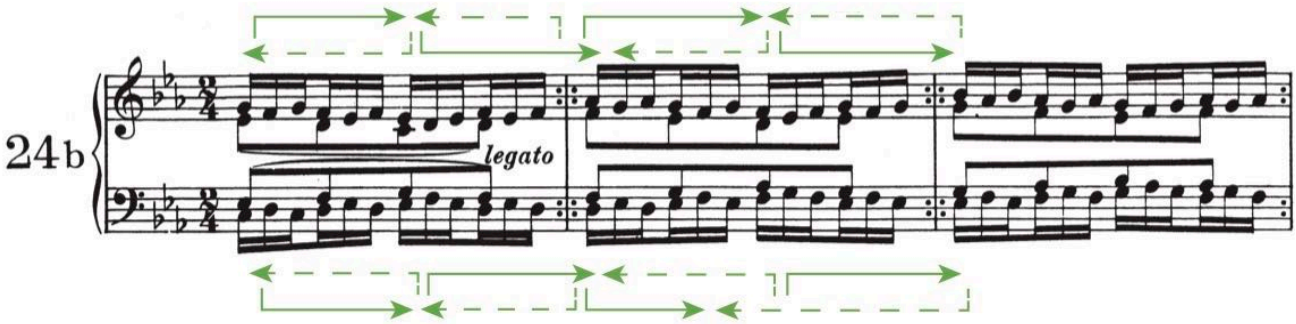
Example 19.3: Brahms Exercise no. 33 WoO 6 (Breitkopf, Mandyczewski, 1926)

Two different polyphonic expressions can be practiced using the notes of Exercise 24b. In the first case, divergence occurs between the two hands.



Example 19.4: Brahms Exercise no. 24b WoO 6 (Breitkopf, Mandyczewski, 1926)

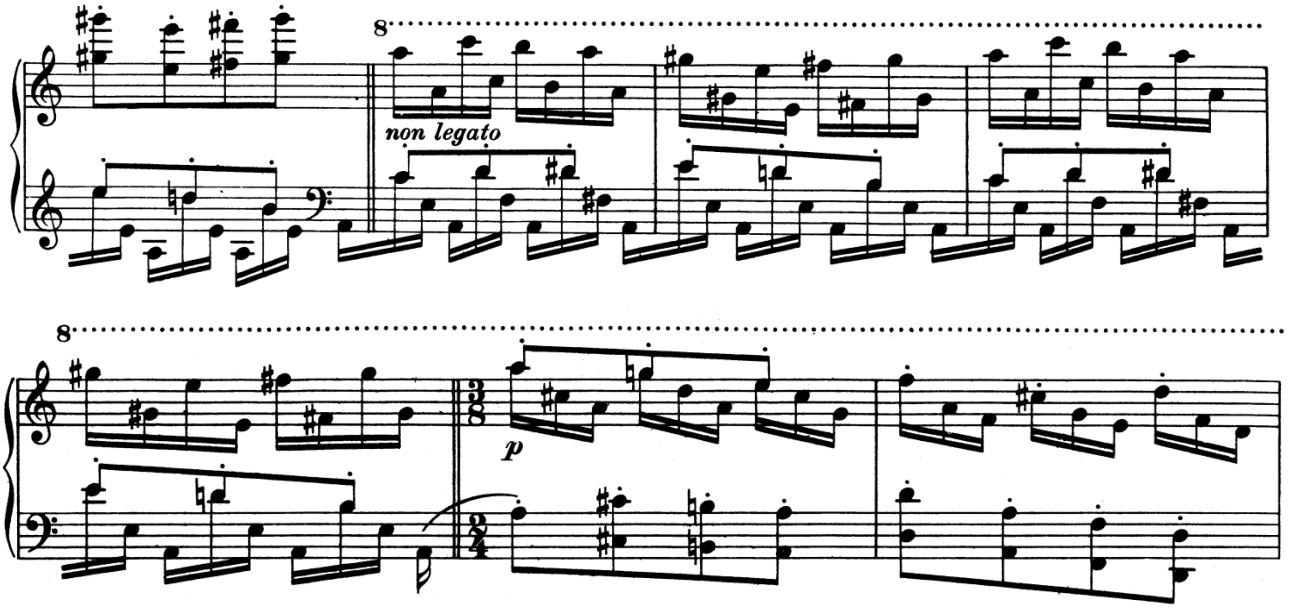
In the second case, the divergence happens within each hand:



Example 19.5: Brahms Exercise no. 24b WoO 6 (Breitkopf, Mandyczewski, 1926)

19.3 Polyrhythmic exercises

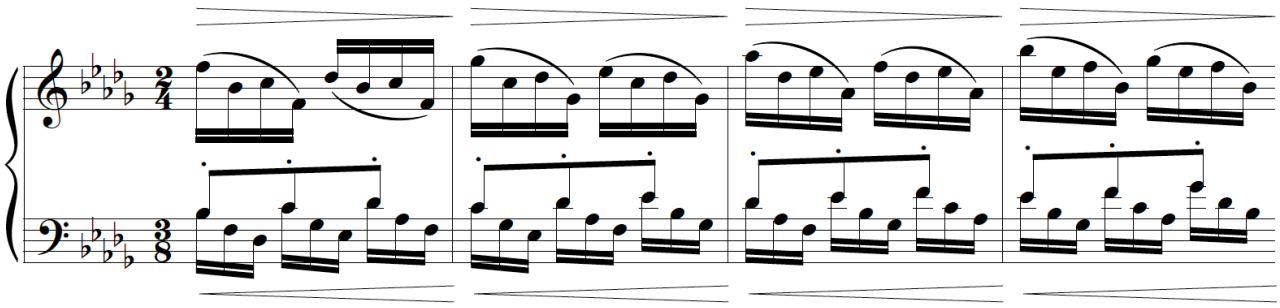
Practising polyrhythmic exercises is a very effective way to strengthen polyphonic expression. In discussing the first Brahms exercise (Example 19.2), I pointed out the usefulness of the four against three (see also §17.5.1). This polyrhythm already encourages the coarticulation of groups of notes on the timescale of the quarter note, thus unifying the overarching gesture while the hierarchically nested gestures of articulating each note diverge. Such divergence is minimal since it occurs at the lowest level in the playing mechanism. It is possible to force this divergence to a higher level of the playing mechanism by adding in one more layer of subdivision below the hierarchical layer that diverges. A good example of this layering is found in the following variation from the Paganini Variations of Brahms, beginning with the double bar.



Example 19.6: Brahms Paganini Variations op. 35, Book II, Variation 7 (Breitkopf, Mandyczewski, 1926)

Because of the notes subdividing the four against three rhythm, the divergence of the rhythm is built on top of coarticulated groups. It is thus embodied higher in the playing mechanism. The lateral movement required to play the left hand part intensifies the gesture overarching each group of three sixteenth notes, while the alternating rotation of the right hand broken octaves, provides a strong grouping for every two sixteenth notes. These already hierarchically layered gestures diverge around the polyrhythm of four against three, while being united by an overarching gesture on the timescale of each measure.

The spread of the left hand notes causes the overarching movements on the timescale of three eighth notes to be rather large. In the following exercise, I take the same rhythmic pattern but reduce the span of the patterns. The structure of overarching gesture should remain the same, but the amplitude is smaller and the particular arrangement on the black keys and white keys gives a suitable range of variation in the embodiment of the pattern.



Example 19.7: Exercise with multi-layered coarticulation and polyrhythm

Inverting the exercise is equally valuable, and I highly recommend experimenting with rhythmic patterns of similar hierarchical complexity.

19.4 Excerpts from pieces

An important part of using polyphonic expression is seeing the polyphonic expressive affordances of passages in normal repertoire. While it is my argument that after focusing and developing the embodied knowledge of divergent gesture - the affordances for its use in passages will be readily seen - it is also true that actively looking for such affordances and making exercises out of them can be an important part of developing both awareness and embodied knowledge. In §20, I will present some examples of polyphonic expression from a recital program. The specific passages that I have highlighted exemplify the kinds of passages that can be taken as the basis for exercises.

In my experience, the process of practicing the polyphonic expression in these passages optimally involves exaggeration of divergent expression, transposition to different keys, and translation between the different kinds of expressive details (articulation, dynamics, timing). In the first place, exaggeration of the polyphonic expression should

take the divergence beyond what is aesthetically pleasing to the performer. Exceeding the aesthetic boundaries of personal taste has the subtle side-effect of stretching those boundaries, thus expanding the aesthetic range of possibilities in a polyphonic direction. Transposition to other tonalities shifts the parameters of how the passage feels on the keys, thus giving a slightly different angle to the embodied feel of the passage. For this kind of practice, I generally use the same fingering for each transposition, even though some of the angles and crossings that result are uncomfortable. The navigation of such difficulties while projecting the overarching polyphonic expression is a particularly powerful way of exploring the embodied feel of divergent gesture. Finally, exploring divergences by translation between types of expressive details is also helpful both in building an awareness of the connection between the underlying gesture and the musical details and also in broadening the possibilities of expression. One of the easiest ways to practice this translation is by playing passages written for the piano on the organ, and passages written for the organ on the piano. Of course, passages need adaptation since, for example, the pianist's two hands often cannot reach all the notes for the manuals and the pedals, and conversely the organ manuals do not have enough notes for some piano passages. Excerpting the relevant parts of the passage makes it possible to play these passages on the "wrong" instrument, and the difference in the available types of musical details causes a shift in the mode of musical expression, while still expressing the same underlying gestures and groupings. For example, in translating the beginning of Bach's E Minor Fugue BWV 548 to the piano (see §20.4 for an analysis of the polyphonic expression) I might use dynamics to communicate the intonation of the eighth note groupings. The articulation then can remain uniform for all the eighth notes, but the underlying gesture is still audible by the touch-controlled dynamic expression, an expressive detail available on the piano but not on the organ. Conversely, if I play the opening of Scarlatti's D Minor Sonata L.

108/K. 213 on the organ, I use articulation and timing to communicate the polyphonic gesture in the absence of touch sensitive dynamic control.

That all three of these suggestions (exaggeration, transposition and translation) go beyond what is comfortable or normal highlights the fact that they are *exercises*. In going beyond the normal parameters of playing, they help stretch the abilities and sensibilities of the performer. Rather than being mechanical drills, they serve as explorations that are effective even when applied to only a few passages, since they build awareness of polyphonic expression and its embodiment.

19.5 Other helpful experiences

Aside from exercises, other experiences can indirectly aid in the development of polyphonic expression. In my own experience, several explorations resulted in experiences that supplemented the intellectual work of thinking about polyphonic expression during the course of preparing this dissertation and the artistic work of my own concert activity.

19.5.1 Kinaesthetic awareness using extra-musical techniques

While it is true that the coordination of every pianist is slightly different, this coordination can be developed through several established body awareness methods away from the piano. Evaluating these methods in detail goes beyond the scope of this dissertation (and beyond the scope of my experience with these methods) but it is important to mention that they exist, and that they can be extremely helpful in building awareness of the embodied experience of polyphonic expression.

My own experience has included several methods or practices, including the Feldenkrais method (approximately fifteen lessons over six months), Alexander Technique (approximately thirty lessons over two years), Rolfing (ten sessions in one year, then five

sessions five years later) and Yoga (ten months of twice-weekly classes). Of these methods, I found Alexander Technique to be particularly useful in building awareness of the hierarchical layers of movement in coarticulation. I don't feel that Yoga contributed directly to any specific aspect of the embodied practices outlined in this research, though it was certainly valuable on its own terms.

Both the Feldenkrais method and Rolfing seemed to help specifically in developing the embodied practices underlying polyphonic expression. I discovered Rolfing after a car accident that left me with severe back pain (several years before the beginning of this research). During the process of the ten sessions, which led to a full recovery, I was amazed by how the process helped me to directly feel the layers of connections between different parts of my body, and how these connections could be freed through the manipulations of the Rolfer. Several years later, during the beginning of this research, I returned to Rolfing with the goal of building awareness of the layers of movement involved in the playing mechanism, as well as expanding my flexibility of movement. Parallel to these sessions, I also went to see a teacher of the Feldenkrais method, a method that uses exercises or movements to build body awareness. It is difficult to articulate the impact that the combination of these methods made on me, but I can say that I experienced through them a sense of increased freedom and ease of movement as well as a sense of an expansion in my range of movement possibility.

Much more importantly, I also felt a greater sense of *musical* freedom through these methods. The opening and freeing of movement in general opened the sense of freedom in the overarching continuities of coarticulation. The methods also seemed to help untangle a web of interferences that I felt in practicing the divergence of gesture underlying polyphonic expression. The greater sense of freedom I felt from these methods led to a

musical sense of freedom through gesture, which in turn allowed me more flexibility in shaping phrases through musical details.

From the community of practitioners of both Rolfing and the Feldenkrais method, various sources have more specifically suggested the connection between the physical experience and the psychological (beginning with the various writings of Moshe Feldenkrais himself and Ida Rolf herself). Notwithstanding the fact that my own experience with these methods seems to coincide with the claims of each method to affect not only movement but also thought, further research is required to verify this subjective impression. I feel sure, however, that any musician participating in Rolfing or the Feldenkrais method will at minimum develop a greater awareness of movement, and this is already extremely valuable in developing polyphonic expression.

19.5.2 Organ study

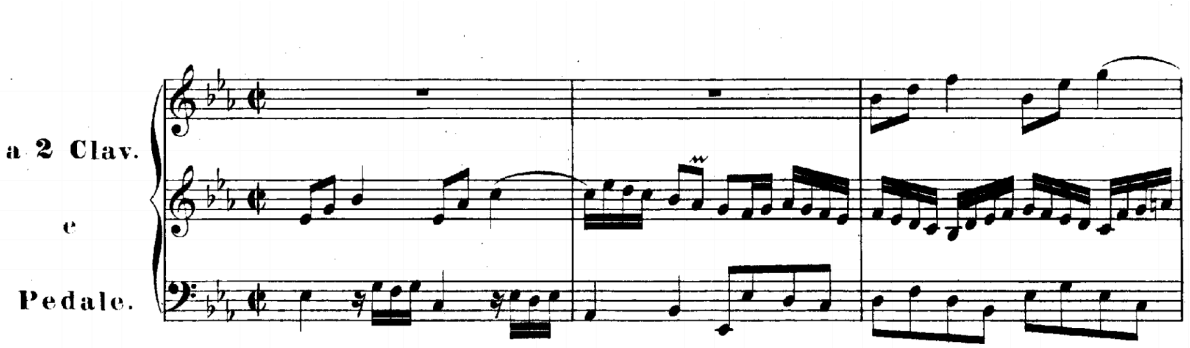
Studying organ helped me immensely in my research process, and I highly recommend organ study for every ambitious young pianist. I began studying organ after I had already finished my piano studies, and as I began the research that led up to this dissertation, it became clear that studying organ would be an immensely useful way to consolidate my views about musical gesture and to expand my polyphonic thinking. As I have already suggested, translation of passages between organ and piano is one valuable practice strategy that pertains directly to polyphonic expression. Going beyond this practice strategy to organ literature, the use of the four additional contact points for the pedal keys (heel and toe of both feet) provided a coordination challenge similar to the challenge faced by young pianists as they learn to coordinate the hands. Through working out this coordination challenge, I could try out the practice strategies that I recommend to

my students, and both sympathise with the coordination challenges they face and help them more efficiently. The general insights and reflections about skill acquisition, coordination, and practice strategies that came up during this period of organ study do not fit into this dissertation.

However, one experience seems particularly relevant. It was my organ teacher Ben van Oosten that pointed out to me, during one of my first lessons with him, that while I was playing the notes in the pedal correctly, I was not listening to them in the same way as to the notes on the manuals. It immediately became clear to me that he was right, that while *aware* of the notes played by the feet, I perceived them differently than the notes in the hands. Upon further reflection, it became clear that the main difference in listening to the pedal notes was that I was listening to them as individual notes, without the same sense of overarching gesture with which I was voicing the manual parts. My musical ears were closely entrained with the activity of my hands and arms, most specifically with the sense of coarticulation of groups of notes, but this close entrainment did not automatically transfer to my feet.

One example of the difference in connection between ear and feet and between ear and hand at this early stage in my organ study occurred in the opening of Bach's Trio Sonata no. 1. I noticed that if I reorganised the opening measure to play it with two hands, the timing of the sixteenth notes on the second and fourth beats of the first measure was slightly different than if I played the sixteenth notes with my feet. If I played as written with left hand and foot, the length of the second beat was slightly shorter than if I played the same passage with two hands. It was as if the timing of this beat when played as written was determined wholly by the manual part, and the sixteenth notes were simply fitted into the time available. The balance in agency between the manual part and the pedal part was skewed heavily towards the manual part. When I played with two hands, the

second beat was slightly longer, as the sixteenth notes were voiced with their own sense of overarching gesture. Once I noticed this, it was relatively easy to correct the problem by practising the passages for the feet with an overarching sense of gesture, which through conscious attention eventually featured equally in the balance of agency between voices.



Example 19.8: Bach Trio Sonata no. 1 in E-flat BWV 525 (Breitkopf, Rust, 1867)

What is interesting about this story is that my musical ear, developed throughout my life, was closely associated with my hands and was not automatically as active in understanding notes played by my feet. In my perception, developing this connection between musical gesture and feet was a very important expansion for my sense of polyphonic thinking through gesture both in organ repertoire (manuals and pedals) and piano repertoire. This perception seems to be supported by the last of the core claims of embodied cognition proposed by Margaret Wilson (see §7 for a discussion of embodied cognition, including the complete list of principles from which this is taken):

> 6. Off-line cognition is body based. Even when decoupled from the environment, the activity of the mind is grounded in mechanisms that evolved for interaction with the environment—that is, mechanisms of sensory processing and motor control. (Wilson 2002: 626)

This principle suggests that developing the sense of musical gesture in the feet and the connection between the feet and the musical ear provides an additional mechanism of sensory processing and motor control, which is available for thought whether or not the feet actually play. It suggests that the expansion of technique to include pedals represents an augmentation of the capacity for polyphonic thinking-through-movement which can be used either at the piano or at the organ. While studying a new instrument might seem like an extreme undertaking, the effort spent on organ study is worthwhile for pianists. The point at which the benefits for polyphonic thinking begin is the moment the feet become involved in the creation of musical gestures which feature equally in importance to the gestures created by the hands in the determination of the overall flow of the music.

19.6 Conclusion

The body schemata underlying polyphonic expression can be developed through exercises, often using existing exercise material. Such an approach serves a second purpose as well: it alleviates the boredom of mechanical repetition of existing exercises, since the realisation of divergent expression requires focus and awareness. Playing through the exercises above is sufficient for a pianist to become aware of the limitations of polyphonic expression caused in part by bimanual interference, and practicing the exercises represents the first step in overcoming them. Body schemata are given (§6.1) in the musical imagination (§9.6.1) and the perception of the musical score (§10.2), and are communicated through musical details (§10.1) in the structure of performance (§14). They underlie the gestural expression that adds grabbiness (§17) to the sounding result. For all these reasons, developing such body schemata through exercises is a step that permeates pre-reflectively through the musical practice of a pianist. In the following section, I will

give some examples of such polyphonic voicings, which in this case are consciously applied (*willed*, §9.7), but which might occur pre-reflectively outside of a research context.

20 A recital program

As a final part of my dissertation, I will give a live performance of a recital program divided between works for piano and organ. In this recital, I will show how polyphonic expression can be highlighted or foregrounded. Polyphonic thinking will be modelled in the sense that various polyphonic affordances of the scores will be made explicit (both in sound at the performance and through the analysis presented here) and the aesthetic balance between polyphonic expression and homophonic expression will be considered.

Polyphonic expression is one part of my practice, and through this research I have made it more central to my practice so that it comes out frequently as simply the way I understand music, without conscious intervention. However, in this research context it is very useful to explicitly analyse the gestural component of polyphonic expression in specific passages, in order to show how this particular kind of musical thinking works.

For each piece or set of pieces, I will present here some reflection about the polyphonic affordances of the piece that I will voice during the performance. I have chosen to focus on certain specific passages from each piece, chosen to show a variety of different situations where polyphonic expression can be employed. This is by no means a comprehensive analysis in the sense that I will not go through every measure of every piece, but serves rather to model example applications of polyphonic expression that I will integrate in a similar way throughout the performance.

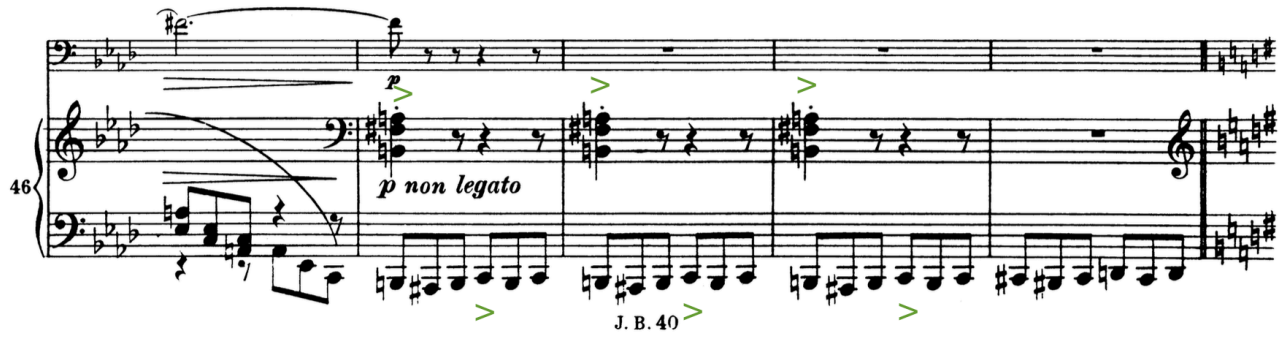
Since it is my goal to think in gesture rather than in musical details, I have mostly used the form of notation presented in the previous chapter for showing gestural shape. While this notation does not describe the *quality* of gesture at all, it does show the prefix and suffix clearly, and thus can show the kind of polyphonic divergence that is intended. How these shapes are communicated remains flexible, and my performance will demonstrate one way of realising these divergences.

The choice of repertoire might seem odd, since rather than focusing on the most polyphonic works, I have simply chosen a selection of pieces from my normal recital repertoire. However, one of the arguments of this dissertation is that polyphonic voicing can be applied to all keyboard music, whether or not it seems highly polyphonic on paper. With that perspective, it is much more interesting to see a representative sample of repertoire, including pieces that are highly polyphonic as well as pieces that are less obviously polyphonic.

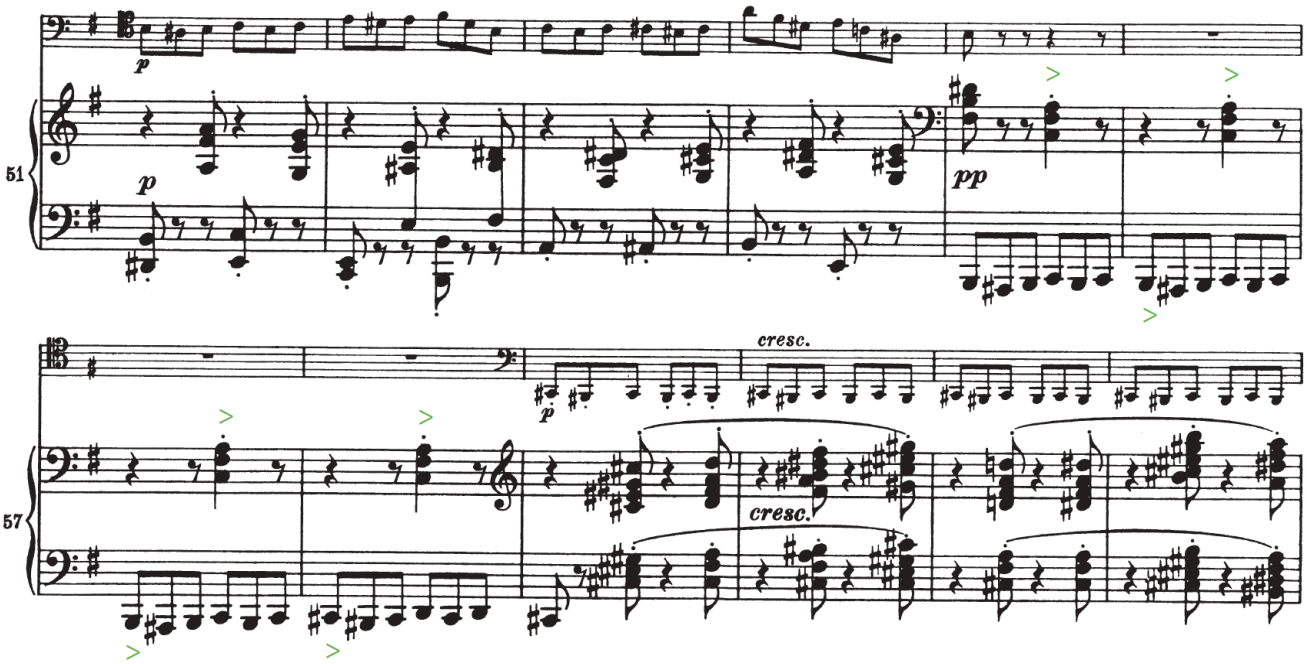
Certain features of each instrument lead to general principles for polyphonic playing. For example, the fact that the sound of the piano decays after the attack gives a predetermined shape to long notes. Two thoughts come up regarding this fact: 1) the decay can be mitigated by the way other voices are shaped; 2) playing longer note values louder often makes sense to make sure their sound balances sufficiently through their full length. This decay in the sound of single notes is an instrumental feature that figures into the appraisal of affordances for polyphonic expression in piano music. Similar organ-specific qualities influence the application of polyphonic expression to the organ pieces.

Besides the qualities of the instrument, polyphonic expression is of course dependent on the affordances of the musical passage at hand. First, the structure of the lines in the score limit options for polyphonic voicing. For an elementary example, consider these passages from Brahms's Cello Sonata in F Major (Example 20.1, measures 47-50, Example 20.2 measures 55-59, Example 20.3 measures 81-84). If we view this passage in two parts (left hand and right hand) we notice that in all three passages, the eighth notes in the left hand part are the same (except of course they are transposed in the third example). However, the rhythmic pattern in the right hand is different. If we are to find a polyphonic voicing for all three passages, it has to be determined by the rhythm of the right hand. This is because the only viable reading of the right hand is that the chords

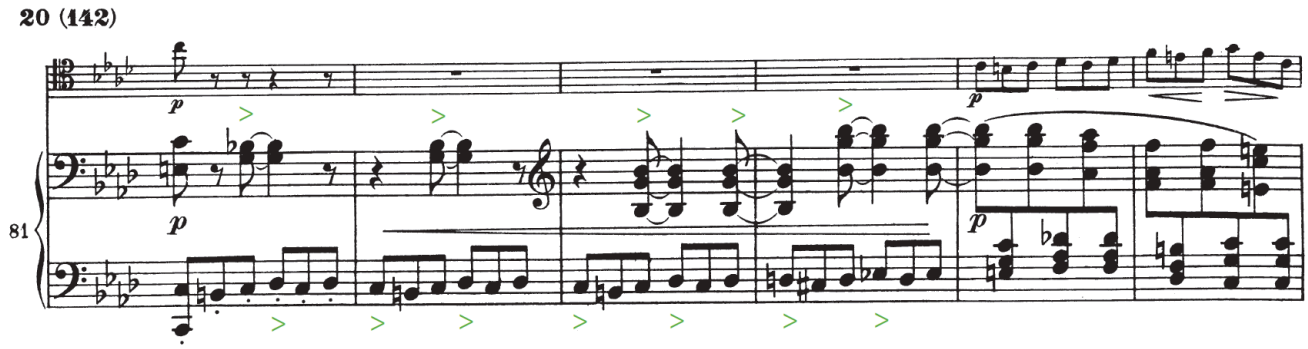
represent points of emphasis, and the rests represent points of de-emphasis. The left hand, therefore, must be shaped differently in each case to provide the polyphonic expression. While it may be possible to find a polyphonic voicing on a longer timescale, it would be much more difficult to project. This is, therefore, the best affordance for polyphonic voicing in these passages. I have marked points of emphasis with green accent marks.



Example 20.1: Brahms Cello Sonata in F major (Gál, Breitkopf, 1926)



Example 20.2: Brahms Cello Sonata in F major (Breitkopf, Gál, 1926)



Example 20.3: Brahms Cello Sonata in F Major example (Breitkopf, Gál, 1926)

Because the points of emphasis in the right hand of this example are simply single chords, the characteristic overarching gesture of coarticulation can be collapsed onto the moment of attack alone. The example, then, is not particularly illustrative of the gestural divergence underlying polyphonic expression, while it does on the other hand offer a clear picture of the interaction between voices that makes polyphonic expression possible. The left hand part, while identical across the three excerpts (except for its transposition) receives a radically different voicing in each case in response to the rhythmic profile of the right hand. Of course, this example is also extremely simple, and many passages in the following pages have alternative plausible polyphonic voicings.

It is therefore not my point to argue that the analyses presented here show the only polyphonic voicings for the passages that I examine, but rather to propose these as options for polyphonic voicing which demonstrate the practice of polyphonic expression in its application. In previous sections, I have written about the relationship between factors of rhythm and contour (§15.2.4), and how these relate to musical gesture in the performance of lines. The overarching trajectory shapes of coarticulation constitute continuities (§9.3) of gesture, which in turn depend on such factors (§15.2.1). Legato (§15.2.1.1) and voicing (§17.3) thus also do. One could imagine voicings in the following examples where the connection between gesture and, on the other hand, contour and rhythm is deliberately broken. While such voicings might offer a radically different performance result, this

innovation would come at the expense of such overarching continuities and would diminish the immediacy in expression of each line, since the performative intonation and the contours and rhythms would no longer would work together. Moreover, such an approach would cerebrally override the subjectivity of each individual line, a subjectivity born from the performer's embodied understanding of the music rather than his conceptual faculties. On the other hand, multiple alternative polyphonic voicings exist that do consider the contour and rhythm in its gestural embodiment, and it is within this field of options that I have chosen to work in the following examples, since these options are themselves under-explored by performing musicians.

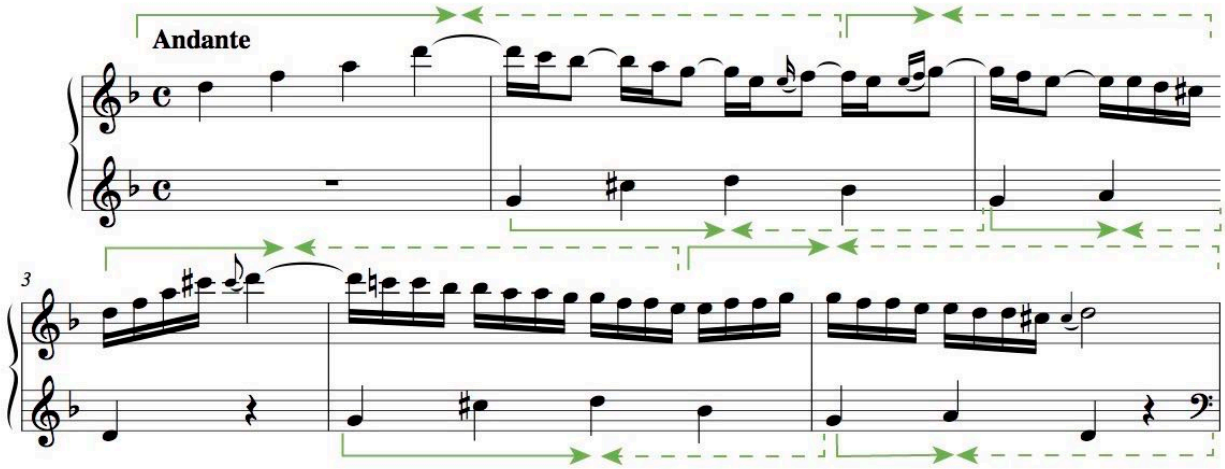
In some examples, an analysis of the musical gesture involved (showing prefix and suffix) is sufficient to show the underlying polyphonic expression. However, the scope of this type of gestural analysis is limited since it only accurately describes passages that have a relatively simple shape. In other examples, it is more productive to describe the polyphonic divergence from the perspective of the temporal flow of voices and from the spatiality of vertical sonorities. For this reason, I will discuss each piece slightly differently; for some, I will use excerpts with an analysis of polyphonic expression through gesture, and for others I will present my more general reflections on creating a polyphonic voicing.

20.1 Scarlatti: Sonata in D Minor

Playing Scarlatti on the piano is not historically accurate but it is very common and extremely beautiful. It is my view that the sound possibilities of the piano (such as pedal, dynamic range) should be fully employed without any feeling of restraint. This approach gives great freedom to the performer, since there are very few expressive markings in the score. With such freedom, it is easy to find a polyphonic voicing for this music. I have

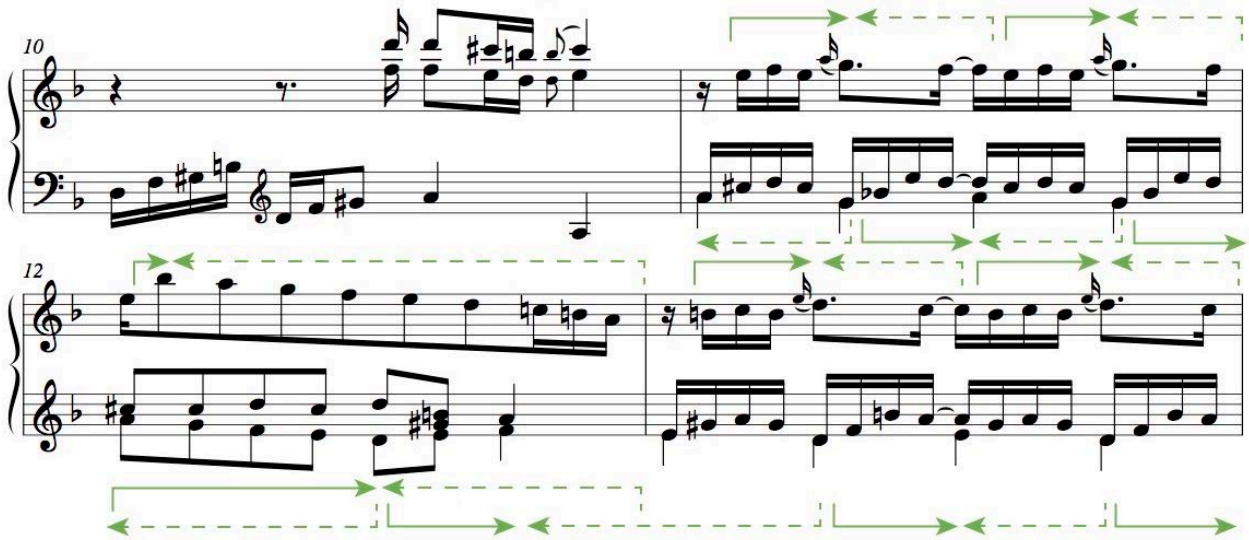
selected a few passages below to give an example of the different kinds of musical material that make up the sonata and how these materials can be polyphonically voiced.

Because this music has relatively few notes, it is easy to show the structure of gesture that creates the polyphonic voicing. While this clearness is definitely beneficial for the purposes of the exposition of research, it also can lead to a rather over-worked or inflexible performance. It is again important to note the difference between interpretation and understanding: playing these passages while consciously trying to project the gestures as written is a very different experience from assimilating those gestures through practice and then allowing them to emerge in performance, without conscious intervention. The difference from the first person perspective is that in the first case, the performer is playing through conscious thinking about the abstraction notated in the score, while in the second case he is playing by the remembered feeling and sound of the gestures, already ingrained through practice. In this research context, of course I will play with enough thought to make sure that I actually do project the polyphonic voicing that I have written (notated with the green arrows §14.4). However, in a normal concert practice, these types of polyphonic voicings should emerge naturally from an embodied instrumental practice that is primed with polyphonic gesture, so that the polyphonic voicing remains flexible and dissolved in the flow of the artistic process.



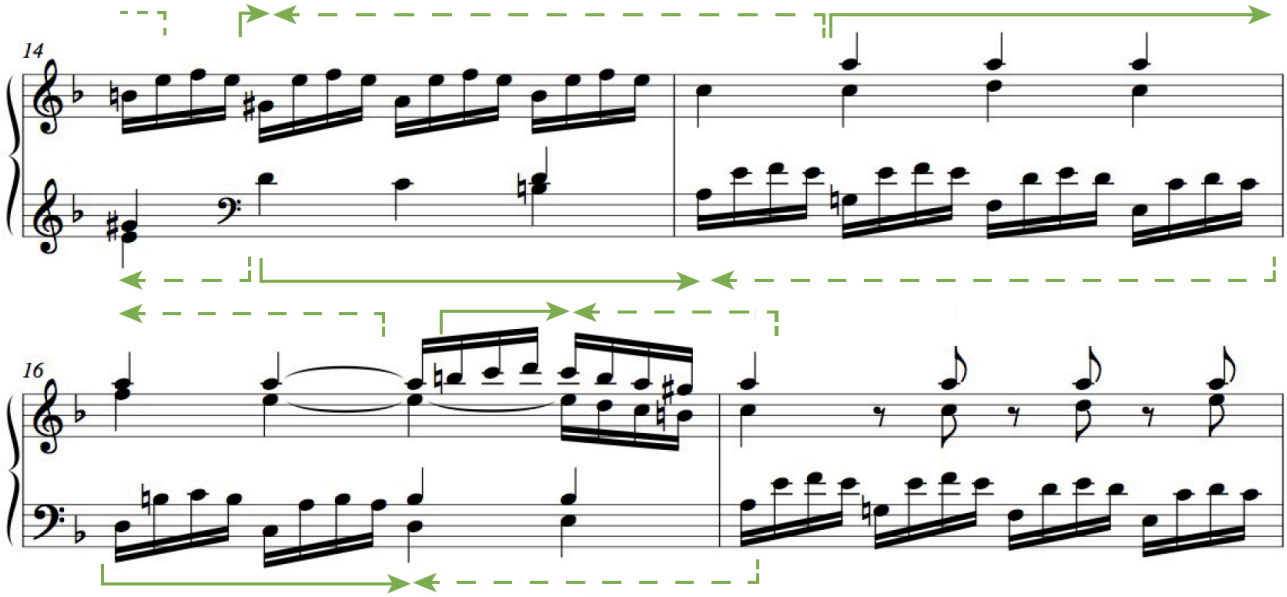
Example 20.4: Scarlatti Sonata in D Minor K. 213 L. 108 (Les Éditions Outremontaises, Gouinn, 2013)[72]

In Example 20.5, please note that of the two sets of arrows below measure 12, the top arrows apply to the middle voice and the bottom arrows to the lower voice. A similar construction occurs in measure 25 of Example 20.6.

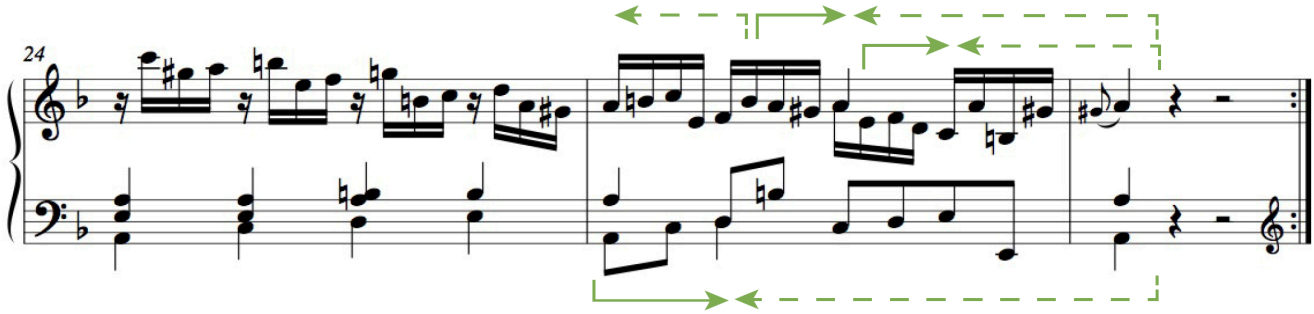


Example 20.5: Scarlatti Sonata in D minor K. 213 L. 108 (Les Éditions Outremontaises, Gouinn, 2013)

[72] Retrieved from <http://imslp.org/wiki/Keyboard_Sonata_in_D_minor,_K.213_(Scarlatti,_Domenico)> accessed Feb. 21, 2016



Example 20.6: Scarlatti Sonata in D minor K. 213 L. 108 (Les Éditions Outremontaises, Gouinn, 2013)



Example 20.7: Scarlatti Sonata in D minor K. 213 L. 108 (Les Éditions Outremontaises, Gouinn, 2013)

20.2 Beethoven: Eroica Variations

As I have described, the act of presenting research through performance is one step removed from artistic practice in the necessity for conscious thought to make sure that the research is projected through the performance. In Beethoven's Eroica Variations op. 35, I decided to take this research component one step further. For a few of the examples, I will

provide an alternative recording of a non-polyphonic performance. Since polyphonic voicing can seem subtle, especially to novice ears, it is useful to have an immediate comparison.

Below is some discussion of possible polyphonic voicing in the first eleven sections of the piece. I feel this gives a good overview of the kind of polyphonic divergences I use, and these are similar in subsequent variations. For the last variation before the fugue and the fugue itself, there are no repeats, so I will use a normal and more flexible mix of voicings, emulating a more normal concert situation where the structure of voicing is not pre-determined. It is my hope that by this point in the piece, both the minds and the ears of the listeners will be primed to hear these polyphonic voicings as they emerge.

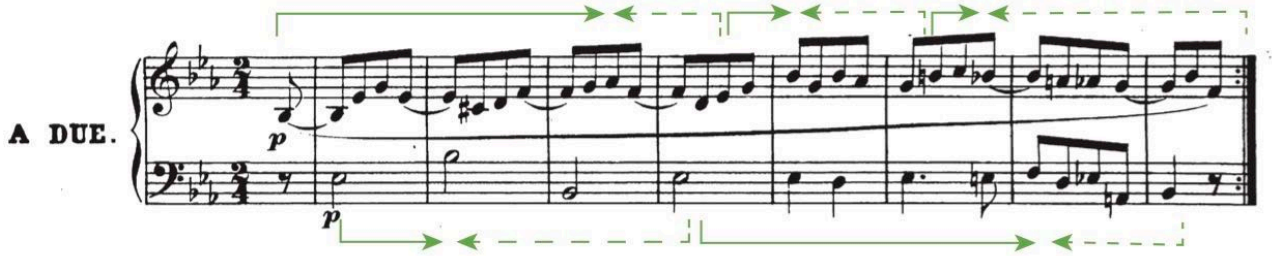
Introduzione col Basso del Tema

Example 20.8: Beethoven Eroica Variations op. 35, *Introduzione col Basso del Tema* (Breitkopf, 1862-90)

In this introduction, the contour and rhythm of the lines moving in parallel octaves is identical, so no polyphonic expression is suggested by these details. However, polyphonic expression can be superimposed on the lines, so that each octave has a distinct

shape. This gives the effect of colouring each octave vertical slightly differently and giving a sense of dynamic movement for individual lines while the overall dynamic remains constant. The effect is subtle but audible, and it gives a sense of liveliness to this section. Since this sound effect is not grounded in the contour or rhythm of the notes in the score, I have not specifically notated it here. I prefer to use it rather flexibly, shaping the sound of each individual instrument.

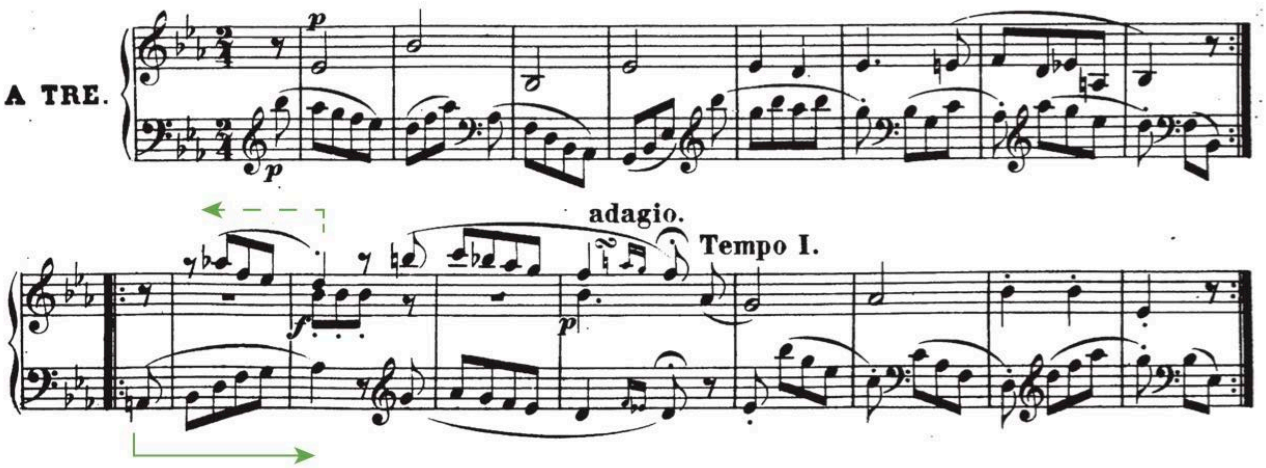
A due



Example 20.9: Beethoven Eroica Variations op. 35, *A due* (Breitkopf, 1862-90)

A tre

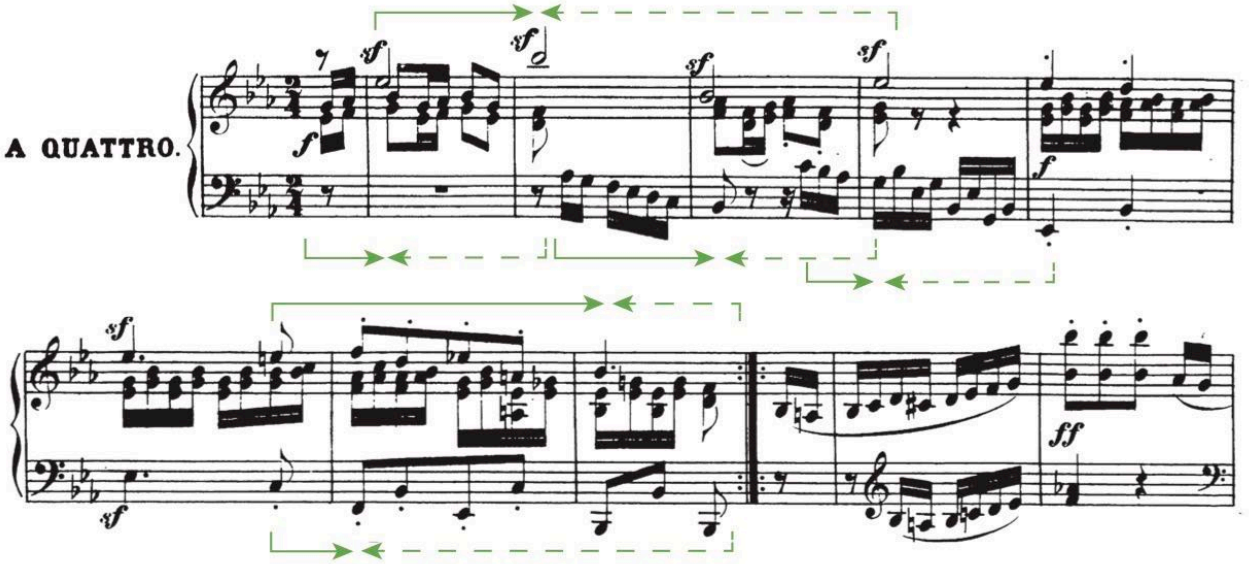
In this section, the jumps of the left hand have the effect of creating a separation in timing between the segments written in treble clef and the parts written in bass clef. This creates a sense of distance that gives the effect of a dialogue, which is grounded by more continuous rhythm of the bass line (played by the right hand). At the beginning of the second half, the polyphonic divergence notated gives an enhanced clarity to the separation between the three voices.



Example 20.10: Beethoven Eroica Variations op. 35, *A tre* (Breitkopf, 1862-90)

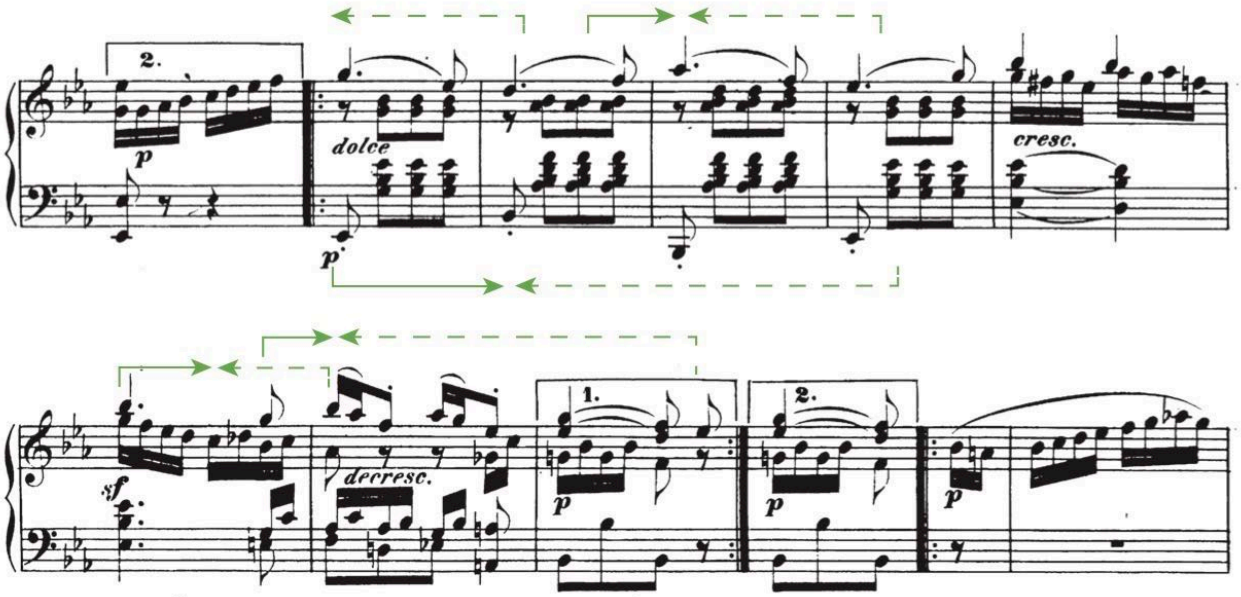
A quattro

In this section, the arrows below the first line apply to pair of voices moving in thirds and to the sixteenth notes written in the bass clef, which diverge in the third measure. Against these voices, the bass line, now in the soprano, is divergently shaped.



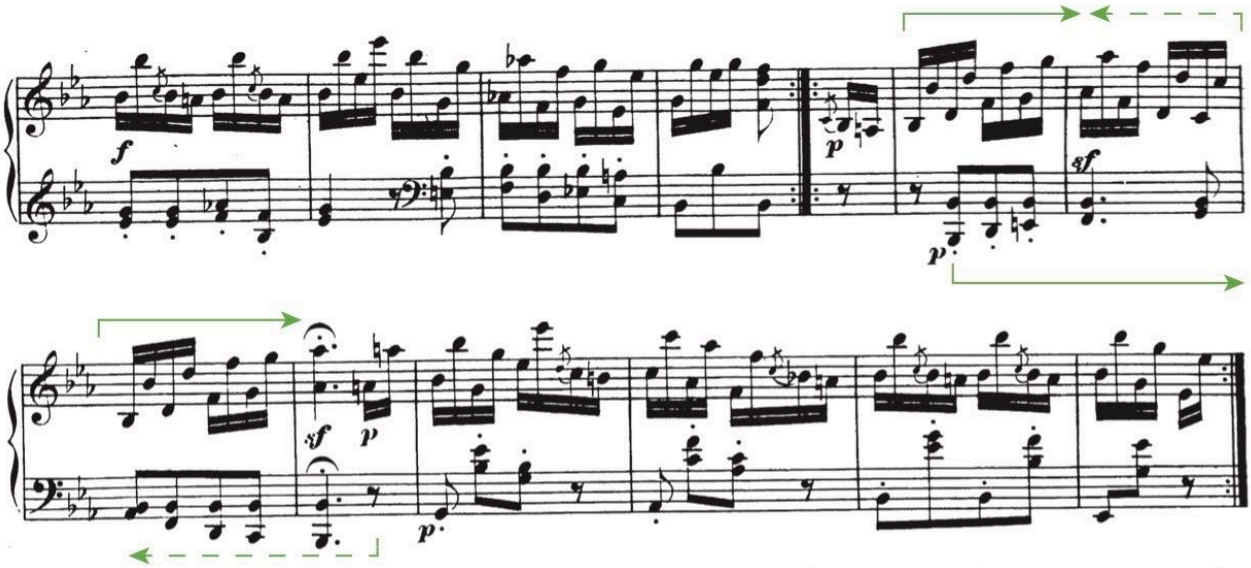
Example 20.11: Beethoven Eroica Variations op. 35, *A quattro* (Breitkopf, 1862-90)

Tema



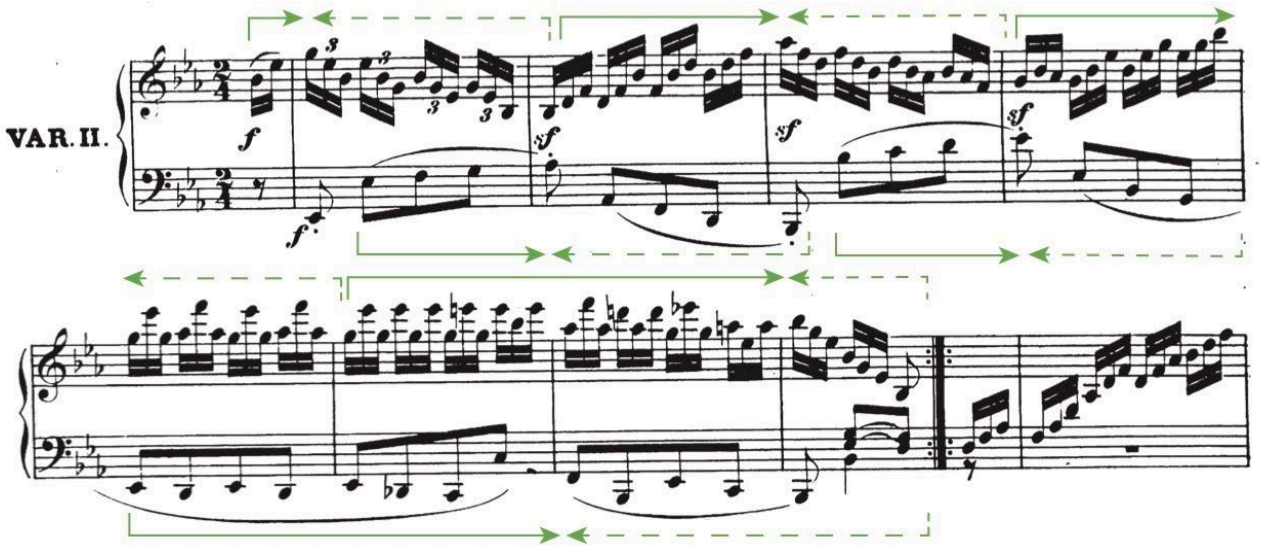
Example 20.12: Beethoven Eroica Variations op. 35, *Tema* (Breitkopf, 1862-90)

Variation 1



Example 20.13: Beethoven Eroica Variations op. 35, *Variation 1* (Breitkopf, 1862-90)

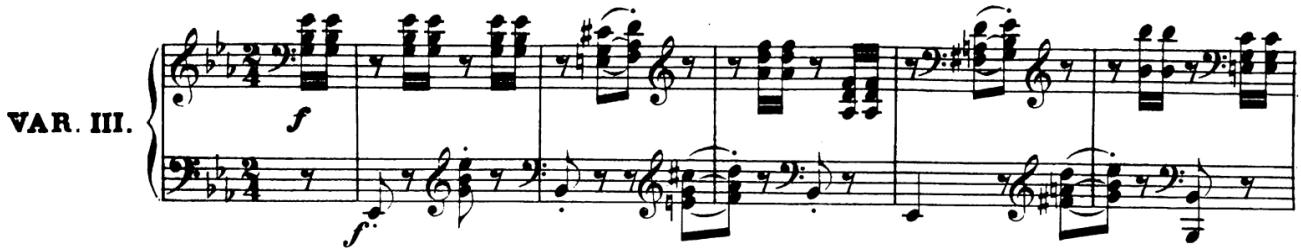
Variation 2



Example 20.14: Beethoven Eroica Variations op. 35, *Variation 2* (Breitkopf, 1862-90)

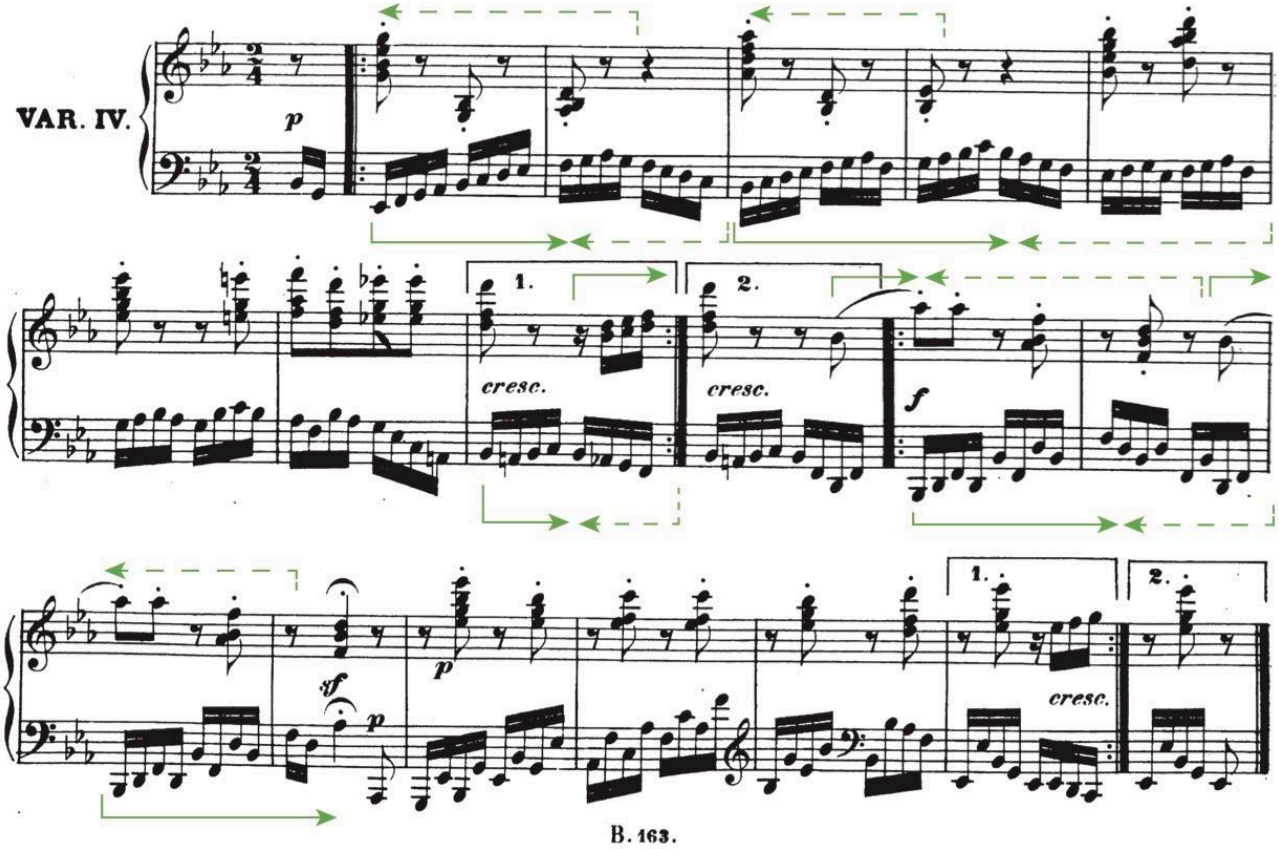
Variation 3

In this variation, a slight separation in timing and colour between the material in the first measure and the eighth-note triads is sufficient to give the sense of spatial separation between these two dialoguing voices. What is interesting to note is that the divergence does not happen with voices that sound simultaneously, but rather in the temporal flow of the music suggested by their gestural unfolding. The slight subversion of expectation in the temporal placement of these eighth-note triads, while still maintaining tempo within this group of triads, give a spatial or antiphonal effect.



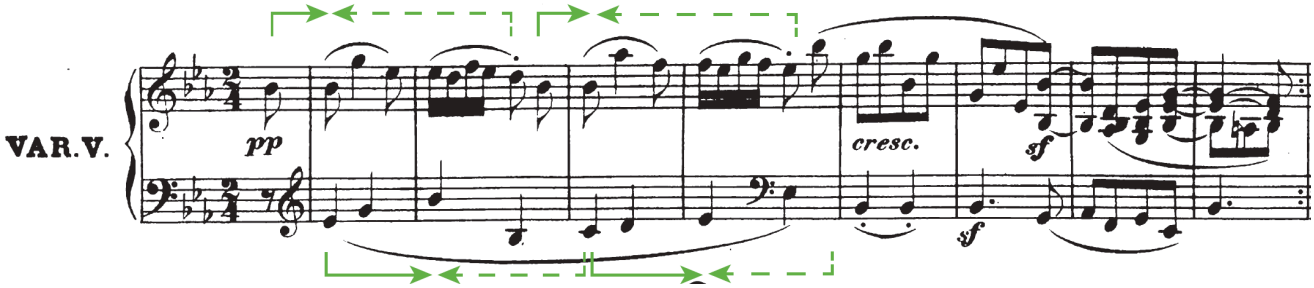
Example 20.15: Beethoven Eroica Variations op. 35, *Variation 3* (Breitkopf, 1862-90)

Variation 4



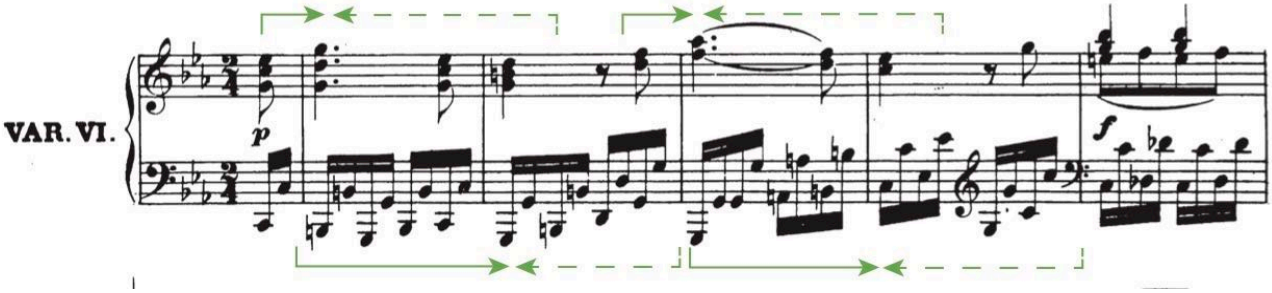
Example 20.16: Beethoven Eroica Variations op. 35, *Variation 4* (Breitkopf, 1862-90)

Variation 5



Example 20.17: Beethoven Eroica Variations op. 35, *Variation 5* (Breitkopf, 1862-90)

Variation 6



Example 20.18: Beethoven Eroica Variations op. 35, *Variation 6* (Breitkopf, 1862-90)

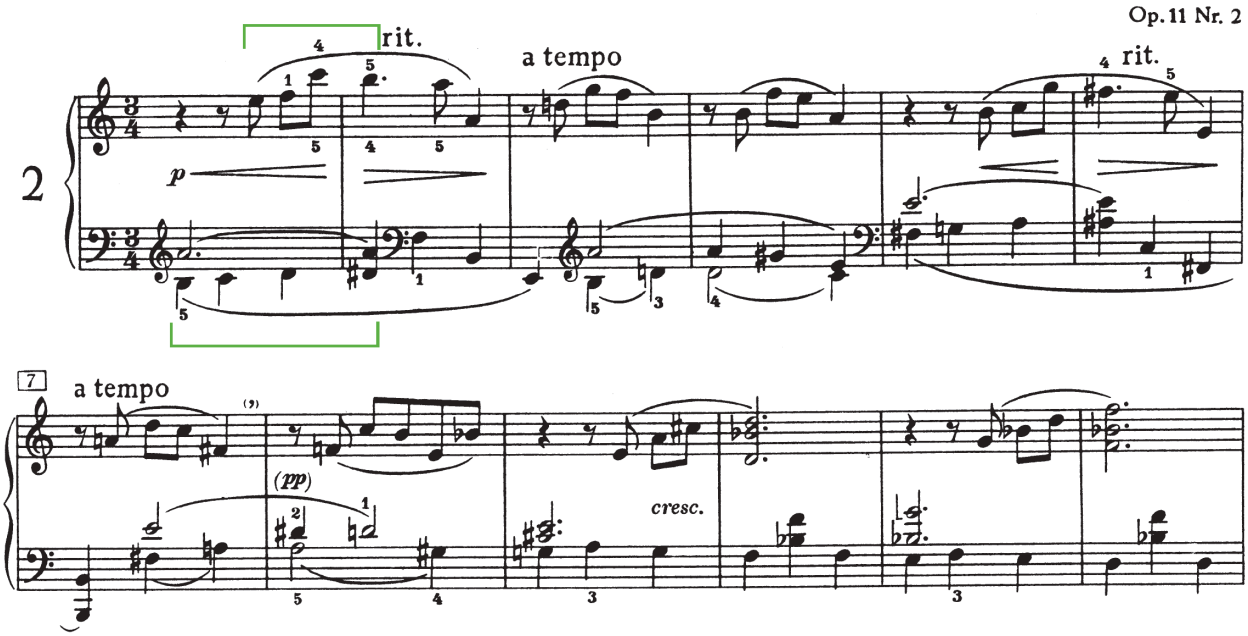
20.3 Scriabin: Prelude op. 11 no. 2

The polyphonic affordances of this prelude are more difficult to summarise with notation of gestures. The relatively simple appearance of the notes on the page belies the complexity of voicing in a successful performance. This complexity is partly caused by the compound nature of the lines, and partly by the possibility of the pedal to provide a sonority into which voices can disappear and out of which voices can emerge. The gestures themselves seem to have less defined moments of arrival, and while prefix and suffix might be felt, a notation that puts a definite moment of arrival seems too definitive. It is therefore easier to describe the polyphonic voicing in terms of temporal flows. These temporal flows

reflect an underlying gesture without separation into prefix and suffix. This more rounded and less focused view of gesture seems to fit the flexibility of this music.

In the first measure, I have marked two such flows with brackets. The separation or unity between the flows of gesture in performance is given by their temporal indissolubility or solubility into each other. The progression of quarter notes, shaped by a temporal envelope of movement, suggests a subdivision into which the eighth notes can fit. If the eighth notes in the upper bracket fit into such implied subdivisions, the two flows of gesture are soluble into each other, and there is no temporal separation in the flow of the two gestures. However, I can suggest a polyphonic voicing through the indissolubility of the two temporal flows. One effect of such a polyphonic voicing is that many vertical alignments are dislocated.

The sense of gesture behind such flows is created by the sense of manipulation of time, which causes the feeling of progression in the gesture - moving forwards in time or holding back in time. While this sense of flow is difficult to capture on paper, I will try to do so in order to describe it and at the same time in order to show the various problems with defining it through analysis. We can define the prefix and suffix of the lower bracket as:



Example 20.19: Scriabin Prelude op. 11 no. 2 (first edition: Leipzig, M.P. Belaieff)

The gestural flow of the quarter notes (the lower bracket) must move against a temporal frame of reference. After all, just playing the notes slightly faster gives the impression of a faster tempo, but not the sense of progression or movement within the temporal flow. To show this progression, the notes must begin slower. Due to the relatively small number of notes, this must occur more or less on the first note, after which the temporal flow spanning the four-note segment will begin. A revised analysis of the structure of gesture thus might include as sense of gestural suffix on the first note, followed by the prefix towards the D#. However, such an analysis seems to give a strong emphasis to that note by suggesting both a prefix and a moment of arrival. In performance it is the sense of *movement toward* the D# that I wish to capture, not an actual emphasis on that note, so I might rather deflect away from accenting it. Shifting the moment of arrival to one note earlier is hardly a sufficient fix, since it does not feel right to include the D# as part of the suffix. Even if I could adjust this kind of analysis to reflect the complexity in expression of these four notes, it quickly becomes cumbersome when layered with longer timescales. For example, the first four quarter notes (the lower bracket) form the

beginning of a line that can be heard as continuing with the B on the second beat of the third measure. In my vision for the character of the piece, which is suggestive rather than concrete, the various temporal flows during this longer phrase suggest movement or gravitation, but not clearly defined moments of arrival.

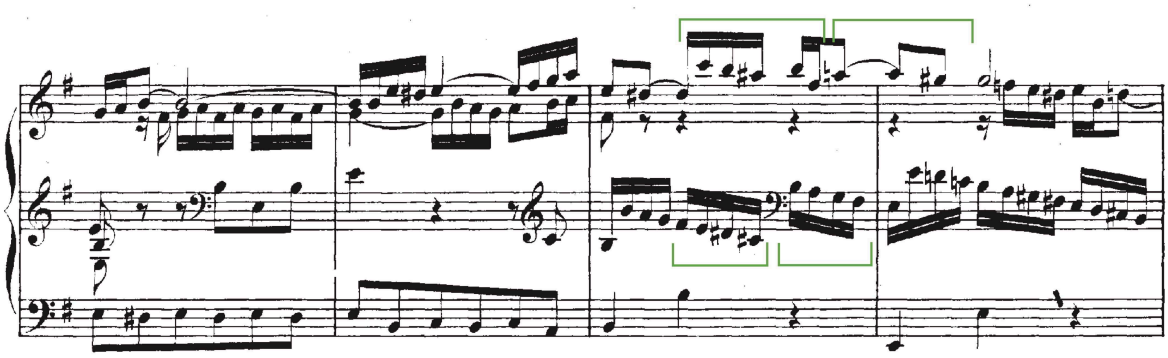
Such temporal flows reflect musical gesture, but this gesture resists clear demarcation into prefix and suffix. The complex layering of hierarchically nested flows and the flows that seem to voice the connections between parts of compound lines are by themselves easy to feel but difficult to define on paper. This complexity is intensified by polyphonic expression, which causes the separation of flows into layers that are indissoluble within each other. What emerges is a three dimensionality of movement, whereby gestures are suggested in temporal flows but are not given clear points of arrival, at least not in the sense of strong emphasis. The difference in flows between a non-polyphonic voicing and a polyphonic voicing is easily heard and felt.

20.4 Bach: Prelude and Fugue in E Minor BWV 548

Foreground grouping of individual lines can create polyphonic voicing in the organ works of Bach because it can be used to show divergence in both the rhythmic profile and the contour of lines. In works on two manuals, the polyphonic layering is already audibly demarcated by difference in registration. An enormous amount has been written about Bach performance practice, particularly from a historical perspective. According to scholars, Baroque fingerings, revolutionised by Bach, give historically-informed options for grouping structure, often resulting in pairs of notes (Swinkin 2007). It is not my purpose to comment on such ideas, but only to point out that there are often key decisions about grouping that can bring about a polyphonic voicing. In this section I will describe two such decisions from the Prelude and Fugue in E Minor BWV 548.

To begin with, the musical details of articulation and timing express gesture on foreground timescales. For example, a grouping of four notes is heard when, roughly speaking, the first two notes are more connected in legato, and the last two are more non-legato. These degrees of articulation range from very separate to over-legato. The grouping structure can be hierarchically nested, so groups of two notes, four notes and eight notes can be simultaneously be expressed. This kind of grouping can be used to make the rhythmic structure of the music clear insofar as it is suggests a sense of underlying coarticulated rhythmic gesture. While one hierarchical level of grouping often emerges as the most salient grouping for a given passage, other levels are often expressed at the same time.

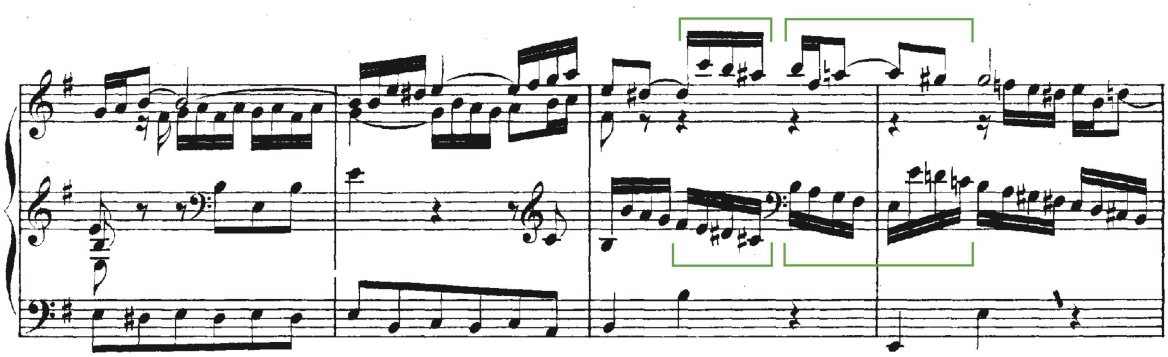
Groupings and the musical gestures that express them can create many different voicings, and the divergence of such groupings can create polyphonic voicing. In this passage from the Prelude, the continuous descending sixteenth notes could be played as one continuous stream since the metrical structure of the passage as a whole is anyway very clear. However, a grouping of four can serve as a gestural counterpoint to a divergent grouping in the right hand:



Example 20.20: Bach Prelude and Fugue in E minor BWV 548 (Breitkopf, Rust, 1867)

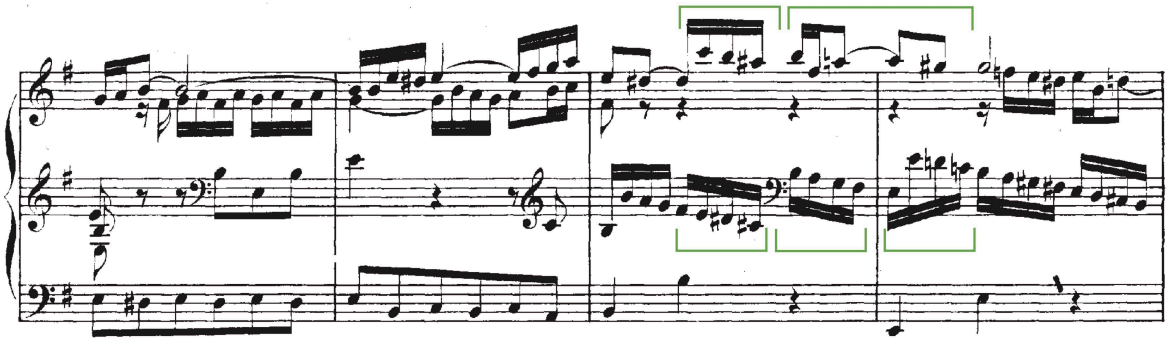
It is interesting to note that the degree to which these groupings can be articulated is quite large, since at each of the moments of articulatory and temporal separation

between groupings, continuity in the other voice holds the texture together. A contrasting non-polyphonic voicing might be either a voicing played *without* groupings (all notes played equally legato or non-legato) or it might be a monophonic voicing like this, where the groupings are identical between the two hands:



Example 20.21: Bach Prelude and Fugue in E minor BWV 548 (Breitkopf, Rust, 1867)

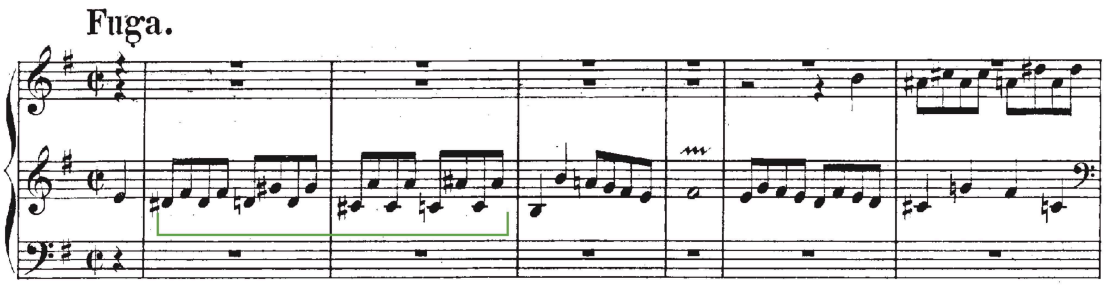
Or a homophonic voicing like this, where the groupings nest into each other:



Example 20.22: Bach Prelude and Fugue in E minor BWV 548 (Breitkopf, Rust, 1867)

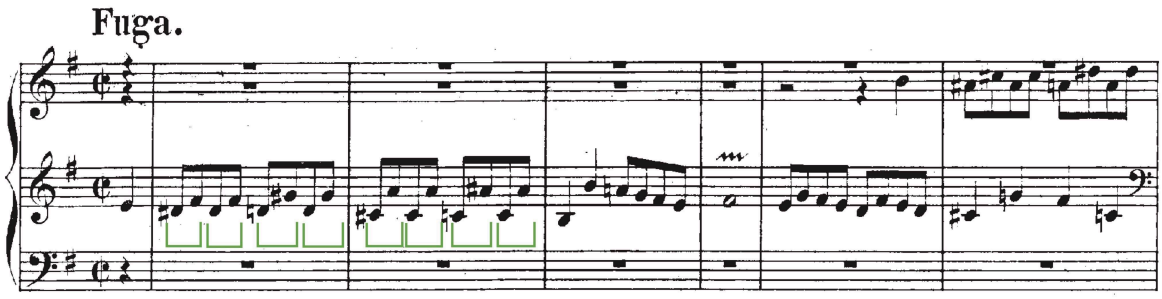
In the fugue, there are various options in shaping the opening eighth notes of the subject which reflect different hierarchical grouping structures. These options are heard in various recordings of the piece, and again it is not my purpose to evaluate these options based on historical performance practice, but rather to point out that one such option leads to a polyphonic voicing. Here are the options:

1) No overarching structure - all the eighth notes are played equally in articulation and timing.



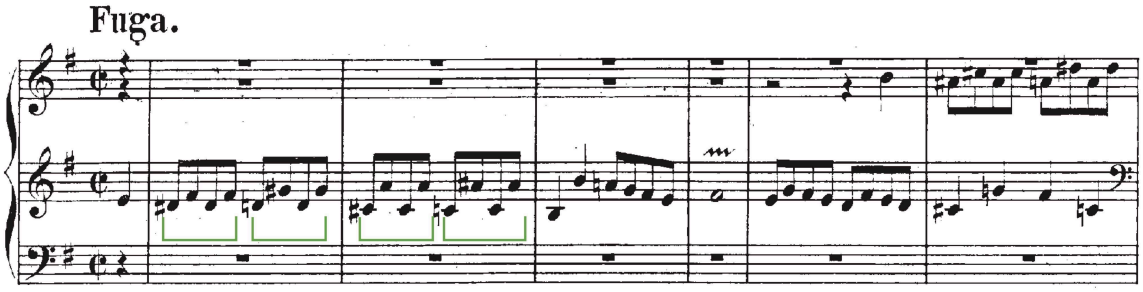
Example 20.23: Bach Prelude and Fugue in E minor BWV 548 (Breitkopf, Rust, 1867)

2) Grouping in twos - notes are articulated in pairs



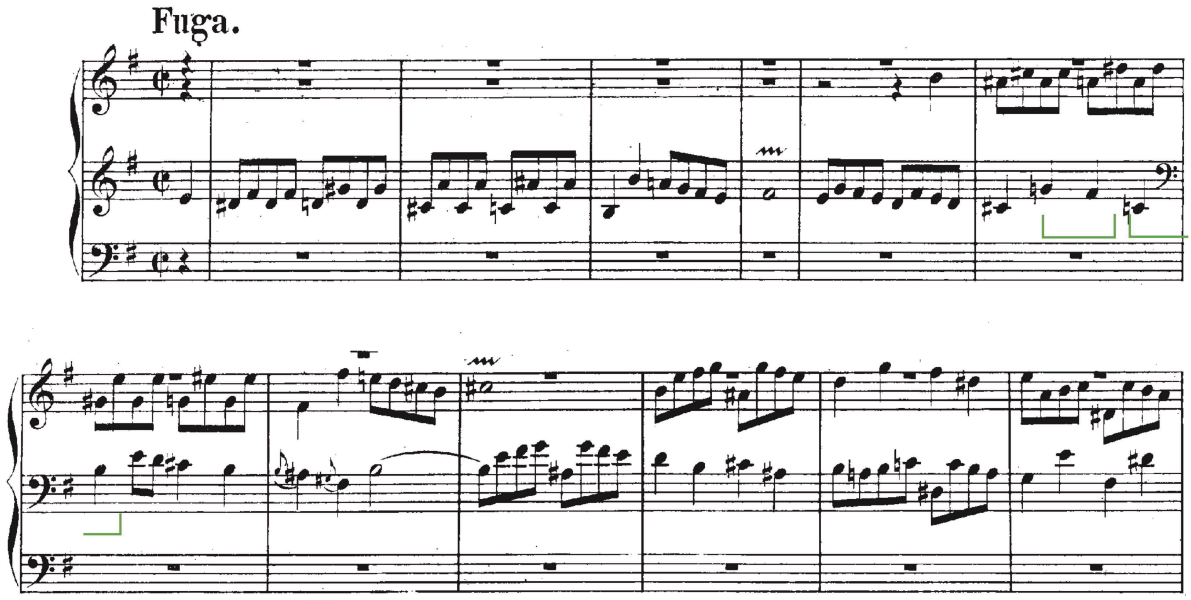
Example 20.24: Bach Prelude and Fugue in E minor BWV 548 (Breitkopf, Rust, 1867)

3) Grouping in fours - notes are articulated in groups of four, and possibly sub-grouped into two note slurs.



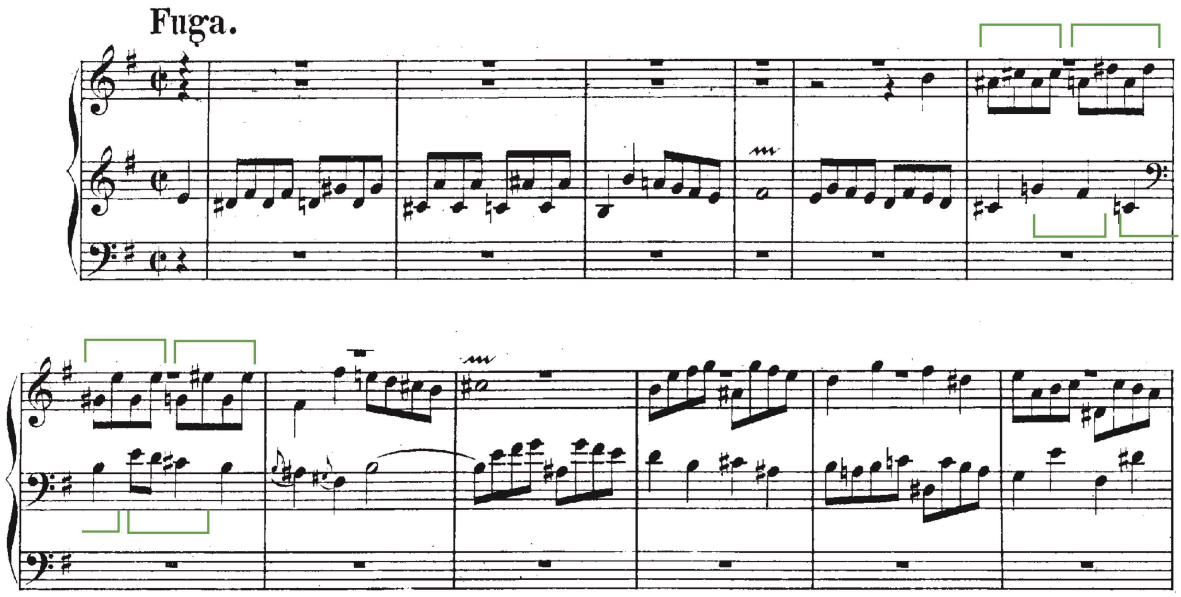
Example 20.25: Bach Prelude and Fugue in E minor BWV 548 (Breitkopf, Rust, 1867)

The countersubject takes the opening motive of the descending chromatic pair of notes to create a very clearly defined grouping:



Example 20.26: Bach Prelude and Fugue in E minor BWV 548 (Breitkopf, Rust, 1867)

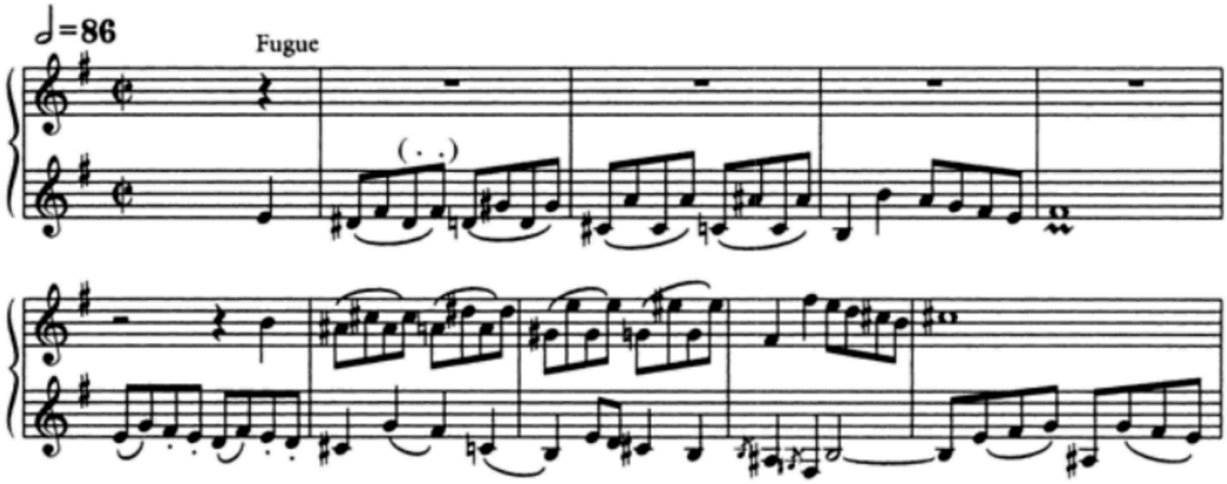
Since this countersubject's most obvious affordance is the grouping by pairs of quarter notes, we can use this to decide upon the grouping of eighth notes in the subject that will result in a polyphonic voicing. The legato connection between the two quarter notes results in the first note sounding longer, and thus creating a sense of emphasis. This emphasis occurs on the timescale of a half-note falling on the off-beats. A clear polyphonic voicing is created by voicing the eighth notes of the subject in groups of four, therefore with a half-note timescale but with emphasis on the strong beats of the measure.



Example 20.27: Bach Prelude and Fugue in E minor BWV 548 (Breitkopf, Rust, 1867)

This is indeed a rather obvious voicing for the passage. In my observation, most organists play the pairs of quarter notes in the countersubject legato as I have notated. But it is interesting to note that relatively few organists group the eighth notes in fours, and if they do, they give up after the first presentation of the subject.

To give one example, consider the recordings and discourse from Bach-specialist and keyboardist Anthony Newman. In his book *Bach and the Baroque* (1995) he notates more-or-less the same articulation that I have suggested:



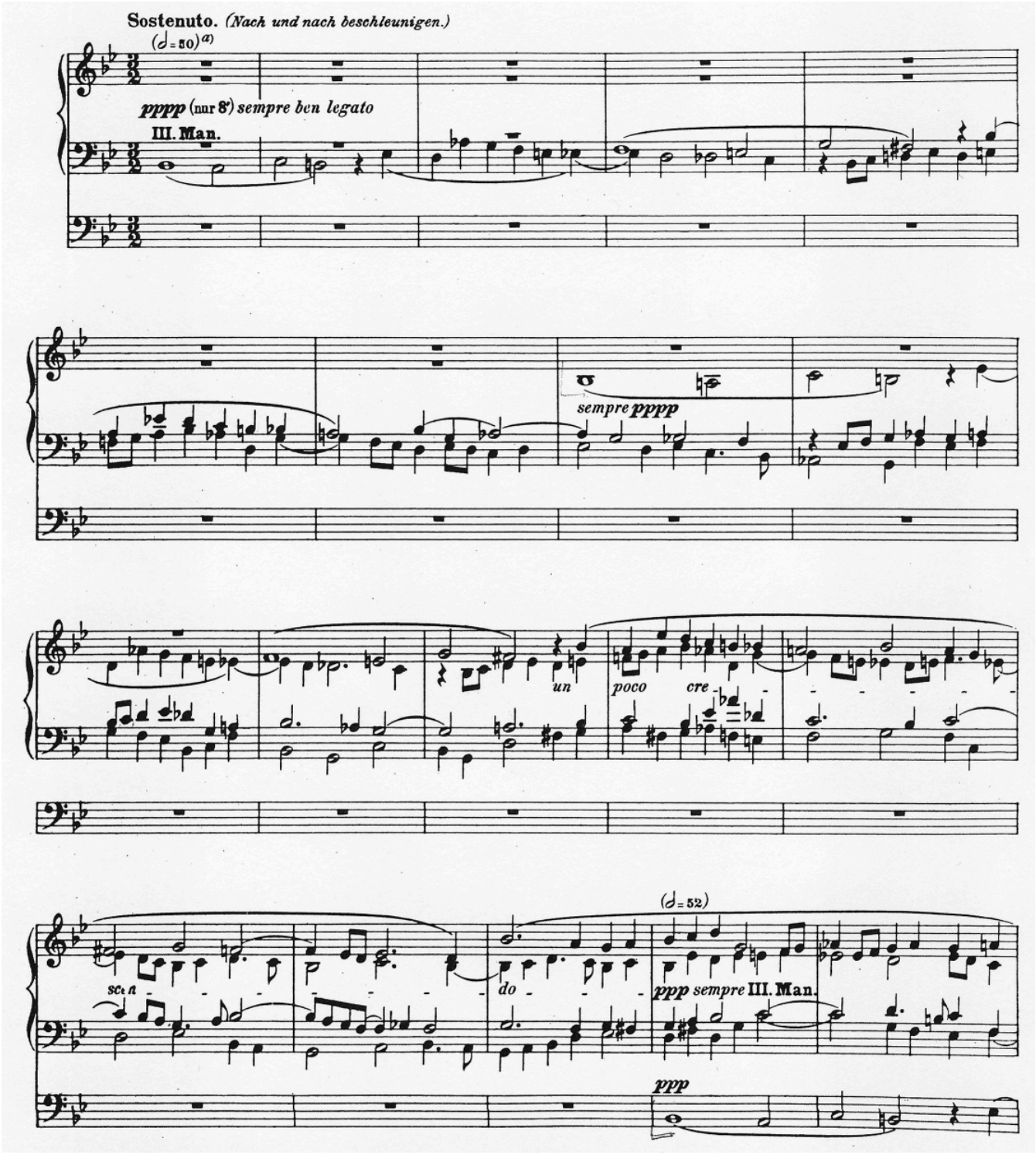
Example 20.28: Bach Prelude and Fugue in E minor BWV 548 (Newman 1995: 232)

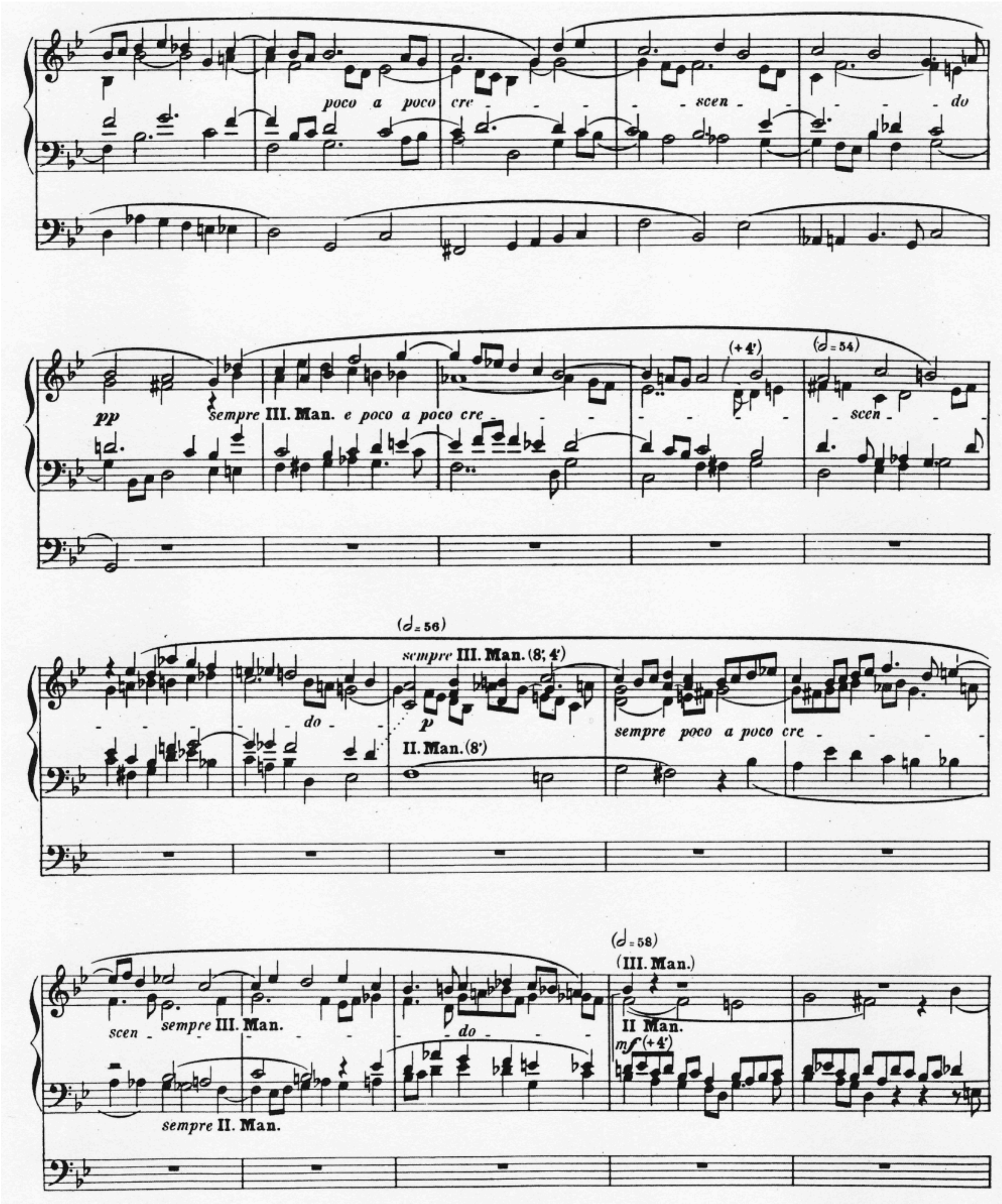
It looks wonderful on paper. But in his own recording of BWV 548 he does not play with this polyphonic articulation. Without asking him, one cannot know the reason for this discrepancy but I speculate that the reason for this might be that, as I have previously explained (§19), polyphonic gesture is cognitively more expensive. In any case, this structuring of the subject and countersubject persists through the fugue, and voicing it polyphonically can be achieved wherever it occurs.

20.5 Reger: Phantasie und Fuge über BACH

In the layered recordings experiment I made for a passage of this piece (§18.3.4), the temporal divergence between voices rendered the music unintelligible since the vertical alignment of harmonies was broken. In examining the same passage, I can use the tendencies of the voices to movement in relation to each other to shape *slight* dislocations of vertical alignment that spatially open the chords, while remaining subtle enough that the vertical alignment of each chord is still felt as one gestural entity. This sort of subtle dislocation is most often used in piano playing and rarely used in organ playing, since the

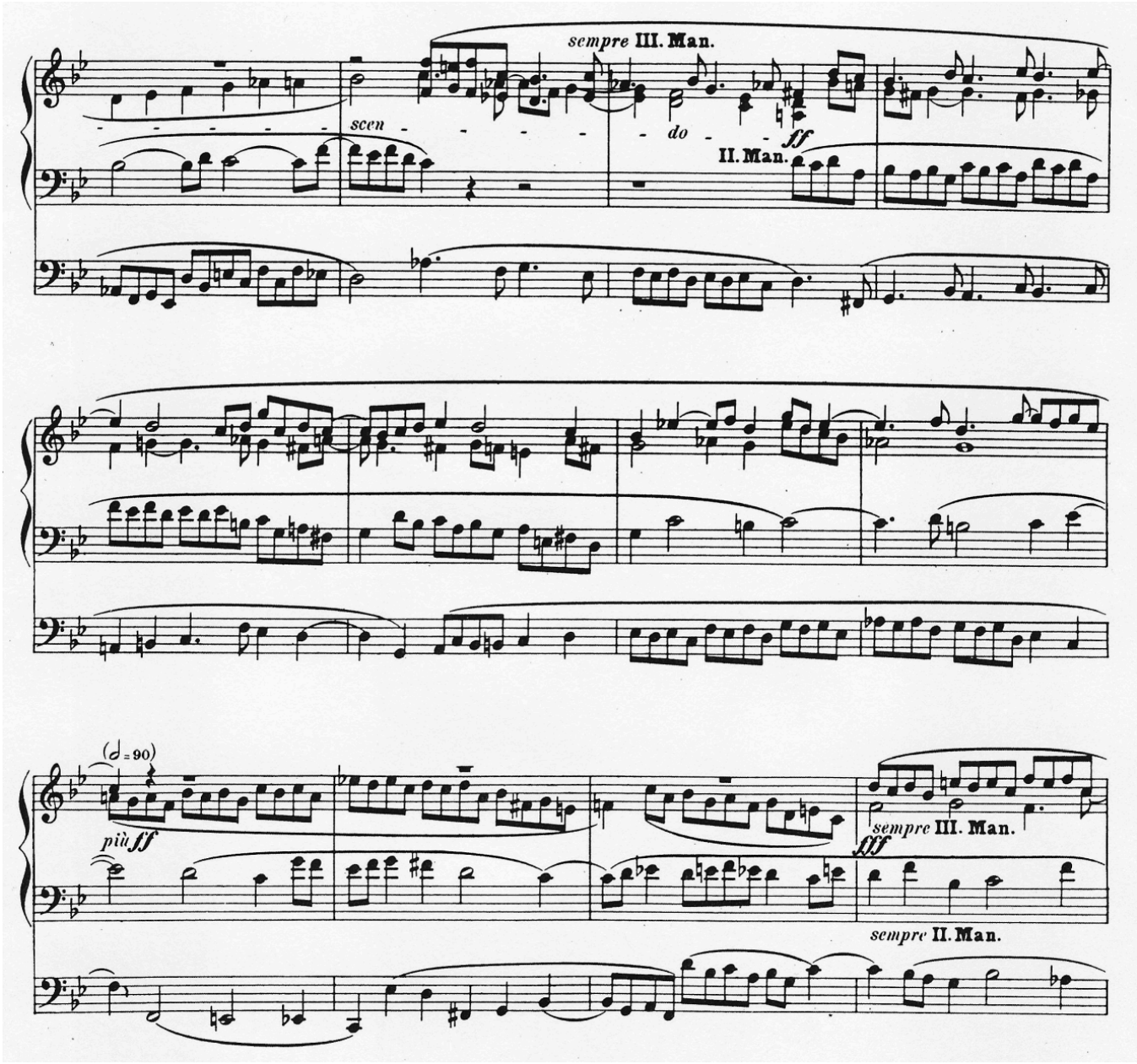
spatial spread of the organ itself is much greater than that of the piano. Obviously such dislocation has to take into account the mechanism and sound of each individual organ. In this piece, slight dislocations can enhance the feeling of musical tension as the tempo gradually rises since they can voice divergence. The result is that voices are heard as being spatially separated. This effect can be used most effectively used in slower passages, such as the first 71 measures of the fugue.


Sostenuto. (Nach und nach beschleunigen.)
(♩= 50)a)
pppp (nur 8') sempre ben legato
III. Man.
sempre pppp
un
poco
cre
(♩= 52)
do
ppp sempre III. Man.
ppp



Example 20.29: Reger Phantasie und Fuge über den Namen B-A-C-H (Universal, Aibl, 1900)

Using polyphonic expression should always be judged aesthetically, and one of the reasons that I included this example is that certain passages are complex enough that only a *limited* amount of polyphonic expression is desirable. In the following passage, the difference in registration between the two manuals and pedals provides enough separation between lines, and very little polyphonic expression is needed. Any divergence that might skew the vertical alignment of eighth notes can easily render such an already complex passage unintelligible.



Example 20.30: Reger Phantasie und Fuge über den Namen B-A-C-H (Universal, Aibl, 1900)

However, the slurs marked by the composer suggest interesting polyphonic divergences which are seldom heard in recordings of this work. Articulating the slurs by lifting the hand between phrases is already more than most performers do, but the audibility of such a lift is rather questionable, considering the resonant acoustic of most organ performance spaces as well as the complex nature of the overall texture. I find that combining such a lift with a change in registration makes the divergence audible. The

general crescendo can be built by adding at these phrase divisions since the voices are spread over two manuals and pedal. These registration changes are handled by registration assistants, who must be alert to pull out the stop on time. The lift between phrases and the slight extra time that it suggests provide a cue which, though not particularly audible to the audience, helps the registrants to place the changes at the right moment.

In writing about this recital program, I have shown only a selection of examples of polyphonic voicings, all of which exist as merely one of many alternatives. Taken alone, some of these voicings are subtle. The listener might only hear the polyphonic voicing when an excerpt is juxtaposed to an alternative voicing, and although the listener might hear (or feel) the difference between the alternatives, he might not be aware of what precisely constitutes the difference. Taken together, however, many such details give a noticeable colour to each piece and to the recital program as a whole.

Conclusion

With this dissertation, I have examined use of polyphonic expression, defined through a specific divergence in gesture. This polyphonic expression is found to a greater or lesser degree in the artistic practice of pianists and organists, and it can be strengthened through building awareness and strengthening the embodied knowledge that is at its foundation. My conclusions have been interspersed throughout the chapters and embodied in the musical examples, so in closing I will reflect on the use of polyphonic expression in artistic practice and as a metaphor, and consider the reasons why a musician might want to develop such polyphonic expression.

In describing the artistic practice of being a musician, I contrasted interpretation (conscious decision making based on the weighing of evidence) and understanding (the pre-reflective embodied process of making sense of the music), and characterised the balance between these two parts of the musical practice as being variable during the phases of development of the musician and likewise during the phases of practice of an individual musical work. Throughout this dissertation, I have pointed to ways to become consciously aware of polyphonic expression as part of an artistic practice. It is my intention, however, to emphasise that this conscious attention must occur during particular phases in the development of a musician, or during phases in the practicing of a new piece, in support of building a sense of embodied understanding which will pre-reflectively find and voice the polyphonic affordances of a piece. The conscious attention necessary during these intermediate phases can later be discarded, while the embodied understanding of

polyphonic expression remains. In this way, polyphonic expression can permeate musical thinking at the instrument even when the concepts used to examine it fade from awareness. While the end-goal is a pre-reflective polyphonic apprehension of the music as situated in the embodied connection to the instrument, the phase of conscious examination and active development is of crucial importance. Because of the specific coordination involved in creating gestural divergence, and its connection to musical thinking in terms of polyphonic expression, it is my argument that without such conscious examination and development, this aspect of musical thinking can remain underdeveloped, representing a blind-spot in the realm of possibilities for expression in performance.

This phase of conscious examination of polyphonic voicing requires extra effort, and even when the underlying embodied knowledge is mastered, its employment in music making is cognitively more expensive than monophonic or homophonic voicing (§17, §18). Why should a musician go through this effort?

Polyphonic voicing is the performer's way of embodying polyphony, taking the idea of polyphony from the realm of thoughts and ideas, and translating it into gestures and sensory experience. Far from being a specialised intellectual domain (as, for example, the study of counterpoint is) this sensory experience directly connects with both expert and non-expert listeners at a gestural level, whether or not these listeners are able to articulate their experiences. In this way, polyphony is appreciated perceptually rather than as a concept. When highly polyphonic works are performed, their grabbiness (§17) *as polyphony* is determined by their degree of polyphonic expression. When homophonic works are performed, polyphonic voicing can bring out hidden lines. Either way, this kind of playing represents an advocacy for polyphony, which should be motivated primarily on aesthetic grounds. Such an advocacy, when verbal explication is necessary, can also be supported by examining the metaphorical meaning of polyphony in a wider cultural context.

In the beginning of this dissertation, I examined how polyphony has gained cultural resonance by its use as a metaphor in many other disciplines. In this metaphorical use, polyphony (the source domain) is fully conceptual, and its meaning depends on the user's grasp of polyphony from a conceptual viewpoint. This explains the vast difference between the use of polyphony as a metaphor between Kormarovich and Bakhtin (§1). After the preceding chapters, it should be clear how fundamentally different it is to see polyphony as a property of a score in which voices imitate each other, seen as a synchronic whole (as Kormarovich does), which is a view both disembodied and taken out-of-time, and by contrast to experience polyphony as an experience unfolding in time, where the subjective apprehension between voices is a continual site of both mutual attunement and divergence (as Bakhtin does).

Conceptual metaphor theory, famously presented by Johnson and Lakoff's book *Metaphors We Live By* (1980), argues that because language is fundamentally metaphorical, metaphor shapes not only human communication but also thought and behaviour. Metaphor operates through a source domain (from where the metaphorical expression is drawn) and the target domain (which the metaphor seeks to understand or explain). According to conceptual metaphor theory, source domains tend to be more concrete and target domains tend to be more abstract. Cognitive linguist Joseph Grady (1997) contrasts high-level metaphors that use abstract concepts as both source and target domains, to what he calls "primary metaphors", which arise from our embodied experience. It follows that the shift of polyphony from a concept to a sensory experience, enabled by a turn from a score-based texture to a performance-based texture, represents an intensification of its potential as a source domain, since its gestural foundation, augmented with the grabbiness (§17) of polyphonic expression, can be felt without conceptual knowledge.

If we accept the hypothesis of conceptual metaphor theory that metaphor shapes thought and behaviour, this suggests that if the embodied experience of polyphony is truly felt, that it is more likely to sprout connections with other aspects of lived experience (both language and meaning) outside of the purely musical. In describing the participant in polyphonic music-making practices (in this case, in Russian cultures) Zemtsovsky (2002) uses the term *homo polyphonicus*. This *homo polyphonicus*, in the social practice of music making, must hear and adapt to the surrounding voices, and thus modulate his or her own sense of agency in attunement, responsiveness or empathy with others while still holding the part. Perhaps for this reason, polyphonic singing has been observed to be deeply connected with certain kinds of social cooperation (Knight 2012), and perhaps for this reason, polyphony is often used as a metaphor for democracy (Koensler 2015: 108, Gjerstad 2013, Schapiro 2009).

It is highly doubtful that any single audience member will become a *homo polyphonicus* just from listening to the polyphonic expression of pianists, since full absorption of it requires inculcation in the practice of doing it. However, polyphonic expression can be meaningful to such uninitiated audiences when it is pointed out to them, and it can also be meaningful to students, who at almost all levels can engage in the practice. In using polyphony as a metaphor, it should be noticed that the exchange of meaning goes both ways. What we hear in the music can be influenced by the metaphor.

The voices in polyphony use each other for expression, and thus each voice has traces of the other inscribed into its shape (§18.4.2). Bakhtin's ideas of the "sideways glance" and heteroglossia entail a similar inscription of the listener into each speaker's utterances (§1). Similarly, the *homo polyphonicus* has the other (or the many others) in his consciousness, creating an internal polyphonic dynamic. In all these cases, the individual must first allow such responsiveness, after which the individual's subjectivity itself

becomes a site of intersecting flows. In the case of single-player polyphony, these flows of subjectivity can come from the embodied sense of being one with the instrument whereby each voice - or each coarticulated gesture that embodies it - is allowed its own agency. Such a state is made possible by the development of the relevant body schemata and by the framing of interpretive choices. In this sense, the single player who emphasises polyphonic expression puts focus on the quality of being that allows unfinalisable and irreconcilable forces within the subjective sense of self, a quality of being which reflects the difference and unfinalisability of others. Precisely because this occurs in a single player, attention is shifted from the interaction between people to the internal dynamic that true responsiveness to difference entails, an aspect of experience that can be overlooked. If we read Said's quote from §1 again, after the intervening sections, it has a greater meaning. In Said's description of his inner world, we find the fluid state of the *homo polyphonicus*, responsive to the environment and not afraid of difference.

> I occasionally experience myself as a cluster of flowing currents. I prefer this to the idea of a solid self, the identity to which so many attach so much significance. These currents, like the themes of one's life, flow along during the waking hours, and at their best, they require no reconciling, no harmonizing. They are "off " and may be out of place, but at least they are always in motion, in time, in place, in the form of all kinds of strange combinations moving about, not necessarily forward, sometimes against each other, contrapuntally yet without one central theme. A form of freedom, I'd like to think, even if I am far from being totally convinced that it is. […] With so many dissonances in my life I have learned actually to prefer being not quite right and out of place. (Quoted in Stevensen 2003: 65)

The *homo polyphonicus* through his musical practice also shows us a form of social interaction, described by Bakhtin as "the affirmation of someone else's 'I' not as an object but as another subject" (Bakhtin 1984: 14). This affirmation without objectification is the state towards which pianists should aim, whereby they can allow their own hands, each

under the "given conditions" of its own voices, to be heard as a self-revelation, each with their own unique subjectivity.

Glossary

Affordance - the possibility of some action existing between an organism and its environment (Gibson 1979; see footnote to Introduction).

Bodiliness - the "awareness of our own body - observing how it has an influence on the perception of stimuli" (Peñalba Acitores 2011: 224).

Body schemata - learned motor patterns, habits, or dispositions that require little mental effort to carry out (§5).

Coarticulation - the corporeal subsumption of smaller units of gesture under superordinate trajectory shapes of movement (§12.2).

Disembodied expressed timescale - a timescale shaped with expression in sound defining the grouping that it outlines, but without a corresponding overarching extensional gesture (§14.3).

Embodied expressed timescale - a timescale shaped with expression in sound defining the grouping that it outlines, combined with a corresponding overarching extensional gesture (§14.3).

Embodied non-expressed timescale - a timescale embodied with an extensional gesture that does not result in an audible expression defining the grouping that it outlines (14.3).

Extensional gesture - musical gesture that results in actual body movement in space (§9.2).

Framing - a conscious process used to separate or insulate a part of pre-reflective experience in order to protect it from being objectified by the conscious mind (§6.2).

Gestural-sonic objects - holistically perceived chunks of musical gesture based on the convergence of movement and sound and defined by coarticulation (§13.1).

Grabbiness - the "capacity of environmental stimuli to attract our attention - in relation to the bodily responses in us that they elicit" (§17, Peñalba Acitores 2011: 224).

Imagination perspective - the temporal perspective involving thinking ahead in performance whereby sounds are imagined *before* their execution (§9.6.1)

Intentional gesture - musical gesture that is imagined but not realised in body movement (§9.2).

Interpretation - the act of making conscious decisions in shaping a musical performance (§5).

Intonation - a concept that connects all manner of socially-shared affective experience directly to the shaping of the most basic and irreducible units of music, a shaping that is neither only a musical image nor only a technical movement, but an organic integration of both (§15.2.1.3).

Invisible body - a pathological form of self-consciousness where the body is "absent from experience" (§6.1, Legrand 2007).

Levers - parts of the playing mechanism that are able to deliver power, including: torso, top arm, forearm, wrist, fingers, rotation (§13.2).

Lines - affordances of scores that can be voiced in performance (§17).

Listening perspective - the temporal perspective involving the performer's own perception after the notes have been played (§9.6.3).

Musical details - objectively measurable modulations of dynamics, timing, and articulation occurring on the sounding surface of the music (§10.1).

Neutral timescale - a timescale neither embodied with an overarching extensional gesture nor with expression defining the grouping that it outlines (§14.3).

Opaque body - a form of self-consciousness where the body is "taken as an intentional object of consciousness" (§6.1, Legrand 2007).

Performative body - a form of self-consciousness characterised by a "pre-reflective experience of the body itself" (§6.1, Legrand 2007).

Playing mechanism - the musician's body, specifically the composite of levers used in playing (§13.2).

Playing perspective - the temporal perspective associated the actual moment of execution (§9.6.2).

Polyphonic expression - a performative texture characterised by simultaneous divergence in expression (§3). More specifically, a form of voicing characterised by either fractional timescale relationships or divergence in direction of gesture (§17.5). An example of divergence in expression is found in Example I.1.

Polyphony - a stylistic description of musical texture with counterpoint as a defining feature, characterised by its distinction from homophony (§2).

Timescale - a unit of musical time measured in the score, such as one beat or one measure (§3).

Transparent body - a form of self-consciousness in which the body is apparent in the "pre-reflective bodily experience of the world" (§6.1, Legrand 2007).

Understanding - a non-conceptual and primarily pre-reflective embodied reaction, depending on the body schemata of the performer (§5).

Voices - continuities of various elements, such as lines, which are created in performance (§17).

References

Albert, N., Weigelt, M., Hazeltine, E., Ivry, R. B. (2007). Target selection during bimanual reaching to direct cues is unaffected by the perceptual similarity of the targets. *Journal of Experimental Psychology: Human Perception and Performance, 33*, 1107-1116.

Alexander, F. M. (1932). *The Use of Self*. Suffolk: Richard Clay Publishing.

Altieri, C. (2015). *Reckoning with the Imagination: Wittgenstein and the aesthetics of literary experience*. Ithaca, NY: Cornell University Press.

Arx, V. (2014). *Piano Lessons with Claudio Arrau*. Oxford: Oxford University Press.

Badura-Skoda, P. (1973). Preface to *Etudes op. 10* by Frederic Chopin. Vienna: Wiener Urtext Edition.

Bakhtin, M. M. (1984). *Problems of Dostoevsky's Poetics*. Emerson, C. (trans). Manchester: Manchester University Press.

Baraldi, F. B., Poli, G. D., & Rodà, A. (2006). Communicating expressive intentions with a single piano note. *Journal of New Music Research*, *35*(3): 197–210.

Barry, C. A. (2011). *Continuing Abby Whiteside's legacy -- the research of pianist Sophia Rosoff's pedagogical approach (based on the playing principles outlined in the book On Piano Playing by Abby Whiteside, with practice and performance observations by Carol Ann Barry)*. Retrieved from http://www.lib.jmu.edu/general/etd/2011/masters/barryca/barryca_doctorate_11-13-2011.pdf. Last accessed March 3, 2015.

Behmer, L. P. (2010). Reading sheet music activates the mirror neuron system of musicians: an EEG investigation. WWU Masters Thesis Collection. Retrieved from http://cedar.wwu.edu/wwuet/41. Last accessed May 3, 2015.

Behmer, L. P., & Jantzen, K. J. (2011). Reading sheet music facilitates sensorimotor mu-desynchronization in musicians. *CLINPH Clinical Neurophysiology*, *122*(7), 1342–1347.

Benedetti, J. (1988). *Stanislavski: An Introduction*. New York: Routledge.

Bengson, J., & Moffett, M. A. (2011). Two Conceptions of Mind and Action: Knowing how and the Philosophical Theory of Intelligence. In J. Bengson & M. A. Moffett (eds), *Knowing how: essays on knowledge, mind, and action* (pp. 3–58). Oxford: Oxford University Press.

Bengtsson, I. & Gabrielsson, A. (1980). Methods for analyzing performance of musical rhythm. *Scandinavian Journal of Psychology, 21*, 257-268.

Bernays M, & Traube C. (2014). Investigating pianists' individuality in the performance of five timbral nuances through patterns of articulation, touch, dynamics, and pedaling. *Frontiers in Psychology*, *5*, 35-53.

Biddle, M. E. (1996). *Polyphony and Symphony in Prophetic Literature: Rereading Jeremiah 7-20*. Macon, GA: Mercer University Press.

Bonpensiere, L. (1953). *New pathways to piano technique; a study of the relations between mind and body with special reference to piano playing.* New York: Philosophical Library.

Booth, C. (2010). *Did Bach really mean that?: deceptive notation in Baroque keyboard music*. Wells: Soundboard.

Boulez, P. (1971). *Boulez on Music Today*. S. Bradshaw & R. R. Bennett (trans). Cambridge, MA: Harvard University Press.

Bråten, S. (2007). *On Being Moved; from mirror neurons to empathy*. Amsterdam: John Benjamins. Retrieved from http://public.eblib.com/choice/publicfullrecord.aspx?p=622929. Last accessed Dec. 21, 2015.

Breene, S. (2007). Mozart's violin sonatas and the gestures of embodiment: The subjectivities of performance practice. PhD dissertation. Duke University. Retrieved from http://gradworks.umi.com/33/17/3317747.html. Last accessed May 2, 2015.

Brody, E., & Larue, J. (1986). Trois Nouvelles Etudes. *The Musical Quarterly*, *72*(1), 1–15.

Brough, J. B. (1991). Translator's Introduction. In E. Husserl, *On the Phenomenology of the Consciousness of Internal Time (1893-1917)*. J. Brough (trans). Dordrecht: Kluwer Academic Publishers.

Brown, M. H. (1974). The Soviet Russian Concepts of "Intonazia" and "Musical Imagery." *The Musical Quarterly*, *60*(4), 557–567.

Buxbaum, L. J., & Kalénine, S. (2010). Action knowledge, visuomotor activation, and embodiment in the two action systems. *Annals of the New York Academy of Sciences*, *1191*, 201–218.

Cadoz, C. and Wanderley, M. M. (2000). Gesture - Music. In M. M. Wanderley and M. Battier (eds), *Trends in Gestural Control of Music* (pp. 71-93). Paris: IRCAM.

Cadwallader, A., & Gagne, D. (2006). *Analysis of Tonal Music: A Schenkerian Approach* (2nd edition). Oxford: Oxford University Press.

Carson R.G. (2004). A simple and unified approach to human voluntary movements. *Journal of Motor Behavior, 36*, 378–380.

Castiello, U. and M. Jeannerod (1991). Measuring time to awareness. *Neuroreport 2*, 797-800.

Cervino, A. (2013). Verbalising the Intangible: An Exploration towards a Performance of Alfred Schnittke's Second Piano Sonata. *Music + Practice 1*. Retrieved from http://musicandpractice.org/musicandpractice/article/view/22. Last accessed Jan. 3, 2015.

Clark, A. (1997). *Being there putting brain, body, and world together again*. Cambridge, MA: MIT Press. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&scope=site&db=nlebk&db=nlabk&AN=1466. Last accessed Nov. 14, 2014.

Clarke, E. F. (2005). *Ways of Listening: an ecological approach to the perception of musical meaning*. Oxford: Oxford University Press.

Clarke, E. F. & Davidson, J. W. (1998). The Body in Performance. In W. Thomas (ed.) *Composition-Performance-Reception* (pp. 74-92). Aldershot, Ashgate.

Clarke, E.F. (1988). Generative principles in music performance. In J. Sloboda (ed), *Generative Processes in Music: The Psychology of Performance, Improvisation, and Composition* (pp. 1-26). Oxford: Clarendon.

Coessens, K., Crispin, D., & Douglas, A. (2009). *The artistic turn: a manifesto*. Ghent: Orpheus Instituut; Distributed by Leuven University Press.

Cone, E. (1982). *The Composer's Voice*. Berkeley, CA: University of California Press.

Cook, N. (2001). Between process and product: music and/as performance. *Music Theory Online: The Online Journal of the Society for Music Theory, 7(*2). Retrieved from http://www.mtosmt.org/issues/mto.01.7.2/mto.01.7.2.cook.html. Last accessed Dec. 14, 2015.

Cook, N. (2014). *Beyond the Score: Music as Performance*. Oxford: Oxford University Press.

Cooke, P., Frobenius, W., Bithell, C., & Zemtsovsky, I. (s.a.). Polyphony. *Grove Music Online*.

Currie, M. (2013). *The Unexpected: Narrative Temporality and the Philosophy of Surprise*. Edinburgh: Edinburgh University Press.

Cyr, M. (1992). *Performing Baroque Music*. Aldershot: Ashgate.

Dahl, S., & Bevilacqua, F. (2010). Gestures in performance. In M. Leman & R. I. Godøy (eds), *Musical Gestures* (pp. 36–68). New York: Routledge.

Damasio, A. (1999). *The Feeling of what Happens*. New York: Harcourt Brace.

Davidson, J. W. (2002). Communicating with the body in performance. In J. Rink (ed), *Musical Performance: a guide to understanding* (pp. 144–152). Cambridge: Cambridge University Press.

Davidson, J., & Clarke, E. (1998). The body in performance. In W. Thomas (ed), *Composition, Performance, Reception* (pp. 74–92). Aldershot: Aldersgate.

De Alcantara, P. (1997). *Indirect Procedures: a musician's guide to the Alexander technique*. Oxford: Clarendon Press.

De Groot, R. (2005). Perspectives of polyphony in Edward Said's writings. *Alif: Journal of Comparative Poetics 25,* 219-240.

De Groot, R. (2010). Music at the Limits: Edward Said's musical elaborations. In *How the West was Won: Essays on the literary imagination, the canon, and the Christian middle ages for Burcht Pranger* (pp. 127–145). Leiden: Brill.

De Vega, M., Glenberg, A., & Graesser, A. (2008). *Symbols and Embodiment: Debates on meaning and cognition*. Oxford University Press. Retrieved from http://www.oxfordscholarship.com/view/10.1093/acprof:oso/9780199217274.001.0001/acprof-9780199217274. Last accessed Dec. 15, 2014

Delalande, F. (2003). Sense and Intersensoriality. *Leonardo*, *36*(4), 313–316.

Desain, P. & Honing, H. (1993). Tempo curves considered harmful. In "Time in contemporary musical thought" J. D. Kramer (ed), *Contemporary Music Review 7*(2), 123-138.

Diedrichsen, J., Hazeltine, E., Kennerley, S. & Ivry, R. B. (2001). Absence of bimanual interference during directly-cued actions. *Psychological Science*, *12*, 493-498.

Dixon, G. T. (2007). *Polystylism as Dialogue.* PhD Dissertation. Goldsmiths College.

Doğantan-Dack, M. (2011). In the beginning was gesture: piano touch and the phenomenology of the performing body. In E. King & A. Gritten (eds), *New Perspectives on Music and Gesture* (pp. 243–265). Aldershot: Ashgate.

Doğantan-Dack, M. (2015). The Role of the Musical Instrument in Performance as Research: the piano as a research tool. In M. Doğantan-Dack (ed), *Artistic Practice as Research in Music: Theory, Criticism, Practice* (pp. 169-202). Aldershot: Ashgate.

Dreyfus, H. L. (1979). *What computers can't do: the limits of artificial intelligence*. New York: Harper & Row.

Ehrenzweig, A. (1967). *The Hidden Order Of Art*. Berkeley: University of California Press.

Eigeldinger, J. J. (1988). *Chopin as Seen by his Pupils*. N. Shohet (trans). Cambridge: Cambridge University Press.

Eitan, Z. & Granot, R. (2006). How music moves: musical parameters and listeners' perceptions of motion. *Music Perception 23*(3), 221-247.

Ekier, J. (ed) (2000) Chopin: Etiudy. Warsaw: Fundacja Wydania Narogowego : Polskie Wydawn.

Fairclough (2004). Sollertinskii and dialogical symphonism. In C. Brandist, D. Shepard, G. Tihanov (eds), *The Bakhtin Circle* (pp. 167-185). Manchester: Manchester University Press.

Fairclough, P. (2006). *A Soviet credo: Shostakovich's fourth symphony*. Aldershot: Ashgate.

Fantl, J. (2014). Knowledge How. In E. N. Zalta (ed), *The Stanford Encyclopedia of Philosophy*. Retrieved from http://plato.stanford.edu/archives/fall2014/entries/knowledge-how. Last accessed July 10, 2015.

Finkelstein, D. H. (2003). *Expression and the inner*. Cambridge, MA: Harvard University Press.

Fleisher, L. (2016). The Inner Ear: an interview with Leon Fleisher. In de Assis, P. (ed), *Experimental Affinities in Music* (pp. 168-177). Ghent: Orpheus Institute, distributed by Leuven University Press.

Fry, K. (2008). Elaboration, Counterpoint, Transgression: Music and the Role of the Aesthetic in the Criticism of Edward W. Said. *Paragraph*, *31*(3), 265–280.

Funk, M & Coeckelbergh, M. (2013). Is gesture knowledge? A philosophical approach to the epistemology of musical gestures. In H. de Preester (ed), *Moving Imagination. Explorations of gesture and inner movement* (pp. 113-131), Amsterdam: John Benjamins.

Fux, J. J. F. (1971). *The Study of Counterpoint (Gradus ad Parnassum)*. A. Mann (trans). New York: Norton.

Galantucci, B., Fowler, C. A., & Turvey, M. T. (2006). The motor theory of speech perception reviewed. *Psychonomic Bulletin & Review*, *13*(3), 361–377.

Gallagher, S. (2005). *How the Body Shapes the Mind*. Oxford: Clarendon Press.

Ganguly, D., & Curthoys, N. (2007). *Edward Said: The Legacy of a Public Intellectual*. Melbourne: Melbourne University Press.

Gazzola, V., Aziz-Zadeh, L., & Keysers, C. (2006). Empathy and the Somatotopic Auditory Mirror System in Humans. *Current Biology*, *16*(18), 1824–1829.

Gibson, J. J. (1979). *The ecological approach to visual perception*. Boston: Houghton Mifflin.

Ginn, R. J. (2007). *The Politics of Prayer in Early Modern Britain: Church and State in Seventeenth-century England*. London: Tauris Academic Studies.

Gjerstad, Ø. (2013). Voices and identities: the polyphony of Tony Blair and Nicolas Sarkozy at the European Parlaiment. In K. Fløttum (ed), *Speaking of Europe; approaches to complexity in European political discourse* (pp. 111-134). Amsterdam: John Benjamins.

Godowsky, L. (1935). Piano Music for the Left Hand. *The Musical Quarterly*, *21*(3), 298–300.

Godøy, R. I. (2003). Motor-Mimetic Music Cognition. *Leonardo*, *36*(4), 317–319.

Godøy, R. I. (2006). Gestural-Sonorous Objects: embodied extensions of Schaeffer's conceptual apparatus. *Organised Sound*, *11*(2), 149–158.

Godøy, R. I. (2008). Reflections on chunking in music. In A. Schneider (ed), *Systematic and Comparative Musicology* (pp. 117–131). Vienna: Peter Lang.

Godøy, R. I. (2011a). Sound-action awareness in music. In E. Clarke & D. Clarke *Music and Consciousness* (pp. 231-243). Oxford: Oxford University Press.

Godøy, R. I. (2012). Coarticulated gestural-sonic objects in music. *New Perspectives on Music and Gesture*, 67–83.

Godøy, R. I. (2015). Ubiquitous Motor Cognition in Musical Experience: Open Peer Review of Jacques Launay's "Musical Sounds, Motor Resonance, and Detectable Agency" . *Empirical Musicology Review 10*(1), 41- 45.

Godøy, R. I., & Jørgensen, H. (2001). *Musical imagery*. Lisse, the Netherlands; Exton, PA: Swets & Zeitlinger Publishers.

Godøy, R. I., & Leman, M. (2010). *Musical gestures sound, movement, and meaning*. New York: Routledge. Retrieved from http://public.eblib.com/choice/publicfullrecord.aspx?p=465371

Godøy, R.I. (2011b). Coarticulated gestural-sonic objects in music. In A. Gritten & E. King (eds) *New perspectives on music and gesture* (pp. 66-82). Aldershot: Ashgate.

Goehr, L. (1992). *The Imaginary Museum of Musical Works*. Oxford: Clarendon Press.

Golandsky, E. (2003). *Virtuosity in a Box: The Taubman techniques*. DVD box set. Medusa, NY: Taubman Institute.

Grady, J. (1997). Foundations of Meaning: primary metaphors and primary scenes. PhD Dissertation. University of California, Berkeley.

Green, M. S. (2007). *Self-expression*. Oxford; New York: Clarendon Press; Oxford University Press.

Gritten, A., & King, E. (eds) (2006). *Music and gesture*. Aldershot, England; Burlington, VT: Ashgate.

Gritten, A., & University of Cambridge. (1999). *Stravinsky's voices*. Cambridge: University of Cambridge.

Hammond, A. (2012). *Pierre Cochereau: Organist of Notre-Dame*. University Rochester Press.

Hannula, M., Suoranta, J. & Vadén, T. (2005). *Artistic Research: theories, methods and practices*. Helsinki; Gothenberg: Academy of Fine Arts; University of Gothenburg/Art Monitor.

Hanon, L. (1928). *The Virtuoso Pianist.* New York: Schirmer.

Hardcastle, W. J., & Hewlett, N. (1999). *Coarticulation: theory, data, and techniques*. Cambridge, UK; New York, NY, USA: Cambridge University Press.

Harshav, B. (2007). *The Polyphony of Jewish Culture*. Stanford University Press.

Hatten, R. S. (2004). *Interpreting Musical Gestures, Topics, and Tropes: Mozart, Beethoven, Schubert*. Bloomington, IN: Indiana University Press.

Hazeltine, E. (2005). Response–response compatibility during bimanual movements: Evidence for the conceptual coding of action. *Psychonomic Bulletin and Review 12*(4): 682-688.

Hermans, C. (2003). When the body takes over. MA Thesis. Retrieved from http://www.du.ahk.nl/people/carolien/pdf/Impro1.pdf. Last accessed Oct. 21, 2015.

Herrigel, E. (1953). *Zen in the art of archery*. New York, N.Y.: Pantheon Books.

Heuer, H. (1995). Models for response–response compatibility: The effects of the relation between responses in a choice task. *Acta Psychologica, 90*, 315-332.

Hibberd, K. P. G., & University of London. (2005). *Shostakovich and Bakhtin: a critical investigation*. London: University of London.

Hirschkop, K. (1989) Dialogism as a challenge to literary criticism. In C. Norris (ed), *The Politics of Culture* (pp. 283-304). London: Lawrence and Wishart.

Horowitz, J. (1982). *Arrau on Music and Performance*. Chelmsford, MA: Courier Corporation.

Hull, S. L. (1985). *Strasberg's method as taught by Lorrie Hull: A practical guide for actors, teachers, and directors*. Oxford: Oxbow Books.

Husserl, E. (1991). *On the Phenomenology of the Consciousness of Internal Time (1893–1917)*. J. B. Brough (trans). Springer Science & Business Media.

Hutto, D. & Myin, E. (2013). *Radicalizing Enactivism: basic minds without content.* Cambridge, MA: MIT Press.

Ihde, D. (2012). *Listening and Voice: Phenomenologies of Sound, Second Edition*. New York: State University of New York Press.

Jabusch, H. (2006). Movement analysis in pianists. In E. Altenmüller, J. Kesselring, & M. Wiesendanger (eds), *Music, motor control and the Brain* (pp. 91-108). Oxford: Oxford University Press.

Jaques-Dalcroze, E. (2007). *The Eurhythmics of Jaques-Dalcroze.* Rockville, MD: Wildside Press.

Jeannerod, M. (2002). From action to interaction: An interview with Marc Jeannerod conducted by Shaun Gallagher. Retrieved from http://www.isc.cnrs.fr/wp/wp01-4.htm. Last accessed Feb. 20, 2016.

Jerde, T., & Flanders, M. (2006). Hand movements and musical performance. In E. Altenmüller, J. Kesselring, & M. Wiesendanger (eds), *Music, motor control and the Brain* (pp. 79-91). Oxford: Oxford University Press.

Johnson, M. (1990). *The Body in the Mind: The Bodily Basis Of Meaning, Imagination, And Reason*. Chicago: University of Chicago Press.

Johnson, M. (2007). *The Meaning of the Body: aesthetics of human understanding*. Chicago: University of Chicago Press.

Juzwik, M. (2004). Towards an Ethics of Answerability: reconsidering dialogism in sociocultural literacy research. *College Composition and Communication*, *55*(3), 536–567.

Kennan, K. (1998). *Counterpoint*. 4th Edition. Upper Saddle River, NJ: Prentice Hall.

Kennerley, S., Diedrichsen, J., Hazeltine, E., Semjen, A., & Ivry, R. B. (2002). Callosotomy patients exhibit temporal uncoupling during continuous bimanual movements. *Nature Neuroscience 5*, 376-381.

Keysers, C., Kohler, E., Umilt'a, M. A., Nanetti, L., Fogassi, L., Gallese, V. (2003). Audiovisual mirror neurons and action recognition. *Experimental Brain Research 153*(4), 628-636.

Kholopova, V. (2000). *Muzyka kak vid iskusstva ("Music as Art")* St. Petersburg. Retrieved from http://www.kholopova.ru/bibeng1.html#fn1. Last accessed Feb. 21, 2016.

Klee, P., & Spiller, J. (1961). *The Thinking Eye; the notebooks of Paul Klee.* New York: G. Wittenborn.

Knight, M. (2012). Hutterite choral singing on the prairies: sounds of salvation. *International Conference for Traditional Polyphony, Tbilsi, Georgia.* Retrieved from http://polyphony.ge/uploads/sixthsymposium/english/46.matthew_knight.eng.pdf. Last accessed Nov. 13, 2015.

Koensler, A. (2015). *Israeli-Palestinian Activism: Shifting Paradigms*. Aldershot: Ashgate Publishing.

Kohler E, Keysers C, Umiltà MA, Fogassi L, Gallese V, & Rizzolatti G. (2002). Hearing sounds, understanding actions: action representation in mirror neurons. *Science 297*(5582), 846–8.

Korsyn, K. E. (1993). Brahms research and aesthetic ideology. *Music Analysis*, *12*(1), 89–103.

Korsyn, K. E. (1999). Beyond privileged contexts: intertextuality, influence and dialogue. In N. Cook & M. Everist (eds), *Rethinking Music* (pp. 55-72). Oxford: Oxford University Press.

Kramer, L. (1995). *Classical Music and Postmodern Knowledge*. Berkely, CA: University of California Press.

Lakoff, G., & Johnson, M. (1980). *Metaphors We Live By*. Chicago, IL: University of Chicago Press.

Legrand, D. (2007). Pre-reflective self-consciousness: on being bodily in the world. *Janus Head, 9*(2), 493-519

Legrand, D. & Ravn, S. (2009). Perceiving subjectivity in bodily movement: the case of dancers. *Phenomenology and the Cognitive Sciences 8*(3), 389-408.

Lehrdal, F., & Jackendoff, R. S. (1983). *A Generative Theory of Tonal Music*. Cambridge, MA: MIT Press.

Leitan, N., & Chaffey, L. (2014). Embodied cognition and its applications: a brief review. *Sensoria*, *10*(1), 3–10.

Leman, M. (2008). *Embodied Music Cognition and Mediation Technology*. Cambridge, MA: MIT Press.

Leman, M. (2010). Music, gesture, and the formation of embodied meaning. In M. Leman & R. I. Godøy (eds) *Musical Gestures* (pp. 126-153). New York: Routledge.

Leman, M. & Godøy, R. I. (2010). Why study musical gestures? In M. Leman & R. I. Godøy (eds) *Musical Gestures* (pp. 3-11). New York: Routledge.

Lepage, J. & Théoret, H. (2007). The mirror neuron system: grasping others' actions from birth? *Developmental Science 10*(5): 513-523.

Lorda, C. U., & Zabalbeascoa, P. (2012). *Spaces of Polyphony*. John Benjamins Publishing.

Mackey, V. & Armstrong, J. (2002). *Just Play Naturally*. Duende Editions.

MacRitchie, J. (2013). Inferring musical structure through bodily gestures. *Musicae Scientiae, 17*(1), 86-108.

Magome, K. (2006). Edward Said's Counterpoint. In S. Nagy (ed), *Paradoxical Citizenship: Edward Said* (p. 298). Lanham, MD: Lexington Books.

Matthay, T. (1912). *The Fore-arm Rotation Principle in Pianoforte Playing; its application and mastery.* Boston: The Boston Music Co. (Schirmer).

Matyja J.R. (2015). The next step: Mirror neurons, music, and mechanistic explanation. *Frontiers in Psychology*, *6*(APR).

Matyja, J.R, & Schiavio, A. (2013). Enactive music cognition: Background and research themes. *Constructivist Foundations, 8*(3), 351–357.

Mazzola, G. (2010). *Musical Performance: A Comprehensive Approach: Theory, Analytical Tools, and Case Studies*. Dordrecht: Springer.

McDowell, J. (1984). Wittgenstein on following a rule. *Synthese*, *58,* 325-364.

McGuiness, A. (2013). Self-consciousness in Music Performance. In M. Clayton, D. Byron, L. Leante (eds) *Experience and Meaning in Music Performance* (pp. 108-134). Oxford: Oxford University Press.

Mcgurk, H., & Macdonald, J. (1976). Hearing lips and seeing voices. *Nature*, *264*(5588), *746–748*.

McKay, N. (2007). 'One for all and all for one' voicing in Stravinsky's music theatre. *Journal of Music and Meaning, 5*(5). Retrieved from http://www.musicandmeaning.net/issues/showArticle.php?artID=5.5. Last accessed March 3, 2016.

McKay, N. (2013). Stravinsky's sideward glance: neoclassicism, dialogised structures and the reflected discourse of Bach. *Journal of Music and Meaning, 12.* Retrieved from http://jmm12.musicandmeaning.net/#post0. Last accessed March 3, 2016.

Mechsner, F., Kerzel, D., Knoblich, G., & Prinz, W. (2001). Perceptual basis of bimanual coordination. *Nature, 414*, 69-73.

Merleau-Ponty, M. (1962). *Phenomenology of perception*. C. Smith (trans). New York: Routledge.

Merrick, F. (1960). *Practising the piano.* London: Barrie and Rockliff.

Merritt, D. E. (2007). The editions of Alfred Cortot and E. Robert Schmitz revisited: Pedagogical perspectives on selected Chopin etudes. *ETD Collection for University of Nebraska - Lincoln*, 1–60.

Milanovic, T. (2014). *Learning and teaching healthy piano technique: training as an instructor in the Taubman approach*. PhD Dissertation. Saarbrücken: Scholars' Press.

Mitchell, M. L. (2000). *Virtuosi: a Defense and a (sometimes erotic) Celebration.* Bloomington, IN: Indiana University Press.

Molnar-Szakacs I, & Overy K. (2006). Music and mirror neurons: from motion to "e"motion. *Social Cognitive and Affective Neuroscience*, *1*(3), 235–41.

Morson, G. S., & Emerson, C. (1990). *Mikhail Bakhtin: Creation of a Prosaics*. Palo Alto, CA:Stanford University Press.

Narmour, E. (1983). Some Major Theoretical Problems concerning the Concept of Hierarchy in the Analysis of Tonal Music. *Music Perception: An Interdisciplinary Journal*, *1*(2), 129–199.

Neuhaus, H. (1973). *The art of piano playing*. London: Barrie & Jenkins.

Newlin, D. (1980). *Schoenberg Remembered: Diaries and Recollections (1938-76)*. New York: Pendragon Press.

Newman, A. (1995). *Bach and the Baroque.* 2nd edition. New York: Pendragon Press.

Nikolajeva, M. (1996). *Children's Literature Comes of Age: Toward a New Aesthetic*. New York: Garland Publishing.

Nöe, A. (2004). *Action in Perception.* Cambridge, MA: MIT Press.

Norris, C. (1989). *Music and the politics of culture*. New York: St. Martin's Press.

Nuwer, R. (2015, July 20). Playing Mozart's Piano Pieces as Mozart Did. *The New York Times*. Retrieved from http://www.nytimes.com/2015/07/21/science/playing-mozart-piano-pieces-as-mozart-did.html. Last accessed Dec. 10, 2015.

Obhi, S. S. & Haggard, P. (2004). The relative effects of external spatial and motoric factors on the bimanual coordination of discrete movements. *Experimental Brain Research, 154*, 399–402.

Ohriner, M. (2012). Grouping Hierarchy and Trajectories of Pacing. *Music Theory Online*, *18*(1). Retrieved from http://www.mtosmt.org/issues/mto.12.18.1/mto.12.18.1.ohriner.php. Last accessed May 3, 2015.

Ohtsuki, T. Changes in strength, speed and reaction time induced by simultaneous bilateral muscular activity. In Swinnen S.P., Heuer H., Massion J., Casaer P. (Eds.): *Interlimb Coordination: Neural, Dynamical and Cognitive Constraints.* San Diego, CA: Academic, 259–274.

Ott, B. (1992). *Lisztian keyboard energy: an essay on the pianism of Franz Liszt*. Windham, D. (Trans.). Lewiston, N.Y.: E. Mellen Press.

Overy, K., & Molnar-Szakacs, I. (2009). Being Together in Time: Musical Experience and the Mirror Neuron System. *Music Perception: An Interdisciplinary Journal*, *26*(5), 489–504.

Palmer, C. (1989). Mapping musical thought to musical performance. *Journal of Experimental Psychology: Human Perception and Performance 15*(2): 331-346

Peace, J. (1993). *The complete pianist, a holistic approach for all levels: teaching of Abby Whiteside (1881-1956) in relation to the work of Jaques-Dalcroze (1865-1950)*. Liverpool: Castillon.

Peñalba Acitores, A. (2011). Towards a theory of proprioception as a bodily basis for consciousness in music. In Clarke, E. and Clarke, D. (eds) *Music and Consciousness: Philosophical, Psychological, and Cultural Perspectives* (pp. 215-230). Oxford: Oxford University Press.

Perianova, I. (2013). *The Polyphony of Food: Food through the Prism of Maslow's Pyramid*. Cambridge: Cambridge Scholars Publishing.

Peters, M (1985). Performance of a rubato-like task: When two things cannot be done at the same time. *Music Perception: An interdisciplinary journal 2*(4): 471-482.

Pierce, A. (2007). *Deepening Musical Performance through Movement: the theory and practice of embodied interpretation*. Bloomington, IN: Indiana University Press.

Pinku, G. & Tzelgov, J. (2006) Consciousness of the self (COS) and explicit knowledge. *Consciousness and Cognition*, *15*(4), 654-661.

Polanyi, M. (1958). *Personal Knowledge*. Chicago, IL: University of Chicago Press.

Poole, B. (2001). From phenomenology to dialogue. In K. Hirschkop & D. Shepherd (eds) *Bakhtin and cultural theory* (pp. 109-135). Manchester: Manchester University Press.

Razumovskaya, M. (2014). Climbing the Summit of Knowledge: Heinrich Neuhaus' interpretation of Beethoven. *Sineris 18*. Retrieved from http://www.sineris.es/neuhaus.pdf. Last accessed Feb. 21, 2016.

Repp, B. H. (1993). Music as motion: a synopsis of Alexander Truslit's (1938) 'Gestaltung und Bewegung in der Musik.' *Psychology of Music, 21*(1), 48–73.

Revonsuo, A., Johanson, M., Wedlund, J. E., & Chaplin, J. (2000) The zombies among us: consciousness and automatic behaviour. In Y. Rossetti & A. Revonsuo (eds) *Beyond Dissociation: interaction between dissociated implicit and explicit processing* (pp. 331-351). Amsterdam: John Benjamins.

Rink, J. (1990). Review of Wallace Berry *Musical structure and performance*. *Music Analysis*, *9*(3), 319-39.

Rink, J. (2002). Analysis and (or?) performance. In J. Rink (ed) *Musical Performance: a guide to understanding* (pp. 35-57). Cambridge: Cambridge University Press.

Rink, J. (2004). The State of Play in Performance Studies. In J. Davidson. *The Music Practitioner* (pp. 37-51). Aldershot: Ashgate Publishing.

Roesner, D. D. (2014). *Musicality in Theatre: Music as Model, Method and Metaphor in Theatre-Making*. Aldershot: Ashgate Publishing.

Rosen, C. (1995). *The romantic generation*. Cambridge, MA: Harvard University Press.

Rosen, C. (2001). *Critical Entertainments*. Cambridge, MA: Harvard University Press.

Rosenbaum, D. A. (1991). *Human motor control*. San Diego: Academic Press.

Said, E. W. (1993). *Culture and imperialism*. New York: Knopf: Distributed by Random House.

Said, E. W. (1999). *Out of place: a memoir*. New York: Knopf.

Said, E. W. (2008). *Music at the Limits*. New York: Columbia University Press.

Sandor, G. (1981). *On Piano Playing: motion sound and expression*. New York: Schirmer Books.

Schacher, J. (2014). Corporeality, Actions and Perceptions in Gestural Performance of Digital Music. *Proceedings of the Joint International Computer Music and Sound and Music Computing Conference, Athens, Greece*. Retrieved from https://www.zhdk.ch/fileadmin/data_subsites/data_icst/Publikationen/2014_NIME_PBR_Schacher_Gestural.pdf. Last accessed Feb. 21, 2016.

Schapiro, R. A. (2009). *Polyphonic Federalism*. Chicago, IL: University of Chicago Press.

Schiavio, A., Menin, D., & Matyja, J. (2014). Music in the Flesh: Embodied Simulation in Musical Understanding. *Psychomusicology, 24*(4), 340–343.

Schmitt, I. (2011). Introduction: Heterogeneity, Belonging and Learning in Schools. In Z. Bekerman & T. Geisen (eds) *International Handbook of Migration, Minorities and Education: Understanding Cultural and Social Differences in Processes of Learning* (pp. 321-329). Springer Science & Business Media.

Schweitzer, A. (1911). *J. S. Bach*. E. Newman (trans). Retrieved from https://archive.org/stream/jsbachvolume1002520mbp/jsbachvolume1002520mbp_djvu.txt. Last accessed March 3, 2016.

Scott, A. (2014). *Romanticizing Brahms: early recordings and the reconstruction of Brahmsian identity*. PhD Dissertation, Leiden University. Retrieved from https://openaccess.leidenuniv.nl/handle/1887/29987. Last accessed Nov. 3, 2015.

Sheets-Johnstone, M. (2011). *The Primacy of Movement*. Amsterdam: John Benjamins.

Shin, Y. K., Proctor, R. W., & Capaldi, E. J. (2010). A review of contemporary ideomotor theory. *Psychological Bulletin, 136*(6), 943–974.

Shusterman, R. (2012). *Thinking Through the Body: essays in somaesthetics*. Cambridge: Cambridge University Press.

Sinigaglia, C. & Rizzolatti, G. (2015). The space of mirrors. In P. Ferrari and G. Rizzolatti (eds) *New Frontiers in Mirror Neurons Research* (pp. 331-348). Oxford: Oxford University Press.

Stam, G., & Ishino, M. (2011). *Integrating Gestures; the interdisciplinary nature of gesture*. Amsterdam: John Benjamins.

Stanislavski, K. (1989). *An Actor Prepares*. New York: Routledge.

Stanislavski, K. (1989). *Building a Character*. New York: Routledge.

Stevenson, N. (2003). *Cultural Citizenship*. Maidenhead: Open University Press.

Stewen, H. (2009). *The Straube Code*. Retrieved from http://www.marcelpuntmusic.com/straubecode. Last accessed Nov. 3, 2014.

Sukhvinder S. Obhi, Melvyn A. Goodale (2005). Bimanual Interference in Rapid Discrete Movements Is Task Specific and Occurs at Multiple Levels of Processing. *Journal of Neurophysiology, 94*(3), 1861-1868.

Swain, J. P. (2002). *Harmonic Rhythm: Analysis and Interpretation*. Oxford: Oxford University Press.

Swinkin, J. (2007). Keyboard Fingering and Interpretation: a comparison of historical and modern approaches. *Performance Practice Review, 12*(1), 1-26.

Taruskin, R. (2005). *The Oxford history of Western music*. Oxford: Oxford University Press.

Telmissany, M., & Schwartz, S. T. (2010). *Counterpoints: Edward Said's Legacy*. Cambridge: Cambridge Scholars Publishing.

Teranishi, M. (2008). *Polyphony in Fiction: A Stylistic Analysis of Middlemarch, Nostromo, and Herzog*. Bern: Peter Lang.

Thelen, E., & Smith, L. B. (1994). *A dynamic systems approach to the development of cognition and action*. Cambridge, MA: MIT Press.

Todd, N. (1985). A Model of Expressive Timing in Tonal Music. *Music Perception, 33*(1), 33-57.

Todd, N. (1992). The Dynamic of Dynamics: A model of musical expression. *Journal of the Acoustic Society of America, 91*(6), 3540-3550.

Trainor, L. J., Marie, C., Bruce, I. C., & Bidelman, G. M. (2014). Explaining the high voice superiority effect in polyphonic music: evidence from cortical evoked potentials and peripheral auditory models. *Hearing Research*, *308*, 60–70.

Trevarthen, C., Delafield-Butt, J., & Schögler, B. (2011). Psychobiology of musical gesture: innate rhythm, harmony and melody in movements of narration. In A. Gritten & E. King (eds) *New Perspectives on Music and Gesture* (pp. 11–43). Aldershot: Ashgate.

Van Hecke, P. (2005). *Metaphor in the Hebrew Bible*. Wilsele, BE: Peeters Publishers.

Varela, F., Thompson, E. & Rosch, E. (1991). *The Embodied Mind*. Cambridge, MA: MIT Press.

Verbalis, J. (2012). *Natural Fingering: A Topographical Approach to Pianism*. Oxford: Oxford University Press.

Viljanen, E. (2005). Boris Asaf'ev and the soviet musicology. Thesis. Retrieved from https://helda.helsinki.fi/bitstream/handle/10138/19573/borisasa.pdf?sequence=2. Last accessed March 2, 2016.

Vineyard, M. (2007). *How you stand, how you move, how you live: learning the Alexander technique to explore your mind-body connection and achieve self-mastery*. New York: Marlowe & Co.

Waldron, J. (1999). *Law and Disagreement*. Oxford: Clarendon Press.

Wallgren, T. (2006). *Transformative Philosophy: Socrates, Wittgenstein, and the Democratic Spirit of Philosophy*. Lanham, MD: Lexington Books.

Wanderley, M. M. (2002). Quantitative Analysis of Non-obvious Performer Gestures. *Lecture Notes in Computer Science,* (2298), 241–253.

Wanderley, M., Vines, B., Middleton, N., McKay, C., & Hatch, W. (2005a). The Musical Significance of Clarinetists' Ancillary Gestures: An Exploration of the Field. *Journal of New Music Research*, *34*(1), 97–113.

Waugh, P. (2006). *Literary Theory and Criticism: An Oxford Guide*. Oxford: Oxford University Press.

Weber, M., Martindale, D., Neuwirth, G., & Riedel, J. (1958). *The rational and social foundations of music.* Carbondale, IL: Southern Illinois University Press.

Whiteside, A. (1997). *Abby Whiteside on piano playing*. Portland, OR: Amadeus Press.

Whyman, R. (2013). *Stanislavski: The Basics.* New York: Routledge.

Wieland, R., & Uhde, J. (2002). *Forndes Üben: Wege instrumentalen Lernens: über den Interpreten und den Körper als Instrument der Musik*. Bärenreiter.

Wilson, M. (2002). Six views of embodied cognition. *Psychonomic Bulletin & Review*, *9*(4), 625–636.

Wilson, R. A., & Foglia, L. (2011). Embodied Cognition. In E. N. Zalta (ed) *The Stanford Encyclopedia of Philosophy*. Retrieved from http://plato.stanford.edu/archives/fall2011/entries/embodied-cognition. Last accessed Dec. 2, 2015.

Windsor, L., & Clarke, E. (1997). Expressive timing and dynamics in real and artificial musical performances. *Music Perception,* 15, 127-152.

Wittgenstein, L. (2009). *Philosophical Investigations.* P. Hacker & J. Schulte (trans and ed). Chichester: Wiley.

Yearsley, D. (2002). *Bach and the Meanings of Counterpoint.* Cambridge: Cambridge University Press.

Young, J. B. (1998). Intonatsiaa and the politics of expression. Presented to the World Piano Pedagogy Conference in Fort Worth. Retrieved from http://www.criticalmass.johnbellyoung.com/intonatsiia/. Last accessed March 7, 2016.

Zbikowski, L. M. (2002). *Conceptualizing music: cognitive structure, theory, and analysis*. Oxford: Oxford University Press.

Zemtsovsky, I. (2002). Polyphony as a way of creating and thinking: the musical identity of Homo Polyphonicus. In J. Jordania & R. Tsurtsumia (eds) *The Proceeding of the First International Symposium on Traditional Polyphony (2002),* Tbilsi. Retrieved from https://www.academia.edu/2292055/polyphony_as_a_way_of_creating_and_thinking_the_musical_identity_of_homo_polyphonicus. Last accessed Feb. 21, 2016.

Zhongwen, Q. (1997). Problems of Bakhtin's Theory about "Polyphony." *New Literary History*, *28*(4), 779–790.

Samenvatting

Uitvoeringen van klaviermuziek kunnen meer of minder polyfoon klinken, afhankelijk van het gebruik van expressieve divergentie door de uitvoerder. Deze divergentie is niet een puur mentale aangelegenheid, maar eerder het resultaat van een ecologische relatie tussen de pianotoetsen en de pianist, een relatie waarbij techniek en muzikaliteit elkaar overlappen. Specifieke *body schemata* die betrekking hebben op expressieve divergentie zijn dan ook fundamenteel voor de interpretatieve vrijheid van de uitvoerder ten behoeve van het creëren van polyfone expressie en dragen op transparante wijze bij aan het muzikale resultaat. Dit proefschrift bestudeert expressieve divergentie en onderzoekt de uitvoering van losse stemmen door middel van de hiërarchische structurering die door coarticulatie kan worden bereikt. De dissertatie laat zien hoe deze veelgelaagde gebaren samenkomen in de polyfonie waarin expressie zich kan uitdrukken.

In dit proefschrift wordt eerst een definitie van polyfonie gegeven en wordt zij geplaatst in het centrum van een web van betekenissen dat gevormd wordt door het interdisciplinaire gebruik van het begrip "polyfonie" als een metafoor, een gebruik dat het geven en nemen tussen subjecten beschrijft. Het begrip polyfonie wordt vervolgens toegepast op expressie tijdens uitvoeringen. Een belangrijk kenmerk van polyfonie die door een musicus wordt gecreëerd, is belichaming, waarbij elke hand (of vinger) zijn eigen subjectieve handelingsmogelijkheden heeft. Reflectie over deze ervaring legt de innerlijke relaties tussen denken, lichaamsbeweging en geluid bloot, wat vervolgens leidt tot een discussie over de rol van muzikale gebaren. Dergelijke gebaren blijken een hiërarchische structuur te creëren door middel van coarticulatie (het samennemen en omvormen door het lichaam van kleinere gebaren tot een overkoepelende continuïteit). Coarticulatie is niet alleen afhankelijk van de manier waarop het lichaam fysiek is gestructureerd, maar ook op

verworven vaardigheden en gewoonten (*body schemata*). Ze impliceert tevens een manier van denken door middel van beweging, een die resulteert in een muzikale structuur tijdens de uitvoering van een stuk en die een essentieel onderdeel van het spelen van instrument-specifieke legatolijnen vormt.

Omdat coarticulatie deelname van het hele lichaam in het vormgeven van individuele stemmen mogelijk maakt, volgt daaruit dat de gelijktijdige divergentie van vorm in het polyfone spel een belichaamde interactie tussen de stemmen impliceert. De term *polyfonic voicing* wordt geïntroduceerd om een bepaalde uitvoeringskwaliteit te kunnen beschrijven (in plaats van de kwaliteit van het werk dat wordt uitgevoerd) en onderscheidt zich daarmee van monofone en homofone interpretaties. Teneinde polyfone stemvoering te kunnen onderzoeken wordt in dit proefschrift een aantal experimenten met gelaagde opnames besproken, die op hun beurt uitmonden in reflecties over objectivering, *agency*, ruimtelijkheid en muzikale spanning.

Vervolgens worden voorbeelden gegeven van oefeningen voor de ontwikkeling van polyfone expressie en de *body schemata* die daarvoor nodig zijn. Tevens wordt uiteengezet wat het nut van deze oefeningen is. Deze kunnen door de lezer van dit proefschrift gebruikt worden als uitgangspunt bij de ontwikkeling van eigen oefeningen. Tenslotte wordt in het proefschrift een concertprogramma besproken, dat duidelijk maakt op welke manieren in de reguliere concertpraktijk – met muziek van verschillende stijlperiodes en repertoire variërend van eenvoudig tot complex – gebruik gemaakt kan worden van polyfone expressie. In de conclusie worden de ideeën van het proefschrift weer in een brede interdisciplinaire context van polyfonie als metafoor geplaatst. De door een solist gebruikte polyfone expressie laat een innerlijke ervaring van de pluraliteit van subjectieve handelingsmogelijkheden zien, een ervaring die mogelijk gemaakt wordt door haar belichaamde dimensie.

Abstract

Performances of solo keyboard repertoire can sound more or less polyphonic depending on the performer's use of divergence in expression. Rather than being a purely cerebral experience, this expressive divergence is situated in an ecological relationship between keyboard and player where the gestural dynamics of technique and musicianship overlap. Specific body schemata relating to expressive divergence are therefore foundational to the interpretive freedom of the performer in creating polyphonic expression, and feature transparently in the musical result. This dissertation theorises expressive divergence by examining the embodiment of single voices through the hierarchical structuring of coarticulation, and by showing how these multi-layered gestures combine in the polyphony of expression.

First, polyphony is defined as a term and situated in the centre of a web of meaning formed by its interdisciplinary use as a metaphor, a use that describes responsiveness between subjective agents. The concept of polyphony is then applied to expression in performance. An important feature of single-player polyphony is shown to be embodiment, where each hand (or finger) has its own subjective agency. Reflection about this experience foregrounds the inner relations between thought, body movement, and sound, which leads to a discussion of musical gesture. Such gesture is shown to have a hierarchical structure created by coarticulation (the corporeal subsumption of smaller units of gesture into overarching continuities). Coarticulation depends not only on the musculoskeletal structure of the body, but also on acquired skills and habits (body schemata). It underlies a kind of thinking-through-movement, which embodies and creates musical structure in performance, and forms an essential part of instrument-specific legato playing.

Because coarticulation allows for participation of the whole body in shaping individual voices, it follows that the simultaneous divergence of shape in polyphonic playing involves a certain embodied interaction between voices. The term polyphonic voicing is introduced to describe a quality of performance (rather than a quality of the work being performed) and is contrasted to monophonic and homophonic voicing. In order to investigate polyphonic voicing, this dissertation presents a series of experiments using layered recordings, which in turn provide a springboard for reflection about objectification, agency, spatiality and musical tension.

Examples are given of exercises for developing polyphonic expression and its underlying body schemata. These are accompanied with a discussion of the reasons behind each exercise, giving models for readers to use in developing their own exercises. Finally, a recital program is presented, demonstrating how the use of polyphonic expression can function within a normal concert practice across various style periods and in repertoire ranging from simple to complex. In the conclusions, the ideas of the dissertation are once again contextualised in the broad interdisciplinary horizon of polyphony as a metaphor. Single-player polyphonic expression is shown to enact or demonstrate an inner experience of the plurality of subjective agency, an experience made possible by its embodied dimension.

Curriculum vitae

Andrew Wright (1983) is a pianist and organist from New York who lives in the Netherlands. His formal education includes: a Bachelor of Music degree in piano performance from Wichita State University where he was the first Konrad Wolff - Ilse Bing Chamber Music Scholar; a Bachelor of Arts degree in organ and a Diploma in church music from Codarts Rotterdam; a Master of Music degree in piano performance from Southern Methodist University where he was an Artistic Merit Scholar; a Master of Arts degree in piano from the Royal Conservatoire of the Hague. His primary teachers were Julie Bees, Ben van Oosten, Alfred Mouledous, and Naum Grubert. Besides an active concert career, Andrew works as cantor-organist of the Koningkerk in Voorburg and as a lecturer at the Royal Conservatoire of the Hague. He is a sought-after piano teacher, whose students have won many of the most important piano competitions in the Netherlands in recent years.

Acknowledgements

To many people, I owe a debt of gratitude:

To my promoter, Frans de Ruiter, who was open-minded to and supportive of the project from the initial proposal to the final draft, and whose keen editorial eye was invaluable at every stage of the process.

To my academic supervisor, Vincent Meelberg, who encouraged me to write with my own voice and provided many useful suggestions.

To my wonderful teachers - all of them - who helped me along the path to becoming a musician:

Piano:

Peter Amstutz
Mario Quiroz
Julie Bees
Andrew Trechak
Jerome Lowenthal
Alfred Mouledous
Naum Grubert

Organ:

Gerard Legierse
Ben van Oosten

Finally, but most importantly, to Amel, who stuck with me through the difficult writing process. Without him, I would be lost.