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

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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.

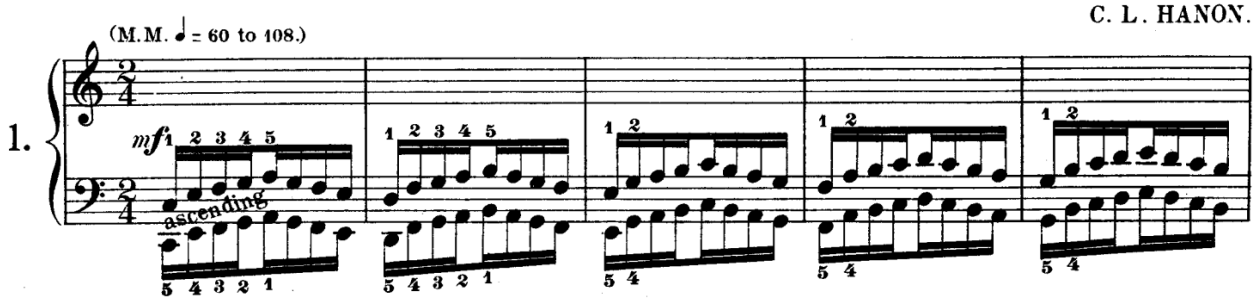
[40] Dancer and phenomenologist Maxine Sheets-Johnstone (2011) has written extensively about felt kinaesthetic experience, and she characterises movement with four basic qualities: tension, linearity, amplitude and projection. The fact that all four qualities relate to the *composite* of the hierarchically 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:

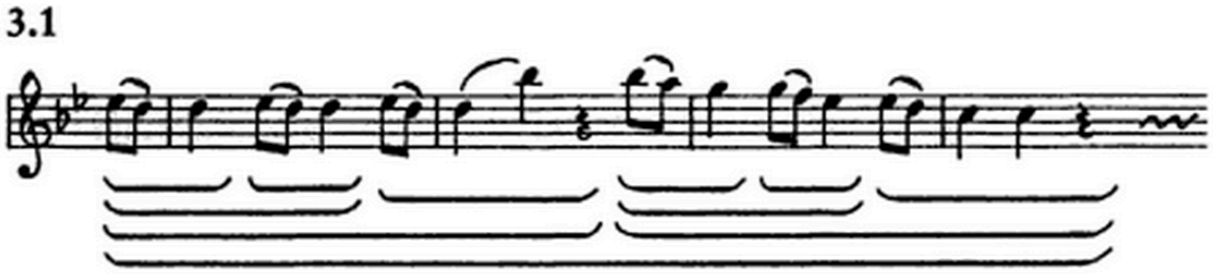


Figure 12.1: Hierarchy of phrase structure (Jackendoff & Lehrdal 1983: 37)

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

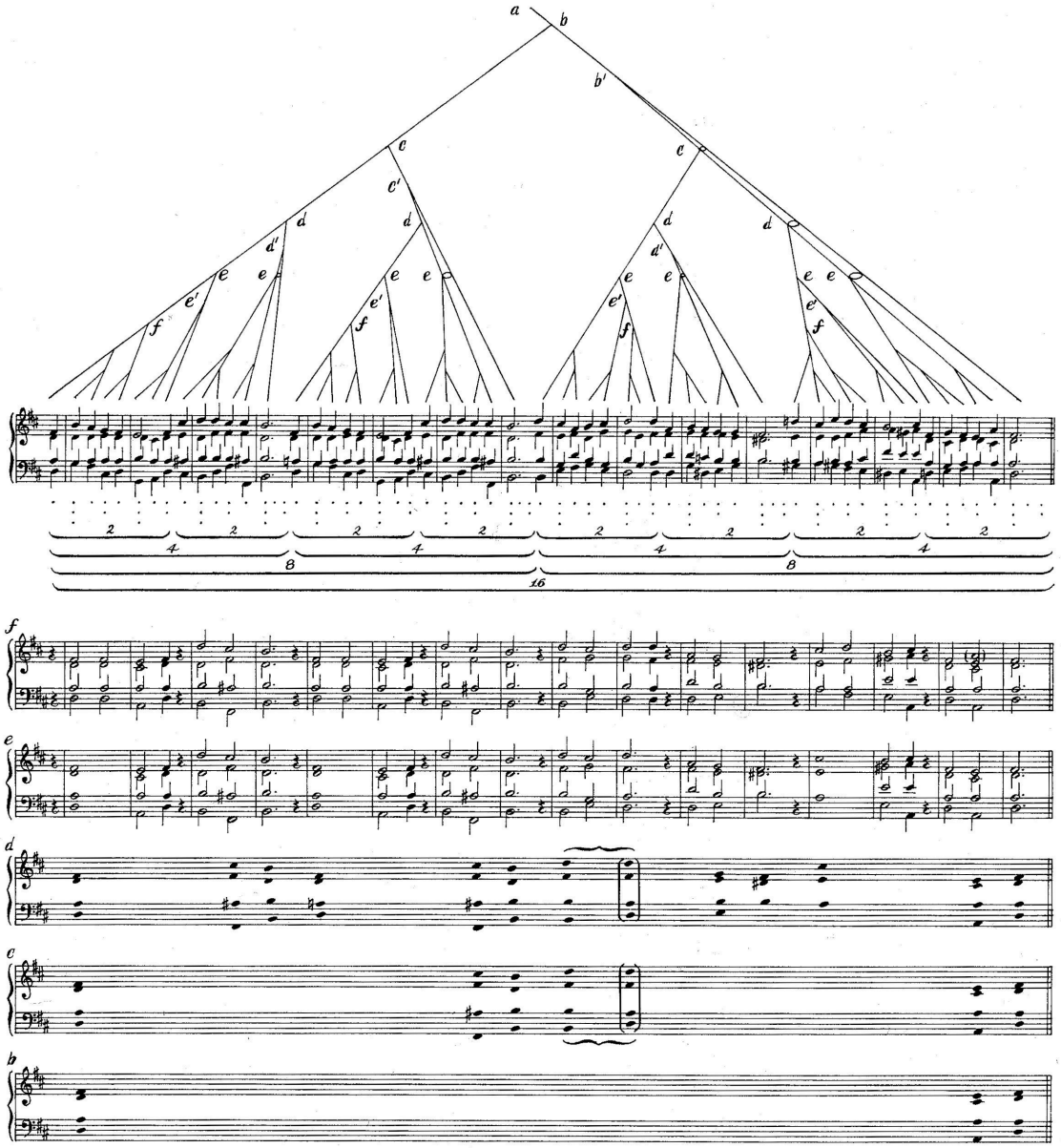


Figure 12.2: Time-span tree structure (Jackendoff & Lehrdal 1983: 144)

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

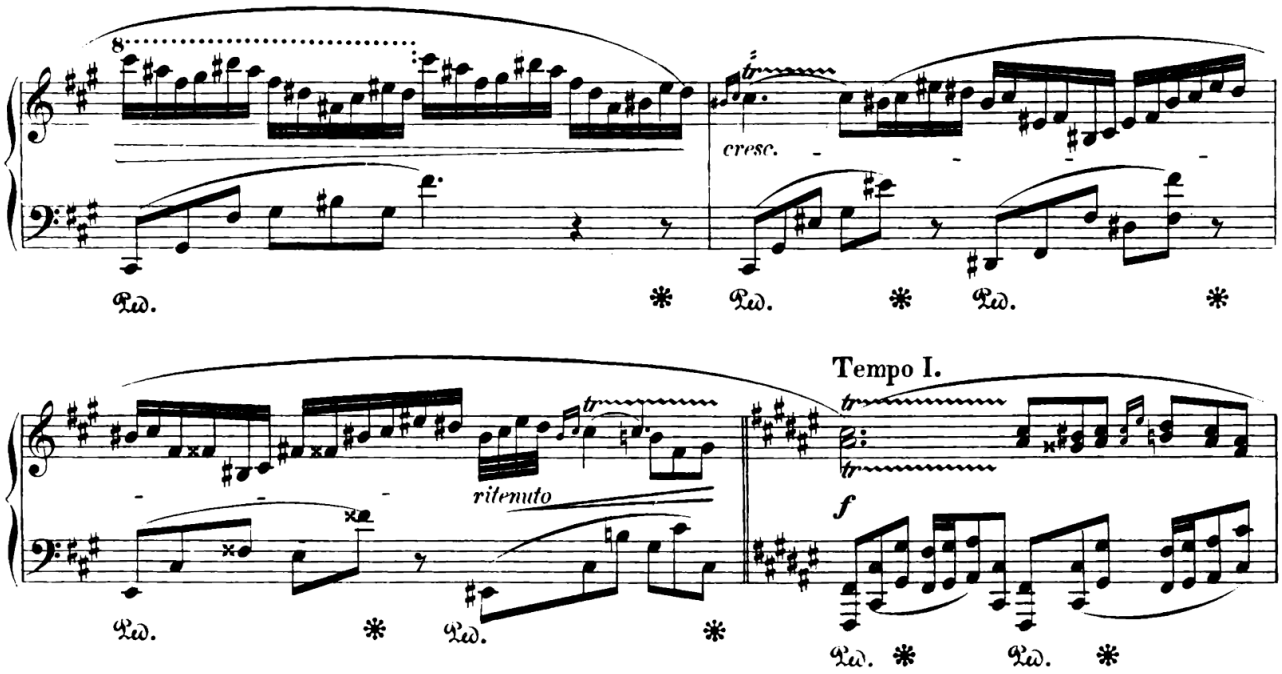
navigate the topography of the keyboard, but which do not result in expression on the timescale that they inhabit, fall into this category as well.

	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.)

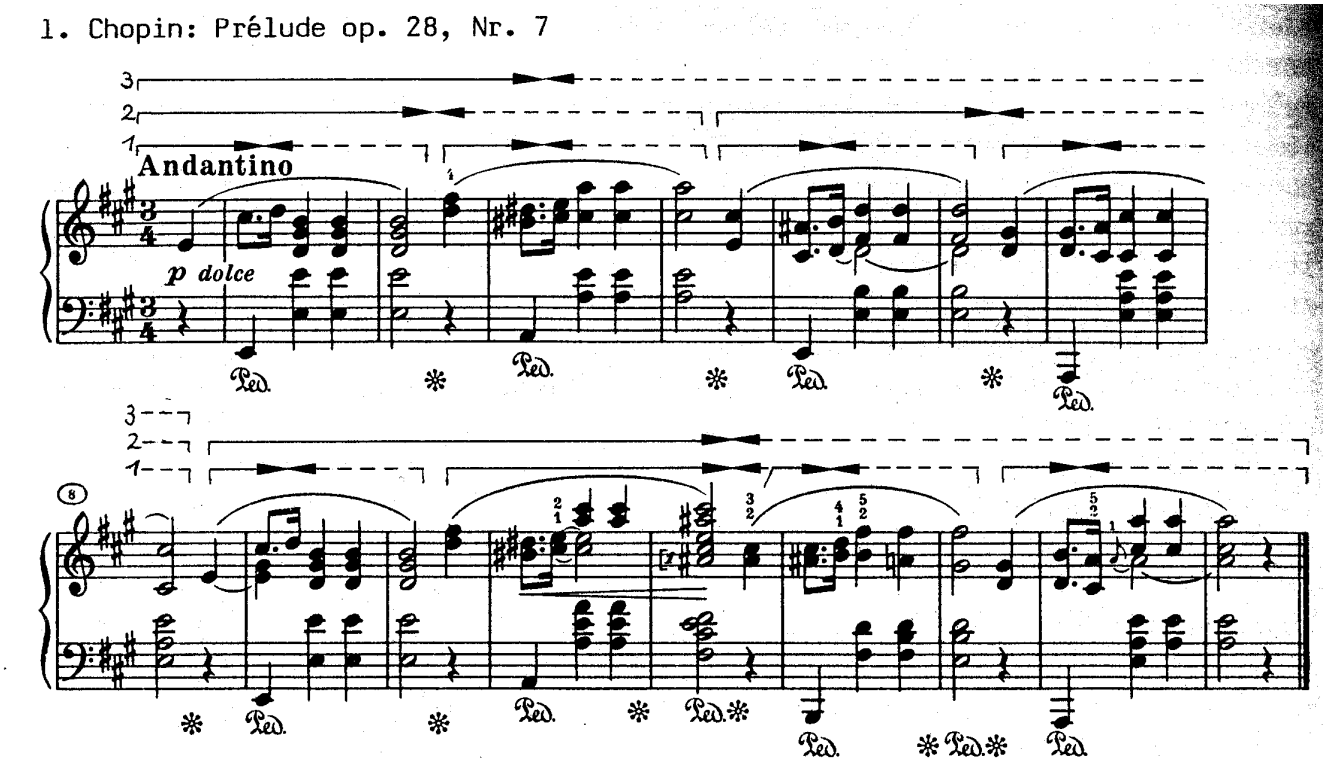
This line of thought yields two assertions (building upon §10.1 and §10.3):

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.

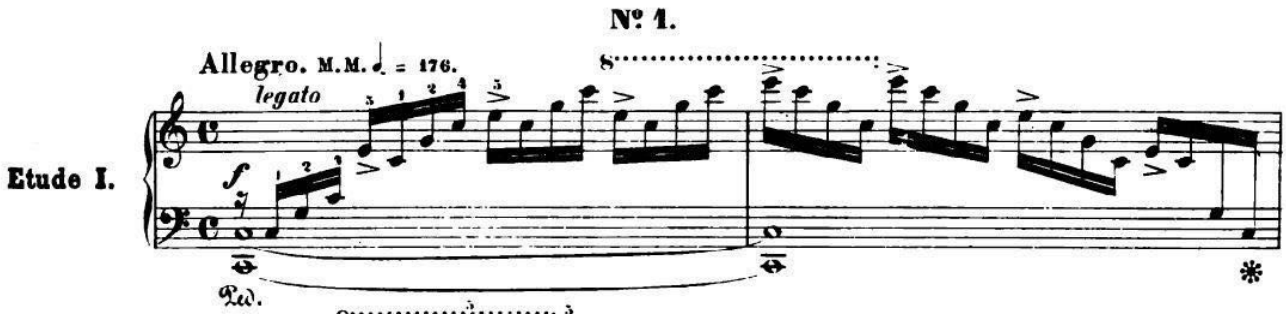
To explain in another way, if the arm follows behind each finger in a more-or-less straight line, then it will follow the contours of the notes on the keyboard. Coalescence of the hand can facilitate the smooth shaping of such overarching contours in the sense that the activity of muscles in the hand 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.

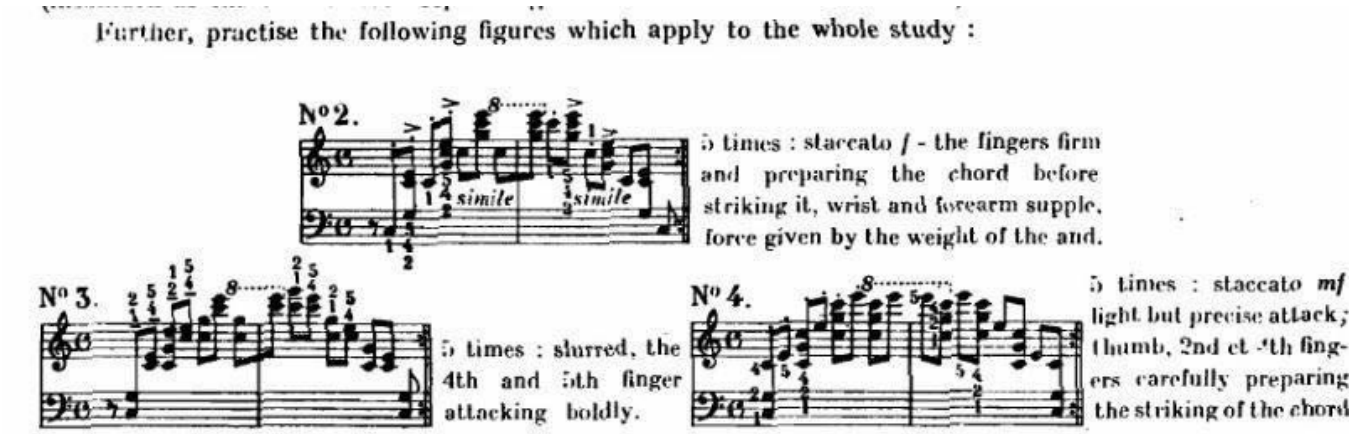
15.2.2.1 Anticipatory cognition and the "singing hand"

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:

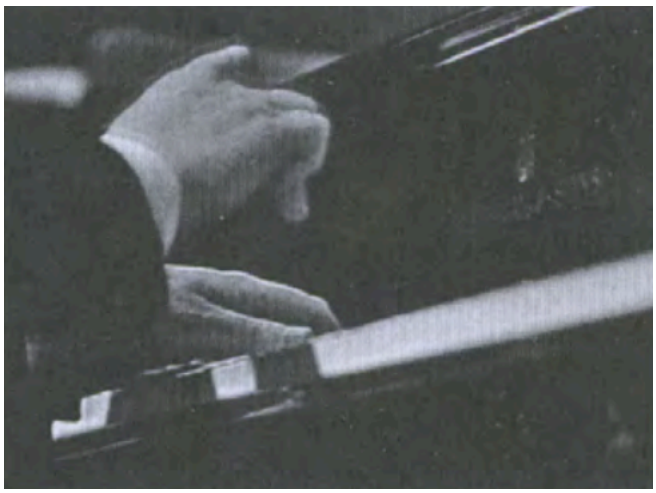
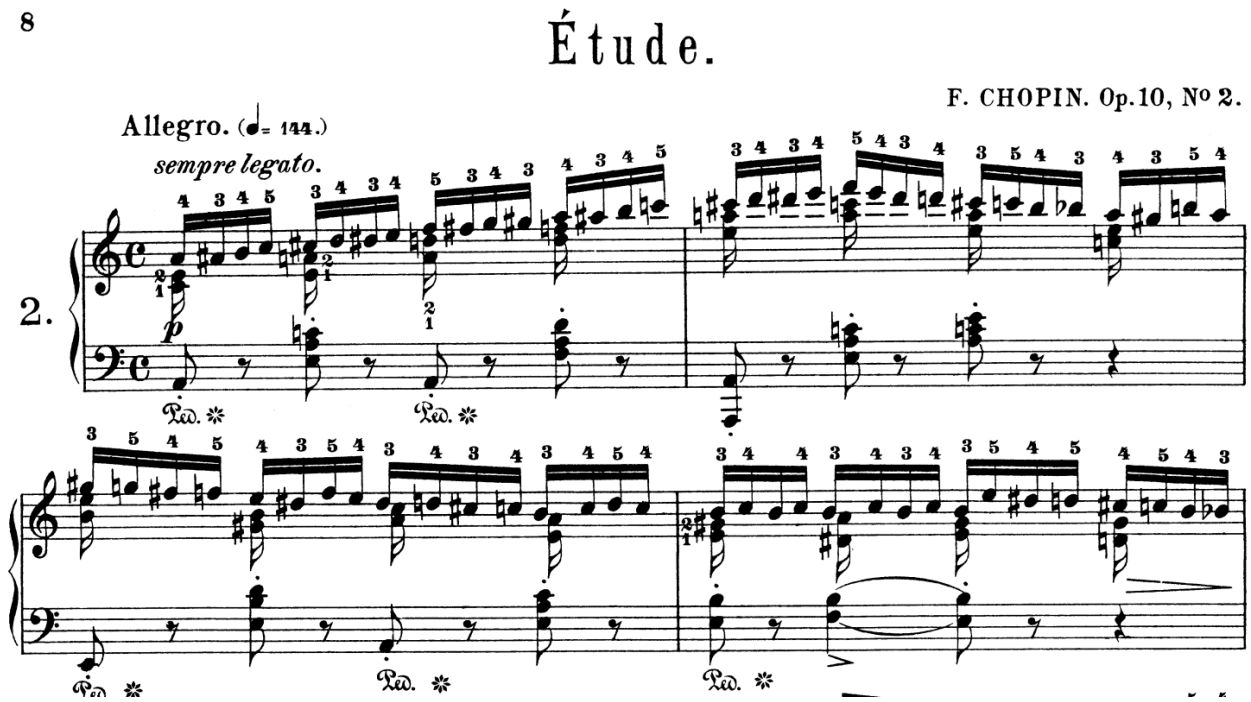


Fig. 15.1: The hand of Emil Gilels preparing to play a melodic note in the first movement of Tchaikovsky Concerto No. 1 in B-flat minor op. 23 (image taken from Doğantan-Dack 2011: 257)

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.

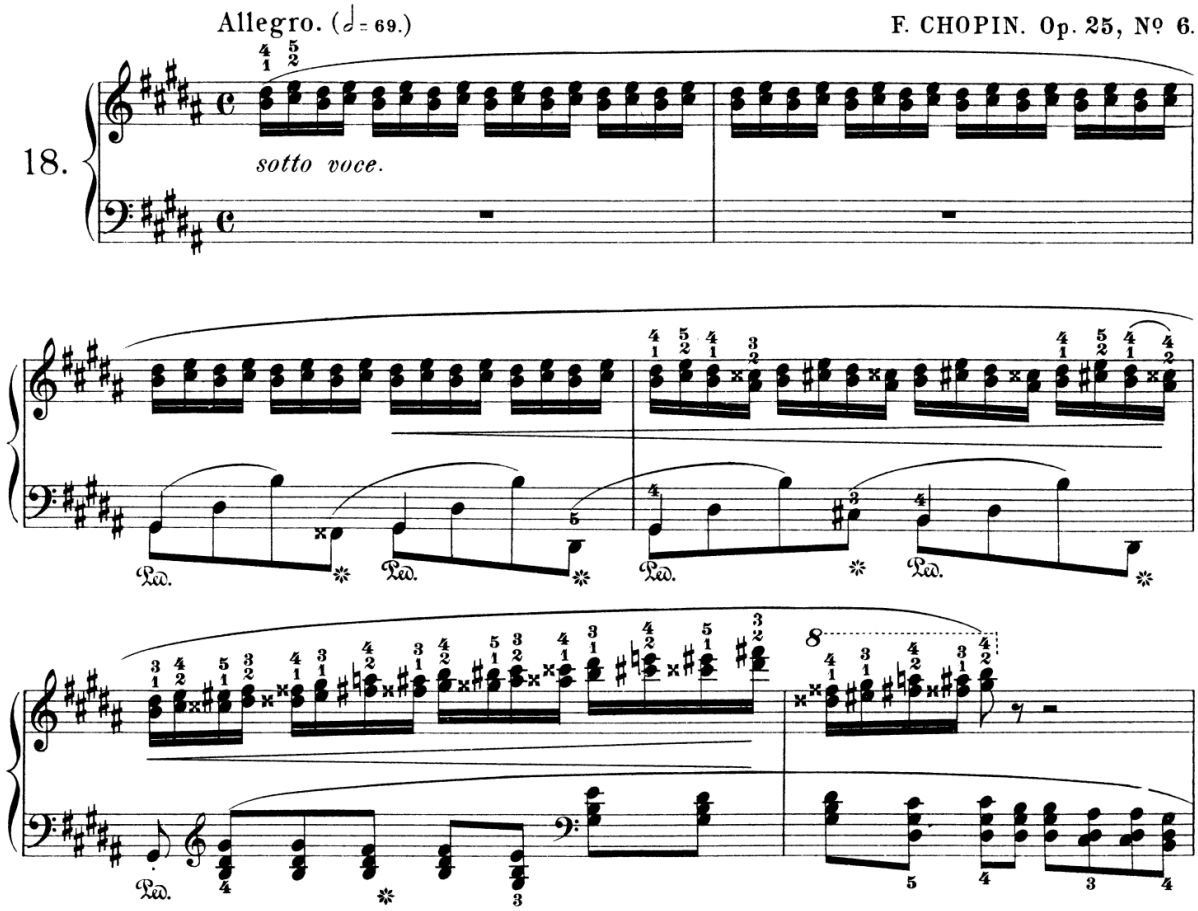
While I have chosen to begin with the first Etude, similar specific demands of coalescence are found in all the other Etudes, often in combination with varying other overarching gestures. In the second Etude (op. 10 no. 2) Chopin aims to develop such a kind of cohesive strength or coordination in the 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.

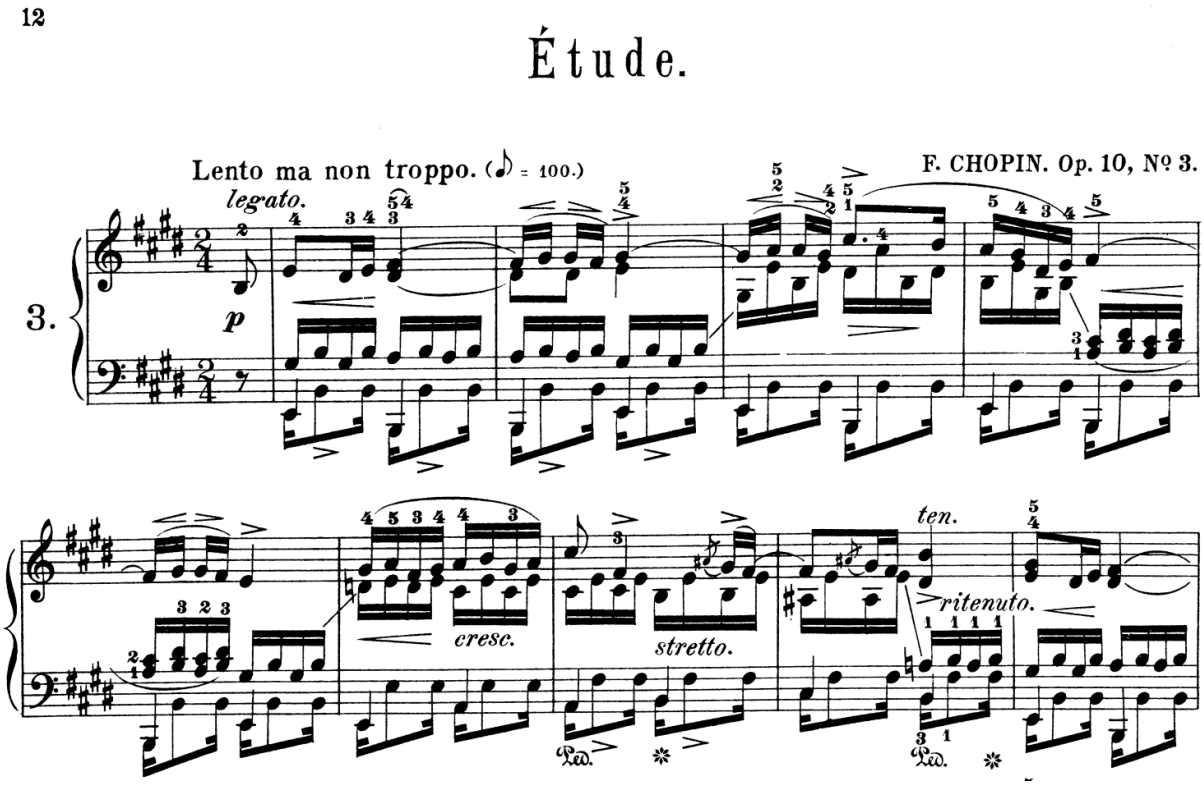
15.2.3.1 Levers and felt time

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.

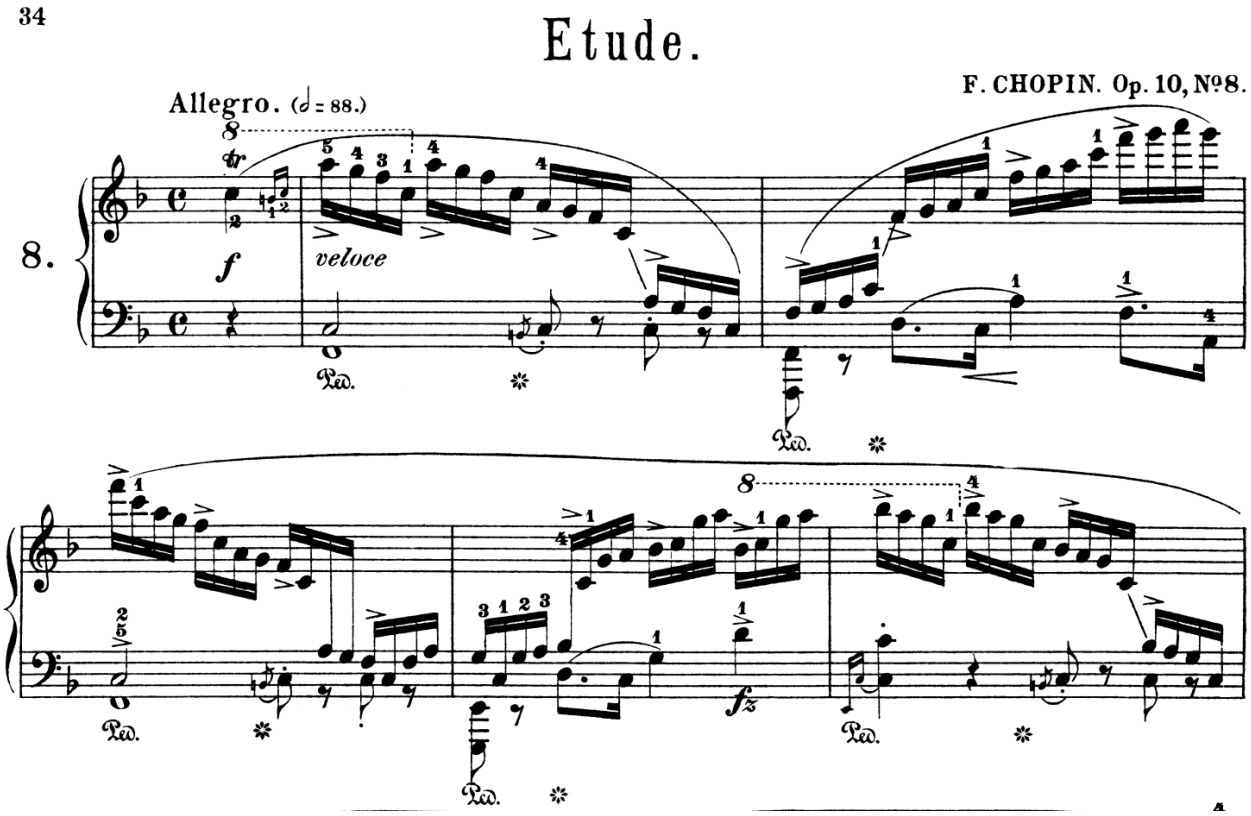
In the last paragraph I referred to the division of weight between one side of the right hand and the other, accomplished by an activity in the hand that invites the weight more into one side than the other. A parallel division of weight occurs between the arms when the onset of weight originates from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

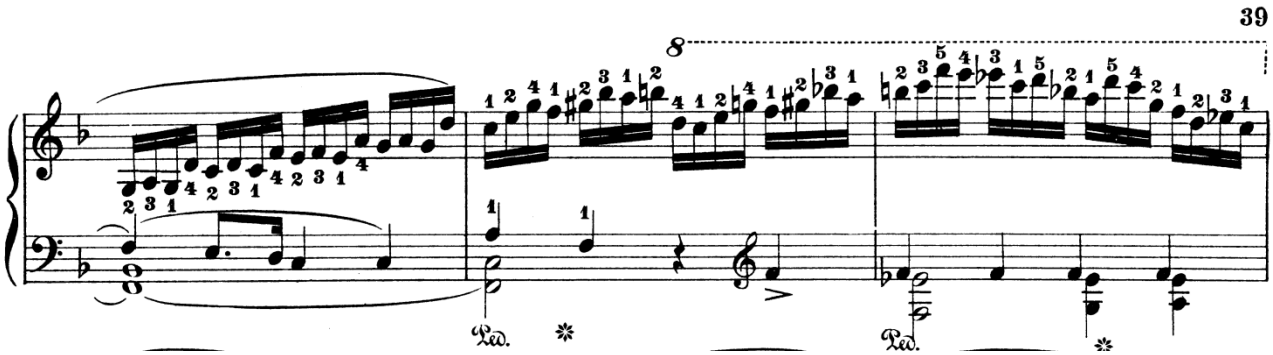
As I described in §9.5, musical gesture can be categorised as contour-based or rhythm based. These types of gestures often blend, and in the Etudes Chopin highlights and problematizes this interaction by superimposing contour- and rhythm-based patterns that occur on unlike timescales. Take for example 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.



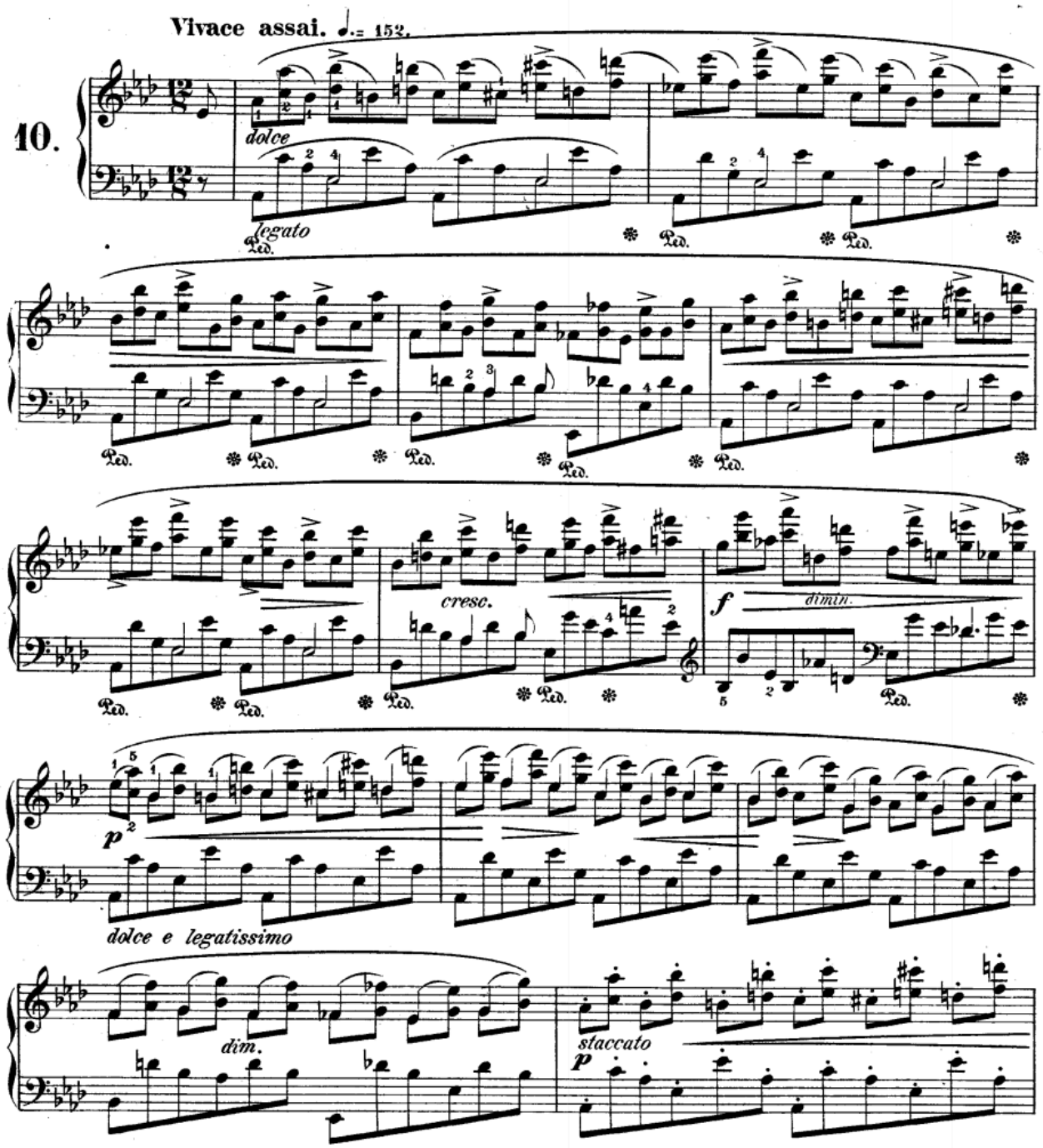
Example 15.6: Chopin Etude op. 10 no. 8 in F Major (Schirmer, Mikuli, 1895)

[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)

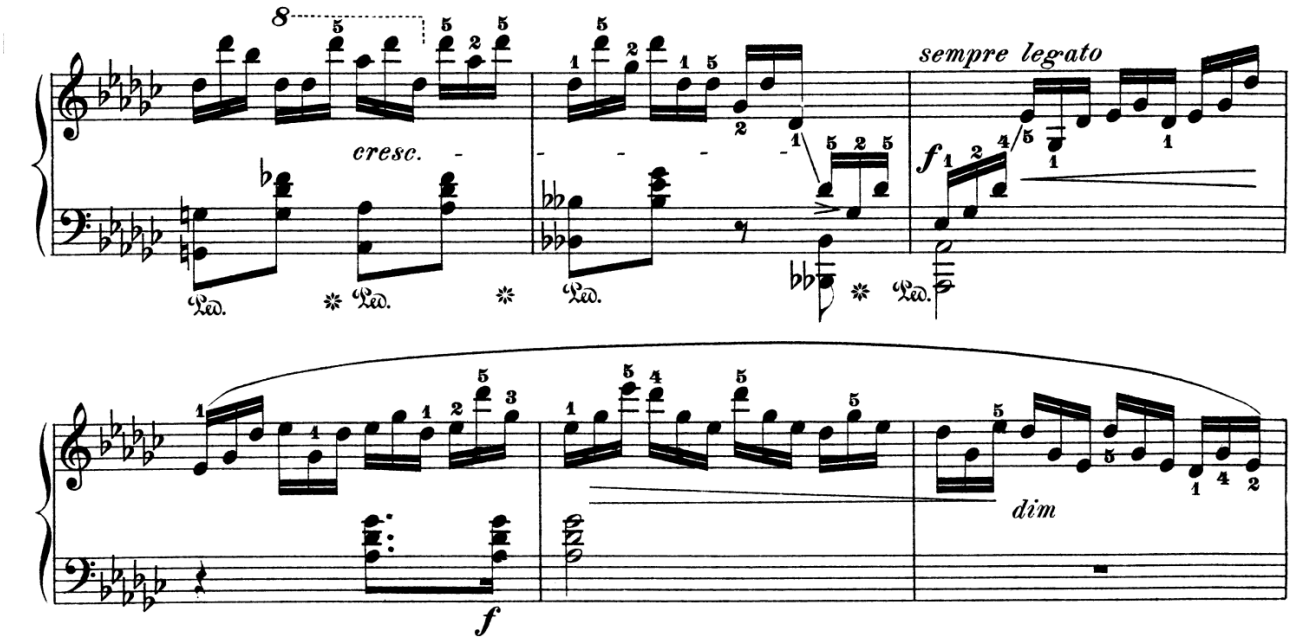
In the Etude op. 10 no. 10 (Example 15.8), different options of grouping are superimposed upon repetitions of similar material, requiring topologically distinct coarticulation. In the case of the accentuation over three eighth notes, the smallest overarching gesture embodied by the forearm falls into 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)

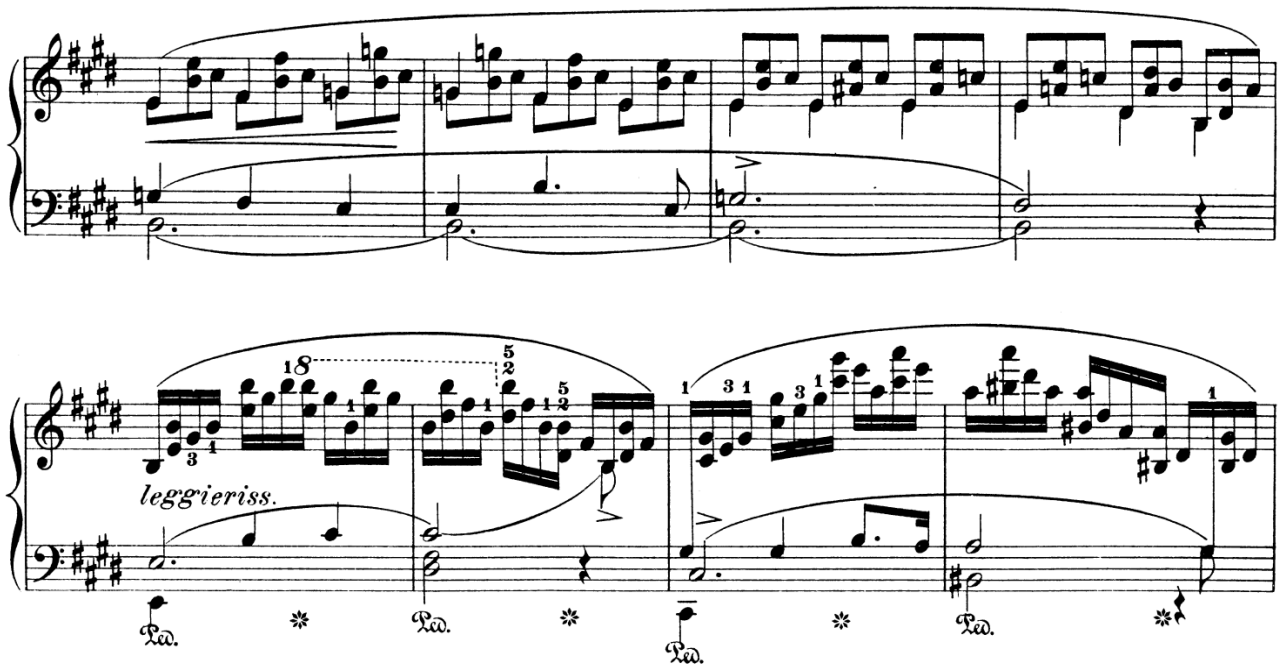
Similarly, the Etude op. 10 no. 5 has a layering of contour- and rhythm-based groupings that fall on unlike timescales. It can be observed even in the first two measures of Example 15.8, where the rotational unit of two notes in the right hand (left-right) forms

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:

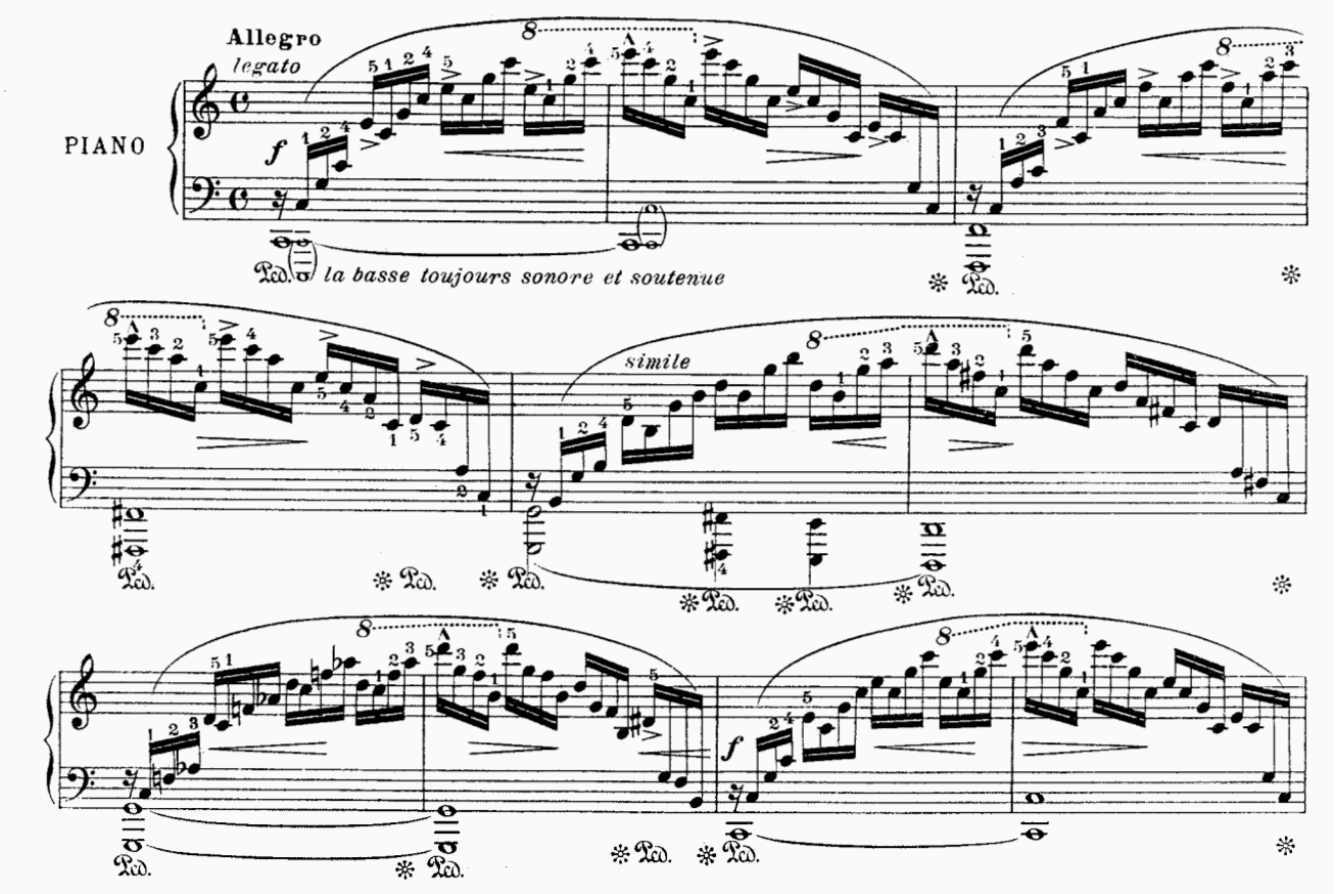


Figure 15.11: Chopin Etude in C Major op. 10 no. 1 (Senart, Cortot, 1916)

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:

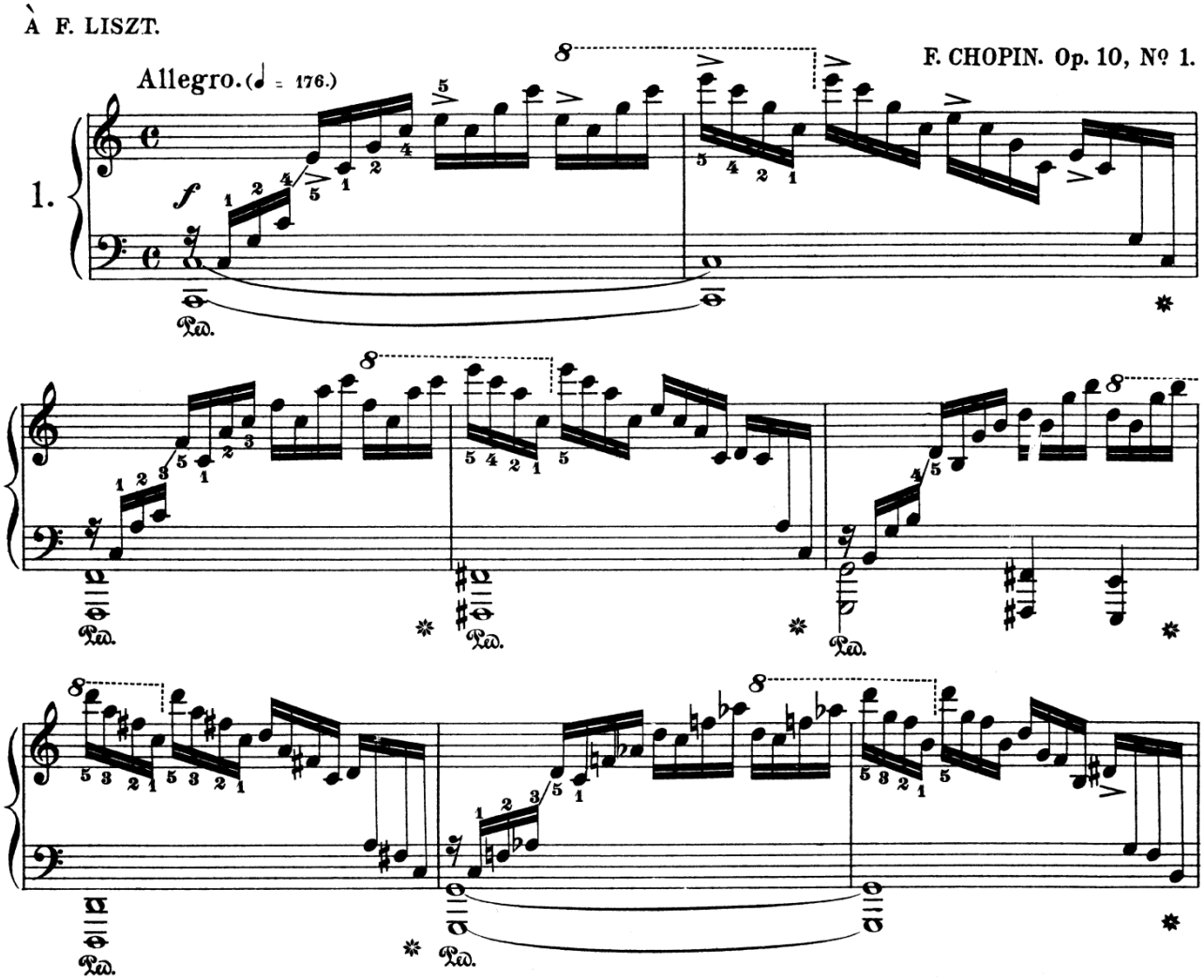


Figure 15.12: Chopin Etude in C Major op. 10 no. 1 (Schirmer, Mikuli, 1895)

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.

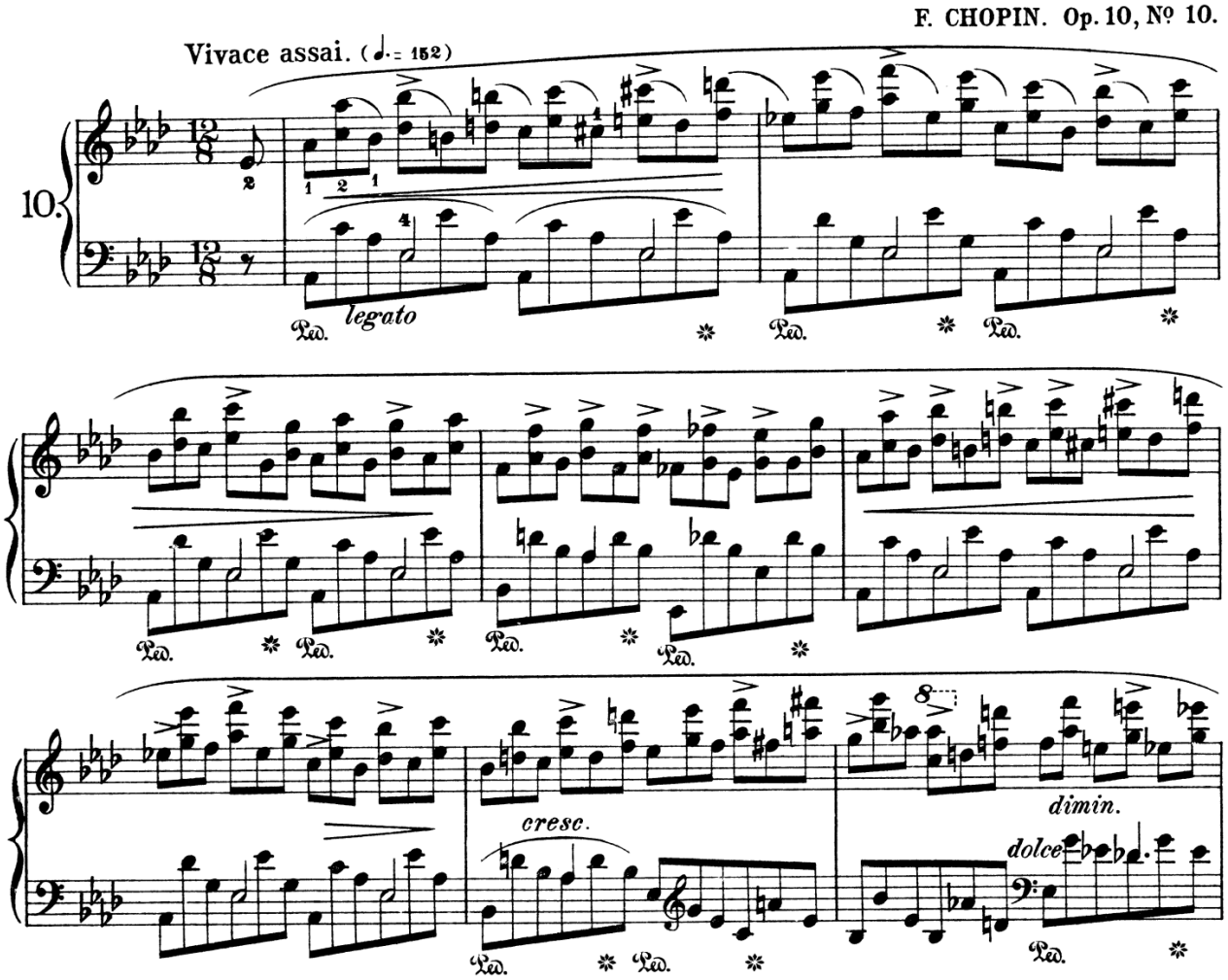
In other cases, choosing notes to play with a movement of the arm by playing from (slightly) above the key can trigger this top-down orientation. For example in op. 25 no. 12, the accents at the beginning of each measure can be taken with a separate movement of the arm. The lifting at the end of each 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.

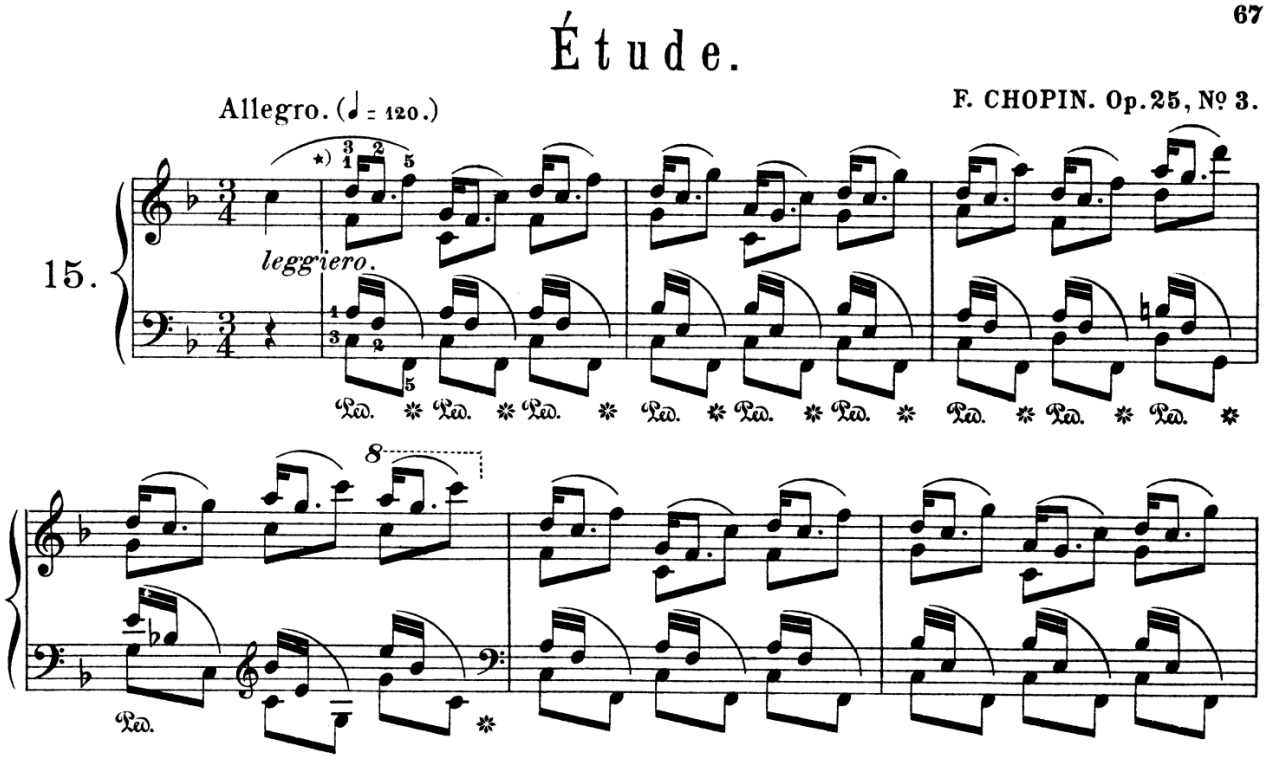
In the first case, Chopin's music is full of passages, especially in the left hand, where a pivot finger is a point of orientation. An example of this is clearly notated in op. 10 no. 10.



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

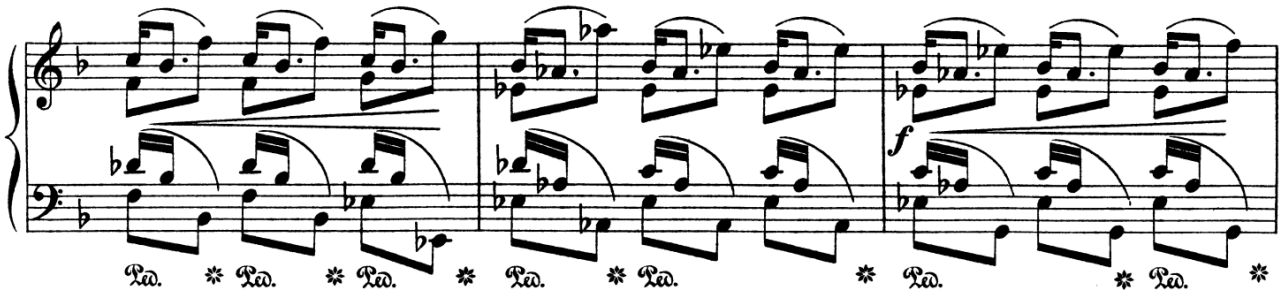
The held E-flat provides a point of stasis around which the hand pivots. Thus, the passage is guided by this external spatial point of reference, and the gesture itself is moulded flexibly around this point. While this note is actually a held note in Chopin's notation, there are many examples where the 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.



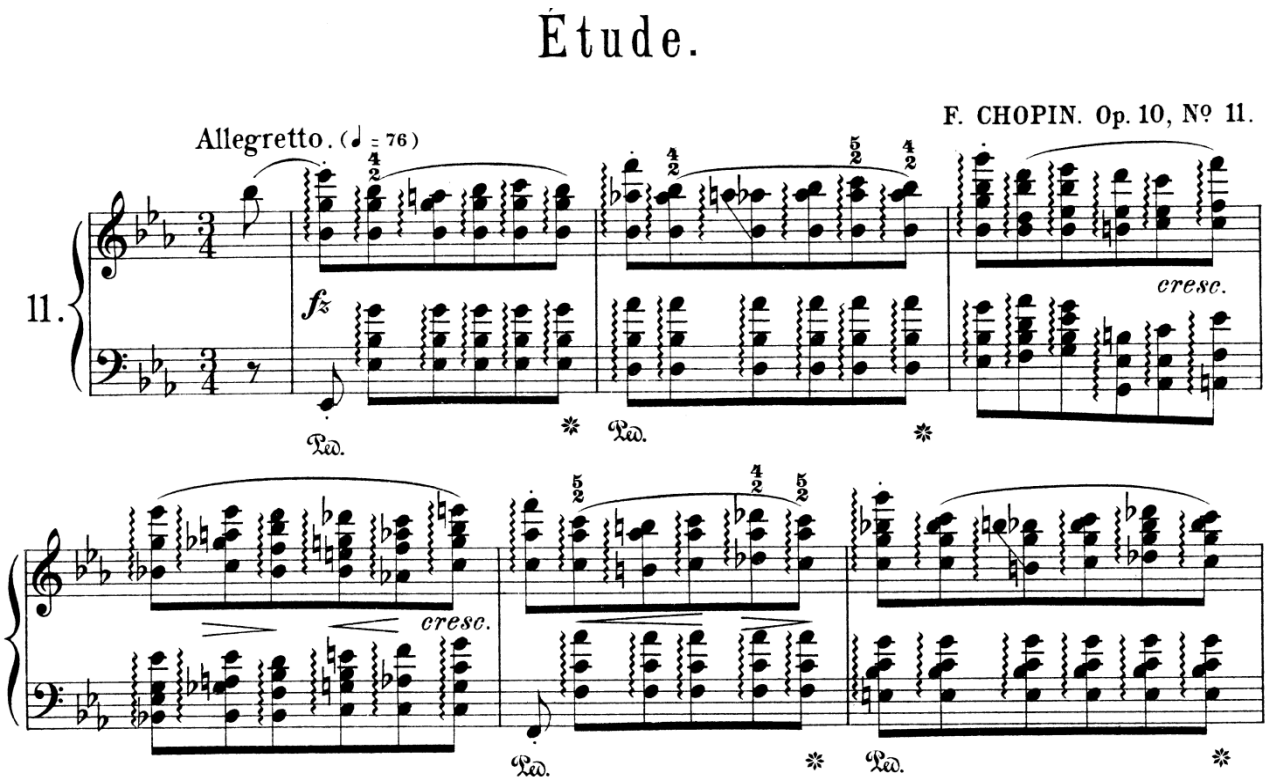
Example 15.14: Chopin Etude in F major op. 25 no. 3 (Schirmer, Mikuli, 1895)

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.

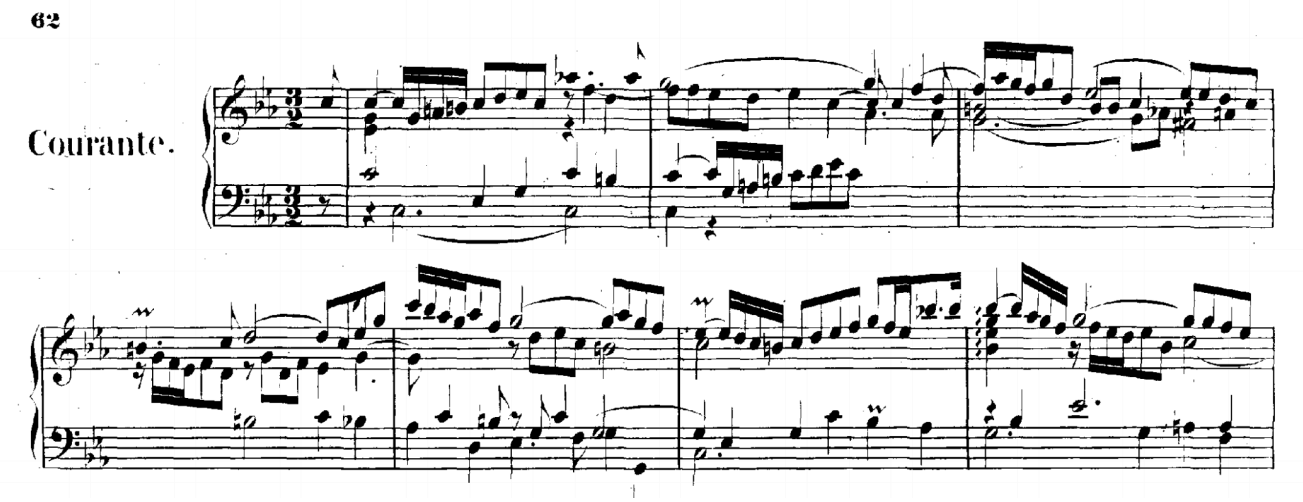


Example 15.16: Chopin Etude in E-flat op. 10 no. 11 (Schirmer, Mikuli, 1895)

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.

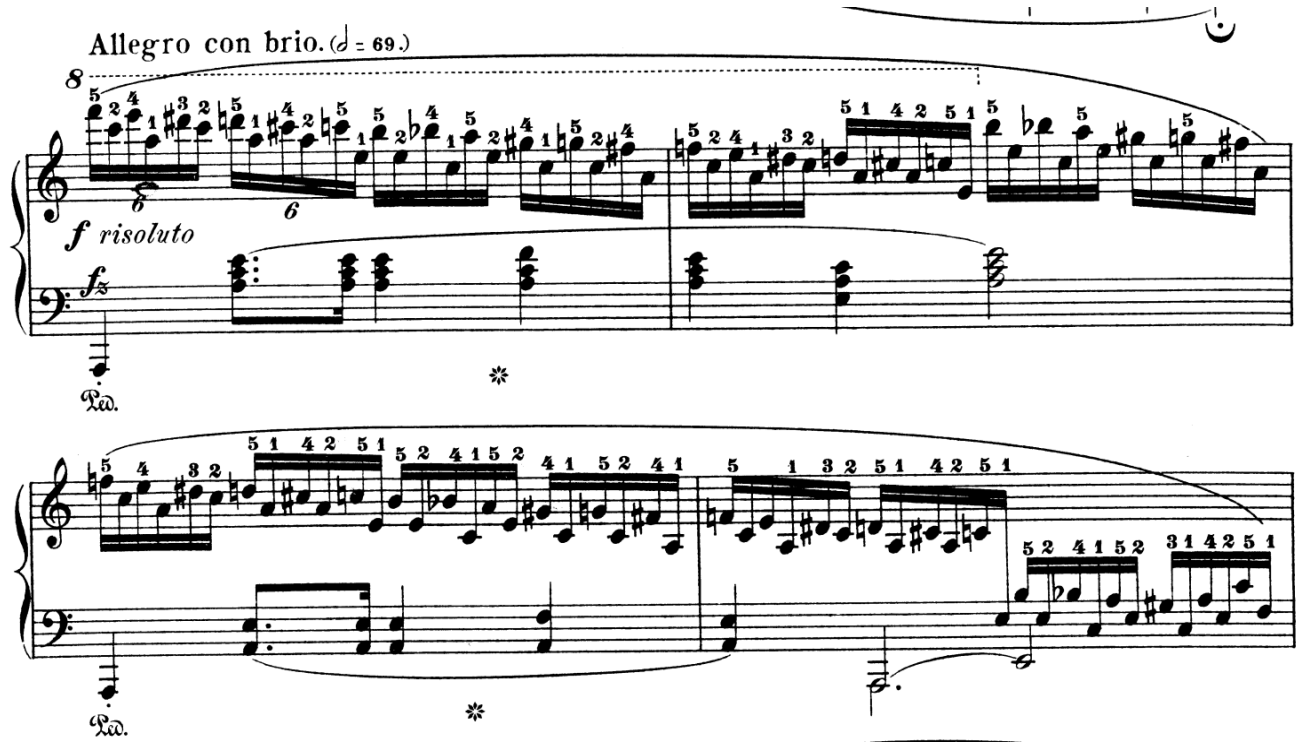


Example 15.17: Bach Courante from Partita no. 2, BWV 826 (Breitkopf, Becker, 1853)

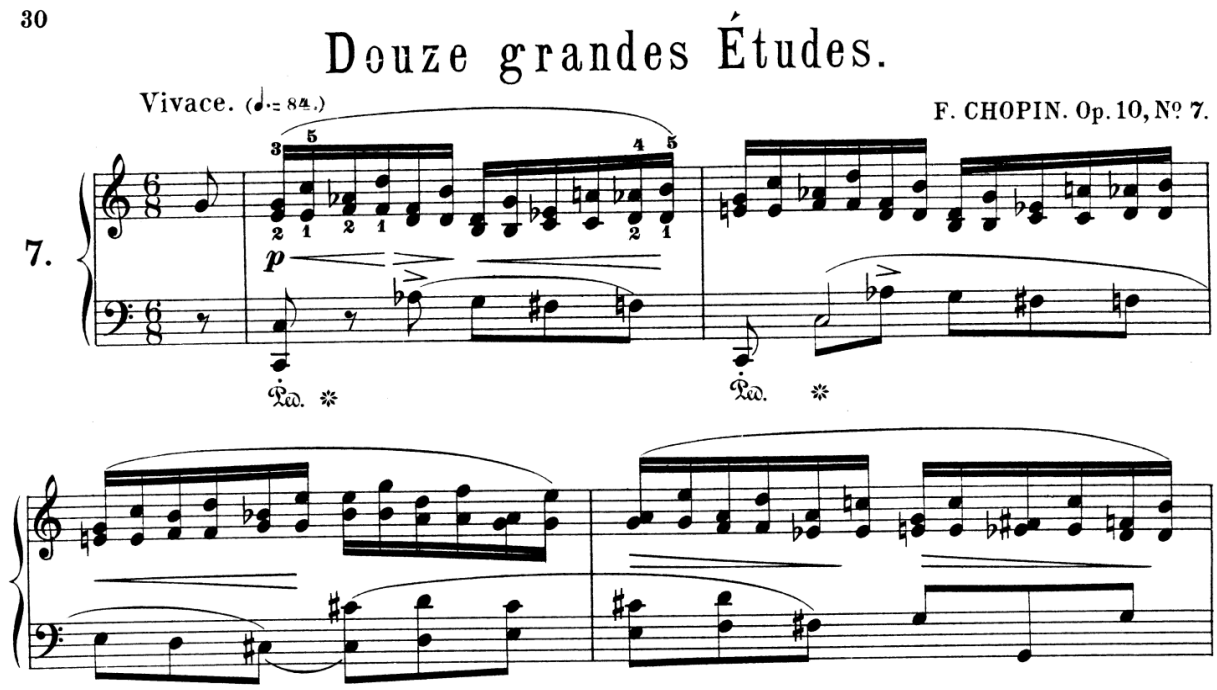
15.2.5.3 Alternation

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).