Density as an aesthetic principle and creative practice in composition

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Note on Research Ethics

For this submission, ethics clearance was sought from every performer involved in rehearsing, recording and — in every instance but one — publicly performing the works discussed in this thesis. However, it was at the time of submission only possible to gain clearance from one complete ensemble. Since the performers remain anonymous in the thesis, and the nature of the research carried out can be seen as low-risk, I chose not to redact the discussion of rehearsals in the text. The names of the performers are omitted from the track list of the CD which forms part of the submission (see p. 11) — with exception of the one ensemble that gave full clearance — to retain their anonymity.

I hope that this approach satisfies any ethical concerns. If any concerns persist, I am happy to amend relevant passages.

List of submitted work

Seven scores:

- *Sammlung*, for basset clarinet and chamber orchestra (2016-17)
- *Absicht*, for marimba and ensemble (2017)
- *bloßes Zubehör der Maschine* on texts by Karl Marx and Friedrich Engels, for baritone and bass flute (2018)
- *4 Abbilder* for string quartet (2018)
- *streifen* for flute (doubling piccolo), clarinet (B flat), violoncello and piano (2018)
- *launenhaftes Licht* for orchestra (2018-19)
- *ein Perspectiv, oder vielmehr die Farbe des Glases* for violin, piano and field recording (2019)

One CD:

1. *Absicht* for marimba and ensemble (22:51)
2. *bloßes Zubehör der Maschine* for baritone and bass flute (5:57)
3. *4 Abbilder* for string quartet (8:59)
4. *launenhaftes Licht* for orchestra (9:26)
5. *ein Perspectiv, oder vielmehr die Farbe des Glases* for violin, piano and field recording — Marcus Barcham-Stevens, violin; Ugne Vazgileviciute, piano/field recording (11:35)

Abstract

Density has been a central concept of contemporary composition since the post-war avant-garde of the 1960s. Works like Ligeti's *Atmosphères* (1961) — which starts with a massive, 66-note pitch cluster — or Ferneyhough's *La terre est un homme* (1979) — whose sound-world is described by its composer as if several compositions were coexisting simultaneously[1] — have put a high degree of musical information as their main focus. However, so far there has not been an attempt to gather and compare different theories on density, or an investigation into different writing techniques associated with it.

My research aims to fill this gap. In the first part of this study, I will examine and compare the existing literature on the subject and try to find common ground — or divergences — between different approaches to density. This examination focusses on concepts and essays of the post-war avant-garde, such as integral serialism, textural music, so-called "New Complexity" and more recent developments such as the French *musique saturée* movement, and their relationship to density. Through the comparison of these approaches, a more nuanced conception of density is arrived at, which views density as the amount of musical information within a specific frame of musical time and a specific musical parameter.

A second strand of my study lies in writing pieces based on this more nuanced theory, as well as on insights and open questions gained from the rehearsal processes of these pieces. Topics addressed in these original compositions include different manifestations of density derived from the new definition; the interaction between density and parametric polyphony; density as a means for formal delineation; superimposition; use of different temporal frames as a means of large-scale development; density and detail, with a focus on microtonality; and finally density and transcription. Reference is also made intermittently to different aesthetic contexts, such as the aforementioned *musique saturée* and the recent *Diesseitigkeit* and New Conceptualism.

This research hopes to shed light on density-related compositional concepts, their aesthetic possibilities and their practical pitfalls. By doing so, it could provide greater conceptual clarity and suggest approaches and tools, not only for composers interested in the subject but also for musicologists or performing musicians.

[1] Boros, James and Toop, Richard (1995) (eds.), *Brian Ferneyhough: Collected Writings*, Amsterdam: Harwood Academic Publishers, p. 310

Density as an aesthetic principle and creative practice in composition

1. Density as a musical term

1.1 Introduction

Density, as a central compositional concern, came into focus as part of the theoretical writings of the post-war avant-garde. In the late 1940s and 1950s, a prominent strand of artistic thought across disciplines concerned itself with an attempted complete break from Western cultural tradition, perceived to have become tainted by the then very recent past of World War II. Those involved in this new movement strove to completely reconfigure aesthetic as well as theoretical approaches to artistic activity, such as for example the German literary movement "Gruppe 47", which had as its central idea "[...] an oppositional consensus, which came into being through the rejection of obsolete mentalities, especially the lack of overcoming the fascist legacy"[2]. The main compositional centres of this "point zero" (*Nullpunkt*)[3] in mainland Europe were the Darmstadt International Summer Courses for New Music and the music periodical *die Reihe*, whose content is characterised by M. J. Grant as featuring "[...] complex and lengthy analyses, baffling terminology and a total rejection of common paradigms of musical expression [...]"[4]. Density — a concept that had so far not been a traditional theoretical focus in the way harmony and melody had been discussed or taught — was quickly discovered as a main area of theoretical and aesthetic concern, both for adopters of serialist technique such as Karlheinz Stockhausen and Pierre Boulez as well as for its main critics like György Ligeti and Iannis Xenakis.

Density as a concept has since been widely used in theoretical writings; however, so far no study has attempted to gather, compare and — if needed — clarify these different approaches. An attempt to do so will form the first part of this thesis. In the subsequent chapters, which form the commentaries on the pieces submitted as part of this research, I will elaborate on the effect

[2] Kinder, Herrmann (1992), "Sätze zum Satz vom Ende der Literatur", quoted after Arnold, *Die Gruppe 47*, Reinbek bei Hamburg: Rowohlt, p. 10 (original German: "[...] einen oppositionellen Konsens, der sich aus der Ablehnung obsoleter Mentalitäten, insbesondere der mangelnden Überwindung des faschistischen Erbes ergab"; translation: Kaspar Querfurth)

[3] Arnold, Heinz Ludwig (2004), *Die Gruppe 47*, Reinbek bei Hamburg: Rowohlt, p. 12

[4] Grant, M. J. (2001), *Serial Music, Serial Aesthetics: compositional theory in post-war Europe* (Music in the 20th century), Cambridge: Cambridge University Press, p. 3

the findings of this study had on my own compositional approach. Finally, a concluding chapter will focus on the aesthetic issues arising from the findings of the preceding chapters.

1.2 Horizontal and vertical density

One of the earliest writings dealing with density as a phenomenon in composition is Karlheinz Stockhausen's 1954 essay *Von Webern zu Debussy: Bemerkungen zur statistischen Form*[5], originally held as a radio lecture. In this article, Stockhausen elaborates a theory of musical form that relies on the perception of approximate degrees of different parameters. Density as a term is first introduced while describing a particular sensation of listening to a segment of what Stockhausen calls "group composition":

> "And further: when composing a group of sounds or sound-mixtures, under certain circumstances one cannot hear anymore the single pitches or sounds or sound-mixtures successively or simultaneously, but one perceives a new resulting phenomenon. [...] One can imagine this very easily using the following example: a swarm of single pitches appears, according to distance — which is according to average loudness — range and speed with which it passes the ear, more or less dense: sometimes, one can make out single pitches, sometimes one hears clusters of pitches, without being able to analyse them. In between lie transitional states of these pitch-swarms. I call this forms of movement, because the temporal processes of change and their speed are crucial in this case. To use an image: Does one see the single leaves, or the shrub? It is dependent on how brightly it is lit, how far I am away from it, how dense the shrub has grown, how long I look at it. Brightness, distance, density, time are varied by the composer."[6]

[5] Stockhausen, Karlheinz (1954), "Von Webern zu Debussy: Bemerkungen zur statistischen Form", in: Schnebel (ed.) *Karlheinz Stockhausen — Texte zur elektronischen und instrumentalen Musik*, Band 1, Cologne: DuMont Schauberg, 1963, p. 75-85

[6] ibid., p. 76-77 (original German: "Und weiter: komponiert man eine Gruppe von Klängen oder Tongemischen, so hört man unter bestimmten Vorraussetzungen nicht mehr die einzelnen Töne oder Klänge oder Tongemische nacheinander oder übereinander, sondern man nimmt eine neue resultierende Erscheinung war. […] Man kann sich das gut vorstellen an folgendem Beispiel: ein Schwarm einzelner Töne erscheint je nach Entfernung, also nach durchschnittlicher Lautstärke, je nach Höhe und Geschwindigkeit, mit der er am Ohr vorbeizieht, dicht oder weniger dicht: Manchmal kann man noch einzelne Töne heraushören, manchmal hört man Tonbündel, ohne sie analysieren zu können. Ich nenne das Bewegungsformen, da die zeitlichen Veränderungsvorgänge und ihre Geschwindigkeit hierbei ausschlaggebend sind. Um ein Bild zu gebrauchen: Sieht man die einzelnen Blätter, oder den Strauch? Es kommt darauf an, wie hell es ist, wie weit ich entfernt bin, wie dicht der Strauch gewachsen ist, wie lange ich ihn ansehen kann. Helligkeit, Entfernung, Dichte, Zeit variiert nun der Komponist."; translation: Kaspar Querfurth)

In this both technical and vivid account, Stockhausen describes important components of perceiving and composing density, as well as possible effects density can have on the listening experience. His idea of density is also one that unfolds in time through a "swarm" of successive sounds, which can be seen by his inclusion of speed as a necessary component of assessing the density of a given passage.

Later on, he describes density as serving as a means of arriving at formal correspondences. A listener, Stockhausen claims, is able to feel that "[…] it is again as dense as in the corresponding earlier form of movement; but the same density is now combined with higher pitch-groupings, higher speed and a darker timbre"[7]. This stands in some conflict with the earlier description that density is dependent on pitch location and speed — here, density is a distinct quality of a given section that can be combined with other qualities.

In his discussion of Debussy's *Jeux* later in the same essay, Stockhausen somewhat broadens his definition of density. Here, he speaks of the first two pages of *Jeux* as containing a "[…] high vertical density (which means simultaneous pitch-groupings)[8]; the degree of density is constant. The vertical density (which means successive pitch-groupings) is low."[9] Here, Stockhausen talks twice about "vertical density" (vertikale Dichte); however, because his two explanations of the term in this passage contradict each other substantially, there is reason to believe that the second phenomenon he describes is horizontal density (horizontale Dichte), rather than vertical density and that there is a misprint in the edition. Stockhausen subsequently uses horizontal density in the essay without ever defining it. The distinction between different types of density further explicates the phenomenon described in the first passage quoted above, which could be seen as a form of horizontal density. Stockhausen then proceeds to formulate a theory of organizing degrees of density of both types into rows and gives examples for how these degrees could be used, even independently of each other. This research led him to the techniques used to

[7] ibid., p. 77 (original German: "[…] ist es wieder so dicht, wie in der entsprechenden früheren Bewegungsform; aber die gleiche Dichte ist jetzt mit höheren Tongruppen, höherer Geschwindigkeit und dunklerer Klangfarbe verbunden."; translation: Kaspar Querfurth)

[8] A related concept of theoretically grasping vertical organization is used by the music psychologist David Huron. He defines (in reference to preceding research undertaken by Huron and Deborah Fantini) a "vertical sonority" as "[…] a particular 'slice' in the musical score: any change of pitch, introduction of a rest or rearticulation of a note was deemed to constitute a new vertical sonority." For further reference, see: Huron, David (1990), "Increment/Decrement Asymmetries in Polyphonic Sonorities", in: *Music Perception*, Vol. 7, No. 4, Berkeley: University of California Press, p. 386 and Huron and Fantini, "The Avoidance of Inner- Voice Entries: Perceptual Evidence and Musical Practice", in: *Music Perception*, Fall 1989, Vol. 7, No. 1, p. 43-48

[9] ibid., p. 78 (original German: "[…] große vertikale Dichte (das heißt Tongruppen gleichzeitig); die Dichte ist konstant. Die vertikale Dichte (das heißt Tongruppen nacheinander) ist gering."; translation: Kaspar Querfurth).

compose his seminal works of the late 1950s — chief amongst them *Gruppen* for three Orchestras (1955-1957) and *Kontakte* for piano, percussion and tape (1958-1960).

Vertical density is most closely associated with György Ligeti's works from the 1960s, particularly his orchestral works *Apparitions* (1958-59), *Atmosphères* (1961) and *Lontano* (1967). A first impulse for *Apparitions*' second movement was the idea of creating "[…] a canon so dense that it creates a texture […]"[10]. Elsewhere, Ligeti talks about a dream in which his "[…] entire room was filled by a thinly fibrous, but dense and extraordinarily convoluted web, similar to the secretion of silk worms, […]"[11] as the initial inspiration for *Apparitions*. These images were translated into "[…] soft, sounding 'textures', [which] are of a different quality depending on their pitch spacing, the form and density of their interweaving, and the nature of their constituting voices."[12] Without referring to Stockhausen's aforementioned essay, Ligeti here implies a similar notion of vertical density. However, Ligeti later does not solely use the word density when talking about a 14-part chord; he ascribes a difference in perception of this chord to an "[…] increase in *width* and density […]"[13].

Another way of differentiating textures lies in "different modes of mobility […]: some are entirely stationary, others — even though they are overall immobile — show inner vibrations or currents that are caused by the continuous change of the mode of weaving, others again move as a whole."[14] This implies a certain importance of horizontal activity to the constitution of the sound textures. Again, Ligeti does not explicitly refer to Stockhausen's article, even though his term "modes of mobility" closely mirrors Stockhausen's "forms of movement".

Emmanouil Vlitakis, in his dissertation on sound and instrumentation in 20th-century orchestral works[15], tables a catalogue of characteristics for the sound textures used in *Apparitions*, which

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[10] Michel, Pierre, "György Ligeti: Compositeur d'aujourd'hui", quoted after: Griffiths, Paul (1983), *György Ligeti,* London: Robson Books

[11] Ligeti, György (1967), "Zustände, Ereignisse, Wandlungen", in: *Melos* 5, Mainz: Schott, p. 165-169 (original German: "[…] das ganze Zimmer war von einem dünnfaserigen, aber dichten und äußerst verwickelten Gewebe ausgefüllt, ähnlich dem Sekret von Seidenwürmern, […]"; translation: Kaspar Querfurth), p. 165

[12] ibid., p. 165 (original German: "[…] zarten, klingenden 'Texturen' sind von verschiedener Qualität je nach ihrer Tonhöhenlage, der Art und der Dichte ihrer Verwebung und der Natur der sie konstituierenden Einzelstimmen."; translation: Kaspar Querfurth)

[13] ibid., p. 168 (original German: "[…] Zunahme an Breite und Dichte […]"; translation: Kaspar Querfurth; italics added)

[14] ibid., p. 165/168 (original German: "Verschiedene Arten der Beweglichkeit […]: einige sind vollkommen stationär, andere, zwar in ihrer Gesamtheit unbeweglich, weisen interne Schwingungen oder Strömungen auf, die durch die fortwährende Änderung der Webeart hervorgerufen werden, noch andere bewegen sich als Ganzes." ; translation: Kaspar Querfurth)

[15] Vlitakis, Emmanouil (2008), *Funktion und Farbe: Klang und Instrumentation in ausgewählten Kompositionen der zweiten Hälfte des 20. Jahrhunderts: Lachenmann —Boulez — Ligeti — Grisey* (= sinefonia 11), Hofheim: Wolke Verlag

in many ways follows Ligeti's characteristics and expands on them. Vlitakis' catalogue also uses width to describe the ambitus of a chord[16] and differentiates density from it as the "complete or incomplete construction of the texture"[17]. Viewed in light of the differentiation of density into "horizontal" and "vertical" outlined above, this statement could refer to either of these two. However, a later description of a diagram of the pitch progression of the first movement of *Apparitions* (which corresponds in its layout to the horizontal/vertical distinction outlined above) refers to certain "single pitches which are not part of a complete cluster texture […]"[18], thus relating the concept of density to pitch space, i.e. the vertical plane. On the other hand, density later on does get associated with vibrato playing, which "[…] in conjunction with the width of this texture conveys an impression of particular density."[19]

Later, Vlitakis refers to concepts like "inner constitution of the texture"[20] — which is then differentiated into "perfect stasis; inner 'vitalization' through vibrato, tremolo or trills; dissolution through figuration or micropolyphonic structures"[21] — or "form of movement or stasis"[22], which clearly correspond to Ligeti's "modes of mobility".

Ligeti's most well known pieces that include extreme horizontal density include *Continuum* for harpsichord (1968) and *Poème symphonique* (1962), which consists of a sound mass of 100 simultaneously started mechanical metronomes, which gradually and individually lose their tension, become slower and finally stop. This creates a shift from a very high to a very low degree of horizontal density (the piece ends in silence, which could be argued is degree zero of density).

1.3 Stochastic music

Another compositional approach closely related to density is the "stochastic music" of Iannis Xenakis, laid out in his treatise *Formalized Music*[23]. In it, Xenakis explores the idea of what he

[16] ibid., p. 133

[17] ibid., p. 133 (original German: "lückenloser oder lückenhafter Aufbau der Fläche"; translation: Kaspar Querfurth)

[18] ibid., p. 134 (original German: "Einzeltöne, die nicht Teil einer lückenlosen Cluster-Fläche sind, […]"; translation: Kaspar Querfurth)

[19] ibid., p. 141 (original German: "[…], die […] im Zusammenhang mit der Breite dieser Fläche einen Eindruck von besonderer Dichte vermittelt." ; translation: Kaspar Querfurth)

[20] ibid., p. 133 (original German: "innere Beschaffenheit der Fläche"; translation: Kaspar Querfurth)

[21] ibid. p. 133 (original German: "vollkommene Statik; inneres 'Beleben' durch Vibrato, Tremolo oder Triller; Auflösung durch Figuration oder mikropolyphone Strukturen"; translation: Kaspar Querfurth; original in bullet-points)

[22] ibid., p. 133 (original German: "Bewegungsform oder Statik"; translation: Kaspar Querfurth)

[23] Xenakis, Iannis (1971), *Formalized Music*, Bloomington: Indiana University Press

calls “mass events”, which he finds in “[…] natural events, such as the collision of hail or rain with hard surfaces, or the song of cicadas in a summer field”[24] or in the sounds of political demonstrations, both of which are comprised of a large density of independent sound sources. Density comes into focus theoretically in several of his explanations of laws governing stochastic music, for example in a formula for the probability of all possible durations, with the density of points and length of any segment as variables[25]. Here, density is used in a sense analogous to Stockhausen’s horizontal density, as evidenced by its categorization into a linear and duration-focused approach.

Interestingly, Xenakis uses a further qualification for density, linking it not necessarily to the pitch-groupings of Stockhausen, but to abstract “points” in a horizontal progression. He also uses density in the vertical sense as a quality of “[…] a set of sound-points defined in the intensity-pitch space […]”[26]. Here, too, Xenakis first uses the abstract idea of a point before then qualifying it as residing in the pitch space. This conception of density, which refers to abstract points, is an important expansion of the concept of density, implying that density does not necessarily need to refer to a density of pitch or rhythm. Xenakis refers to sound-points as “[…] granular sounds, which are in reality a particular case of sounds of continuous variation.”[27]. This implies that density above all refers to the distribution of “grains” in a given musical space, which can then take on different manifestations. In a list of preconditions of an example, leading to an analysis of a section of his orchestral work *Pithoprakta* (1955-56), one of these conditions is that “the density of speed-animated sounds is constant; i.e., two regions of equal extent on the pitch range contain the same average number of mobile sounds (glissandi).”[28] Here, density refers not to a precise pitch or array of pitches, but the probable occurrences of a given sound — in this case the glissando — within a limited frame. However, in his conclusion, Xenakis again treats density as a subset of granular sounds, when he asserts that

> “we can control continuous transformations of large sets of granular and/or continuous sounds. In fact, densities, durations, registers, speeds, etc., can all be subjected to the law of large numbers with the necessary approximations”[29],

[24] ibid., p. 9

[25] the formula given by Xenakis is given as “$P_x = \partial e^{-\partial x}\, dx$, in which ∂ is the linear density of points, and x the length of any segment.” (ibid., p. 12). The mathematical concepts behind Xenakis' musical theory will not be discussed in this thesis.

[26] ibid., p. 12

[27] ibid., p. 13

[28] ibid., p. 13

[29] ibid., p. 16

which again somewhat muddles the expanded definition of density. Still, this expansion provides a vital clue that the first definition of density as undertaken by Stockhausen might not be sufficient.

1.4 Relation to "New Complexity"

Density as a compositional concept plays a decisive role in music of the so-called "New Complexity" movement. In his article *Complex Music: An Attempt at a Definition*[30], Claus-Steffen Mahnkopf lists "a large amount of information", manifesting itself as "a mass of real 'empirical' sound-events with a high degree of speed and density"[31] as one of the central qualities of complex music. He goes on to claim a similar quality of "density and rapidity of events"[32] as one of the characteristics of "complexist" music, which he distinguishes from a broader spectrum of complex music — also including movements such as *musique concrète instrumentale* or spectralism — by not exclusively focussing on one part of the material of complex music, as the two examples just given usually do, but on the whole spectrum. Density is here used in a similar sense to Stockhausen's first use of the term as a horizontally developing phenomenon, dependent on the rate of occurrence of musical material.

A concept widely used in complexist music is the idea of de-coupling different strands of musical performance. An example for this is the separate notation of left-hand and right-hand activity in string music, as exemplified by Klaus K. Hübler's *3rd String Quartet "Dialektische Fantasie"* (1982/84), or the separate notation of breath and fingering in Aaron Cassidy's *metallic dust* for amplified solo bass clarinet (1999). Both composers conceptualize de-coupling in terms of a polyphony — understood by Cassidy as the "interdependence of multiple musical objects, with such an interaction resulting in a new singular object"[33] — of different layers of musical activity. However, Cassidy also describes a passage of four simultaneous rhythmic layers for one instrument in his *Second String Quartet* (2010) — each layer connected to different planes of activity such as finger pressure for the left hand and bow pressure for the right hand — as a "[…] passage of maximum rhythmic density […]"[34]. This implies a

[30] Mahnkopf, Claus-Steffen (2002), "Complex Music: An Attempt at a Definition", in: Mahnkopf, Cox and Schurig (eds.), *Polyphony & Complexity* (= New Music and Aesthetics in the 21st Century, Vol 1), Hofheim: Wolke Verlag, p. 54-64

[31] ibid., p. 54

[32] ibid., p. 56

[33] Cassidy, Aaron (2002), "Interconnectivity and Abstraction: *metallic dust* as a Testing Ground for Monophonic and Structural Polyphonies", in: Mahnkopf, Cox and Schurig (eds.), *Polyphony & Complexity* (= New Music and Aesthetics in the 21st Century, Vol. 1), Hofheim: Wolke Verlag, p. 147

[34] Cassidy, Aaron (2013), "Constraint Schemata, Multi-axis Movement Modeling, and Unified, Multiparametric Notation for Strings and Voices", in: *Search. Journal for New Music and Culture*, Fall 2013 [Online], available at: http://www.searchnewmusic.org/cassidy.pdf, accessed

connection between the stratification of playing components and a resultant layered rhythmic conception of density.

Sam Hayden, in his article on "clarity" versus "complexity" in recent British music[35], discusses density in multiple ways. In his characterizations of "complex" music, density is often a feature, such as in his description of "[…] the 'faithful' subjective response of Ferneyhough (and 'complexism') [to the Second Viennese School] in which atonalism is embraced and traditional conceptions of tonality, harmony and melody are overthrown by gesture, density and contour"[36]. This is contrasted with a "realistic", "clarity"-based response which he claims is favoured by composers such as Thomas Adès or George Benjamin[37]. Hayden also claims that high degrees of density in a piece form a fundamental part of a reluctance of audiences and institutions to engage with "complex" music by arguing that "[…] criticizing music as too dense can be an implicit negative valorisation of 'complexity', since the listener cannot immediately aurally disentangle the constituent polyphonic elements from the sonic totality."[38]

In his descriptions of pieces on different sides of the complexity/clarity-divide, density is explicitly used in a vertical sense with the description of "[…] the starkly rendered vertical structures of Steve Martland's *Babi Yar* (1989), with its dialectic between harmonic density and clarity of orchestration."[39] However, Hayden hints at a different sort of density in his description of Brian Ferneyhough's orchestral piece *La terre est un homme* (1979) as existing "[…] in an ever-shifting 'hinterland' between perceptions of simultaneous constituent elements, and a level of density that becomes textural."[40] Here, a contrast is implied between the predominantly "harmonic" density of *Babi Yar* and a density made up of undefined "simultaneous constituent elements" in *La Terre est un homme*. Ferneyhough himself confirms this when he claims in an interview with Philippe Albèra that "*La terre est un homme* might be seen as several compositions coexisting simultaneously, each distinguished according to technique of generation, frequency of appearance, register and instrumental coloring."[41] This might be seen as implying a possibility of a density of separate compositions within one piece.

16. 11. 2017, footnote 3, p. 4

[35] Hayden, Sam (2016), "Complexity, Clarity and Contemporary British Orchestral Music", in: *Tempo* 70, Cambridge: Cambridge University Press, p. 63-78

[36] ibid., p. 73

[37] This claim could be challenged by further examination of works such as Adès' *Piano Quintet* or the third of Benjamin's *Three Inventions*. Adès' relationship to "New Complexity", especially with regard to rhythm, is further discussed in Belling, Huw (2010), *Thinking Irrational: Thomas Adès and New Rhythms*. Critical Project in partial fulfilment of the requirements of the Master of Music degree in Advanced Composition. London: Royal College of Music

[38] Hayden, Complexity, p. 76

[39] ibid., p. 65

[40] ibid., p. 76

[41] Boros, James and Toop, Richard (1995) (eds.), *Brian Ferneyhough: Collected Writings*, p. 310

1.5 *Musique saturée*

A different approach to density is used by the composers of the *musique saturée* movement, such as Franck Bedrossian and Raphael Cendo. In his article *An excess of gesture and material*[42] — which he describes as an "[…] attempt to shed light on this musical grammar […]"[43] —, Cendo gives a basic definition of the term saturation:

> "Instrumental saturation may only be understood in reference to its most basic notion, i.e. the excess of one or more parameters within a given context. One simple example would be the distortion created by a microphone when one attempts to record an excessively loud sound. Beyond a certain point the microphone is no longer able to function correctly and to provide a faithful reproduction of the sound environment in which it is operating. Consequently, sonic artefacts are generated: an ***excess*** of sound causes saturation."[44]

This idea of excess is linked to the concept of density; one of the examples of this idea is described as "saturation by density", which is "[…] the excess of material in a given period of time […]"[45] and which is then further explicated by using an example from the opening of Cendo's string quartet *In Vivo* (2011) in which "[…] the second bar alone contains 13 non-synchronised accents within only 2½ seconds of music"[46].

A different concept of density, which is referred to in the the preliminary pages of the score of *In Vivo*[47], refers to the density of the granulation of sound produced by different degrees of pressure exerted on the bow while playing. Later in his article, Cendo refers to "granular density" in describing a section of the third movement, in which this technique is combined with a cracking sound produced by the bow hair on the strings[48]. This granular density is described as having three different degrees in its own right and implying "[…] a lack of control of periodicity (except when the density is very low)"[49]; however, in the music example used to highlight this concept (mm. 56 f., third movement[50]), this concept is only linked to the highest state of bow pressure and granulation and played with a high degree of density.

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[42] Cendo, Raphael (2015), "An excess of gesture and material – Saturation as a compositional model", in: *Dissonance* 125, Basel
[43] ibid., p. 1
[44] ibid., p. 1 (Cendo's italics and bold-face)
[45] ibid., p. 1
[46] ibid., p. 3
[47] Cendo, Raphael (2011), *In Vivo* for string quartet, Paris: Billaudot, p. 2
[48] Cendo, An excess of gesture and material, p. 3-4
[49] ibid., p. 4
[50] Cendo, In Vivo, p. 27 f.

Excess and saturation are however not used by Cendo as synonyms for density. This is implied by a remark on what he calls "infra-saturation": "[…] retaining the dominant sounds [of saturated music] but at a low intensity whilst maintaining extreme speed, as well as an excess of density and event multiplication"[51]. If an "excess of density" is not merely tautological, excess and saturation go beyond a merely "grammatical" approach to density, as shown in the article discussed above, but also encompass aesthetic goals. This thought is corroborated by an earlier article of Cendo — *Les paramètres de la saturation*[52], which is in many ways a predecessor to the aforementioned essay — which describes the example used above of the distorted signal produced by the recording of an excessively loud sound by a microphone as an "[…] incapability to transcribe the real"[53] which "[…] thereby opens up to the sound a space which was previously unheard, a new poetry"[54].

1.6 Conclusion; towards a new definition of Density

This survey of writings on density shows that density is used to describe a wide variety of musical phenomena across different parameters of music. What can also be seen is that there is a considerable difficulty in distinguishing density from adjacent concepts, such as polyphony or excess, or even to define density in the confines of a single essay. However, all the articles cited share a similar approach to conceptualizing density as having to do with a specific (usually high) amount of musical information related to a specific context — pitch, rhythm, "grains", etc. — and to one of the two compositional planes (horizontal or vertical).

Based on the theories discussed above, I want to propose a definition of density as ***the number of events within a specific frame of musical time and a specific musical parameter (e.g. pitch, rhythm, timbre, etc.)***. The specific frames could be longer — in which case the described density will likely be horizontal — or just be a short "slice" of musical time — in which case the described density will likely be vertical. This definition closely follows Xenakis' use of the term in *Formalized Music*, in that it does not necessarily limit the use of density to describe the parameters of pitch (for the vertical plane) and rhythm (for the horizontal plane), but includes any parameter of musical organization by the introduction of two necessary descriptors.

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[51] Cendo, Excess of gesture and material, p. 12 (Cendo's italics)

[52] Cendo, Raphael (2008), "Les paramètres de la saturation", in: *Franck Bedrossian: De l'excès du son*, Champigny sur Marne: Collection À la ligne, p. 31-37

[53] ibid., p. 33 (original French: "[…] une inaptitude à transcrire le réel."; translation: Jean-Charles Beaumont)

[54] ibid., p. 33 (original French: "[…] ouvrant ainsi un espace inédit au son, une poésie nouvelle." translation: Kaspar Querfurth)

However, in contrast to Xenakis, this definition would not only involve "grains" of sound, but would also allow for a "polyphony" of different densities. To give an example, the famous opening page of Ligeti's *Atmosphères* includes a cluster of 66 concurrently sounding pitches, which would constitute a high degree of vertical pitch density[55]. However, simply speaking of a "dense" passage of music in this case would be imprecise, because the passage is rhythmically entirely static, its only horizontal activity confined to the gradual phasing out of pitches. This results in a very low degree of horizontal rhythmic density, concurrent with the high degree of vertical pitch density. Reversing these two density manifestations, the opening of the third movement of Ligeti's *Kammerkonzert* for 13 instrumentalists (1969-70)[56] opens with a comparatively high degree of horizontal rhythmic density — 8 impulses per second or 32 impulses per measure —, but the lowest possible degree of vertical pitch density — the sole pitch *e4*.

The definition given above also removes density as a compositional concern from its association with high surface-level density (although most works discussed in this literature review feature just that). By not necessarily defining density as a high degree of musical activity but as a value relating to a specific frame of musical time, a composition like Antoine Beuger's *calme étendue* (1996) — which can consist of just a single played sound in the span of 9 hours — can be seen as just as extreme of an exploration of the limits of horizontal rhythmic density as a piece like Conlon Nancarrow's *Study for player piano No. 21 (Canon X)* (1961), which features an extremely high horizontal rhythmic density of up to 17 impulses per half second that is unplayable by a human performer and therefore necessitates the use of a mechanical player piano.

So far, density has exclusively been discussed with reference to works written in the 20th or 21st centuries. This is not to say that compositions of earlier artistic epochs have not included or concerned themselves with density. However, before the post-war avant-garde, density techniques have rarely been the primary focus of a composition and have usually been deployed locally as effects or carriers of specific meanings. An example of the former use of density can be found in the sudden burst of hemidemisemiquavers in the second movement of Beethoven's *Symphony Nr. 8* (1812)[57]; the latter can for example be found in the huge diatonic cluster that slowly unfolds at the beginning and end of Richard Strauss' *An Alpine Symphony* to convey — as indicated programmatically in the score — dawn and nightfall[58].

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[55] Ligeti, György (1963), *Atmosphères* for large orchestra, Wien: Universal Edition, p. 1

[56] Ligeti, György (1970), *Chamber Concerto* for 13 instrumentalists, Mainz: Schott, p. 61

[57] Beethoven, Ludwig van (1812), *Symphonie Nr. 8 in F major*, ed. Jonathan Del Mar, Kassel: Bärenreiter, 1999, p. 29, m. 23

[58] Strauss, Richard (1915), *An Alpine Symphony*, op. 64, ed. Stephan Kohler, London: Ernst Eulenburg, 1996, pp. 1-8 and p. 156/157

It is at this point also necessary to distinguish density from two adjacent, but different concepts: counterpoint and polyphony. Counterpoint can be defined as "[…] the combination of simultaneously sounding musical lines according to a system of rules"[59], while polyphony can be defined as "[...] music in more than one part […] and the style in which all or several of the musical parts move to some extent independently"[60]. Both definitions imply a vertical harmonic density greater than one and can indeed come together to form compositions of intricate density, such as Thomas Tallis' 40-part motet *Spem in alium nunquam habui*, which both features vast textures using the full complement of voices, as well as slowly unfolding increases and decreases of vertical density, which are immediately graphically evident in the printed score[61]. However, while the system of rules that makes up a given counterpoint could refer to a precise number of musical events between lines, it could very well refer to different, isolated phenomena in music, most commonly pitch. Similarly, while most dense music will also be polyphonic, density-related compositional techniques can also be deployed in single-part music — this will be shown over the course of this thesis (for example in chapter 8.3.3).

In the following chapters, I will chronologically discuss the pieces I wrote to further investigate compositional questions that arose from the extended definition of density given above. The two concertos *Sammlung* and *Absicht* form initial explorations of different types of density arrived at through various combinations of compositional frames and parameters. These explorations formed a direct application of the expanded definition of density onto one of my principal compositional interests, which is parametric polyphony. I had already begun to explore this topic — and its uses beyond its integral serialist origin, such as the further articulation and elaboration of melodic lines — in pieces written before the beginning of this research, such as *not telling* for two percussionists or *dark beats instanter* for mezzo-soprano, bass clarinet and harp[62]. My findings in the concertos then suggested most of the research questions and concepts in the subsequent pieces. *bloßes Zubehör der Maschine* and *streifen* use as their central idea the manipulation of frames and their relationship to density. *4 Abbilder* and *ein Perspectiv, oder vielmehr die Farbe des Glases* explore the aesthetic idea of sonic resolution, analogous to image resolution. The only outlier is *launenhaftes Licht*, which combines the latter two topics into one piece.

[59] Sadie, Stanley (Ed.), *The New Grove Dictionary of Music and Musicians*, 2nd edition, Vol. 6, London: Macmillan, 2001, p. 551. The *Grove* does not include an article on density.
[60] Sadie, Stanley (Ed.), *The New Grove Dictionary of Music and Musicians*, 2nd edition, Vol. 15, London: Macmillan, 2001, p. 265.
[61] Tallis, Thomas (ca. 1570), *Spem in alium nunquam habui — A Motet in Forty Parts*, ed. Buck, Ramsbotham, Fellowes, Townsend Warner, Oxford: Oxford University Press, 1966, mm. 125 ff. and mm. 1-24
[62] see footnote 64

2. *Sammlung* for basset clarinet and chamber orchestra

2.1. Introduction

Sammlung was written as the first piece in the course of my doctoral studies and is a concerto for basset clarinet and chamber orchestra. The initial idea while writing the piece was to have the soloist completely overshadowed by the orchestra in the beginning and then to gradually reassign more and more of the orchestra's material to the soloist, so that in the cadenza the solo clarinet would concentrate the entire musical material previously played by 28 musicians into one single instrument. The basset clarinet, which accentuates the registral differences present in ordinary clarinets by the addition of additional pitches in the bottom register, seemed uniquely suited to this endeavour of simulating different orchestral timbres in one single instrument. Also, conflating detailed orchestral material — which depends on the interaction of multiple performers — into material that has to be managed by a single performer poses questions regarding performability and fidelity to a source whose material would ordinarily be too dense for a single performer.

Both in coming up with a framework for this gradual shift of material from the orchestra to the solo clarinet as well as in shaping this material — namely its abrupt changes in tone-colour — strategies were used that are directly connected to ideas of density. Also, density came into focus as a means of varying structural means such as rows and periodic rhythms while still retaining their effect of maintaining structural unity throughout the piece.

2.2. Density as a principle for formal organization

Sammlung is organized into multiple smaller sections, whose lengths are determined by a string of periodic impulses of constant number — a constant horizontal rhythmic density — and duration. For example, mm. 4-6, of which each measure is one small section, feature a constant flow of 12 semiquavers per measure, filling out an entire 3/4 bar. The next smaller section (mm. 7-9) does again feature a periodic flow of 12 impulses. However, this time the overriding note-value is dotted quavers, which brings the length of this smaller section up to three 3/4 measures. Large-scale formal development is thus created by varying the overriding note-value of the smaller sections. Across the whole piece, each larger section starts in its densest state of horizontal rhythmic density and then gradually — by elongating the overriding note-value — becomes less horizontally dense and more transparent.

To introduce further timbral articulation and — by breaking up the periodic rhythm — add to the unpredictability of the sonic surface of the smaller section, a second layer of two impulses —

one near the beginning and one near the end of each smaller section — is superimposed onto the layer of periodic impulses[63]. Finally, the small sections are often interjected with short measures that feature periodic strings of semiquavers. These act as freely distributed distortions of the overall rhythmic scheme and often provide an audible difference in horizontal rhythmic density. Figure 2.1 shows an example for the processes described above.

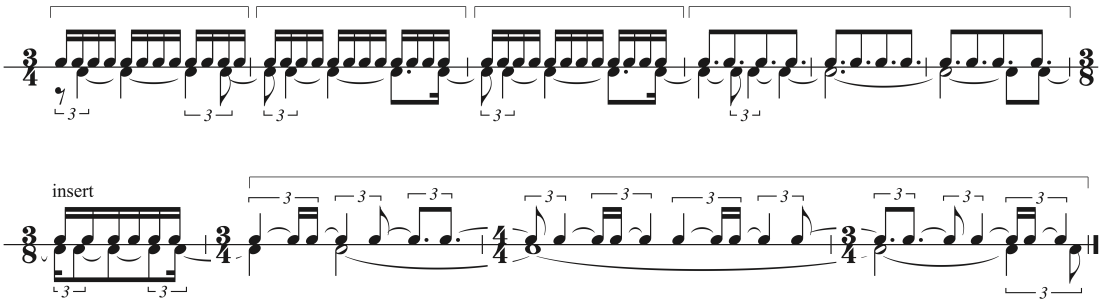

Figure 2.1 — rhythmic scheme of mm. 4-13; the duration of each small section is denoted by a bracket

2.3. Density as a principle for timbral organization

The audible surface of *Sammlung* is characterized by abrupt, short changes in timbre. These changes are governed by two rows of timbral values, which are mapped on the two layers of impulses discussed above. These impulses along with their timbral values are in turn mapped onto a continuous melody and a continuous chord progression. This technique allows for a very specific but still highly organized timbral articulation[64] and also, by linking the timbral transformation of a musical surface to a rhythmical construct that organizes the amount of impulses within a given timeframe, constitutes a form of horizontal timbral density. A link can here be traced to the integral serialist notion of parametric polyphony, in which a single note is shaped by the combination of several rows of parameters[65], as well as to Aaron Cassidy's

[63] This constitutes a problem later in the piece: because the first impulse is necessarily held over almost the entire smaller section, this additional timbral articulation can in longer smaller sections completely overpower the rest of the structure (as for example with a tremolo articulation that would then be held over almost a minute of music). Therefore, this second layer is dropped from the structure of the piece from m. 133 (which is roughly the structural halfway point of the piece).

[64] As mentioned in the introduction, I have used this technique before in *dark beats instanter* for mezzo-soprano, bass clarinet and harp (2014) and *not telling* for two percussionists (2015) and also described it in further detail in my masters thesis, *Das Konzept des Artikulations-Rhythmus dargestellt am Beispiel von* not telling *für zwei Schlagzeuger* (2016).

[65] examples in this style include Pierre Boulez' *Structures Ia* (1951-52) or Luigi Nono's *Il Canto Sospeso* (1955-56); on the former piece, see also Whittall, Arnold (2008), *The Cambridge Introduction to Serialism*, Cambridge: Cambridge University Press, p. 4 and pp. 175-176

aforementioned article *Interconnectivity and Abstraction*[66], which expands from the idea of parametric polyphony outlined above in that the statements of the different parametric rows do not necessarily coincide on one single note, but — through their de-coupling — form separate layers. A similar approach, only applied to the compositional process itself, is at work here. The following example, which shows an excerpt of the sketches for the section immediately following letter W, shows the stages of this compositional process.

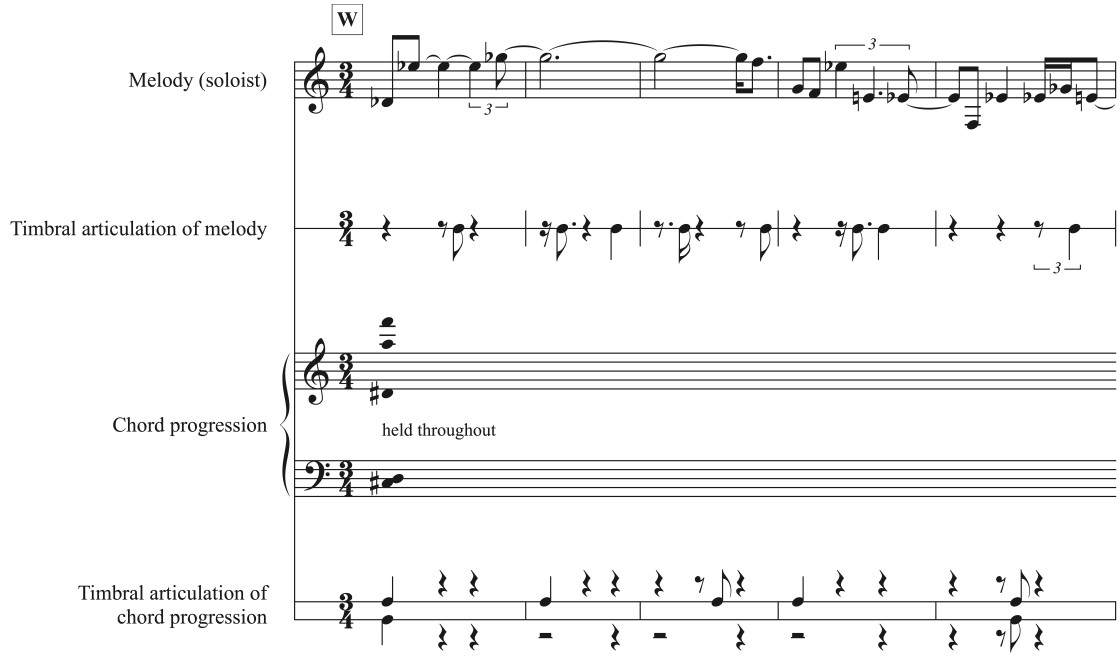

Figure 2.2 — sketch for the first 5 bars of letter W

In the denser moments of the piece, this procedure generates what are essentially very complicated hockets. To lessen the challenge for the performers, short crescendi from *niente* or *ppp* were added before the actual "attack" of the rhythm.

2.4. Redistribution of material from orchestra to soloist

Working with a specific amount of impulses in each smaller section of the piece — a specific horizontal rhythmic density — allows for a precise gradual redistribution of material from the orchestra to the clarinet by way of simple ratios. The clarinet spends most of the first large section of the piece silently and enters in measure 32 with — after an onset crescendo of one semiquaver — one quaver-triplet, or 2/9 of this smaller section's total duration. From there on, the clarinet gradually takes on more and more of the orchestra's material in this manner, drawing from the melody and its timbral rhythm until it has completely usurped this material in figure O (mm. 136). From then on, it gradually takes on the material from the chord progression

[66] Cassidy, Interconnectivity and Abstraction

and its timbral articulation, finally joining together the entire material of the piece in the cadenza. This process, too, uses horizontal rhythmic density as a tool for precisely sketching out a large-scale development.

This process can also be used as an example of how the constraints posed by density — in this case the vertical pitch density of a chord in its context of a single performer with a usually monophonic instrument — can be used to vary and shape the material of a piece at a local level. Condensing polyphonic orchestral material for a single solo instrument does necessitate certain changes to the material. Any chord is able to be set for an orchestra, provided there are enough players for every pitch in the chord. A clarinet is able to play chords by using multiphonics; however, even though a large number exists, they depend on the acoustic characteristics of the instrument and are therefore less flexible than the possible chords of an orchestra. Therefore, compromises had to be found between staying true to the pitch content of a chord and the possibilities of the clarinet[67]. This compromise usually meant that the pitches were retained but the actual voicing of the chord changed according to the pitch distribution of a given multiphonic.

2.5. Conclusion

Because *Sammlung* has so far not been performed, it is not yet possible to draw definite conclusions regarding the effectiveness of the methods employed. However, it is possible at this stage to make assumptions based on the place these methods inhabit in the compositional process.

All three applications of density discussed above show interactions of rigid and statistical density schemes with different intuitively composed materials, such as melodies, chords and timbral rows. Because of these interactions, the density schemes do not appear as material in their own right and — even though there are sporadic passages of audibly high surface-level density — most of the piece might not sound superficially dense, nor might it directly communicate its ideas of density to the listener. These concerns do not necessarily invalidate the application of these techniques: as was shown in the first chapter, density refers to the amount of information in a specific timeframe — which could be very low — or could be used within a parameter such as timbre that does not affect the surface of the music as conspicuously as for example pitch or rhythm would do. This could serve as a first step of the exploration of density

[67] the multiphonics for *Sammlung* were taken from Krassnitzer, Gerhard (2002), *Multiphonics für Klarinette mit deutschem System und andere zeitgenössische Spieltechniken*, Aachen: edition ebenos. Further research into the practicality of these multiphonics on a basset clarinet still needs to be undertaken.

as more than a material in itself, but as a principle that informs, structures and details a piece at both the small-scale and large-scale level, without appearing as its central material.

Nevertheless, the use of density in a more surface-level setting, as well as the relation between organisation of density and more intuitive writing such as the superimposition of additional layers, seemed a relevant topic in the context of this research, which I tried to explore further in subsequent pieces.

3. *Absicht* for marimba and ensemble

3.1. Introduction

Absicht (German for "intention, purpose"; a more literal translation of the compound word "Absicht" would be "down-view") for marimba and ensemble was written on the request of the Oslo-based percussionist David Cariano Timme. Written just after *Sammlung* — which involves density-based compositional strategies both for the soloistic and orchestral writing — the initial challenge in this piece was finding a different approach for using density as a vital component without merely repeating the concepts of the former piece. In the end, *Absicht* does use many similar approaches for delineating formal and timbral organization; however, they involve different parameters and trace a different narrative than the former piece.

An initial impulse for the development of the constituent material of *Absicht* was a passage from the article *Monstrosity, from Eye to Ear* by the French composer Franck Bedrossian[68], one of the foremost representatives of the compositional movement *musique saturée* (see chapter 1.5). In this fundamental article on the aesthetic approach of this movement, Bedrossian writes:

> "In other words, a saturated sound played by acoustic instruments *interrogates* the act of listening in a radical way. For we still have no idea *where* the saturated sound *comes from* — that is, what its material origin is, what playing techniques and timbre combination generate it — and we do not even know, at a poetic level, *where it is going*, what it is supposed to evoke, to what it makes reference: its identity is unstable, even *hybrid*."[69]

[68] Bedrossian, Franck (2008), "Monstrosity, from Eye to Ear", in: *Franck Bedrossian: De l'excès du son,* Champigny sur Marne: Collection À la ligne, 2008

[69] ibid., p. 16 (original French: "Autrement dit, un son saturé émis par les instruments acoustiques *interroge* l'écoute de manière radicale. Car on ne sait pas toujours *d'où il vient* —

This notion poses fundamental questions regarding the role of a soloist in a concerto setting. Simon P. Keefe, in his essay *Theories of the concerto from the eighteenth century to the present day*, argues that "[…] a concerto from the eighteenth century through to the present day is expected to feature a soloist or soloists interacting with an orchestra, providing a vehicle for the solo performer(s) to demonstrate their technical and musical proficiency."[70]. Bedrossian's text suggests that the perception of one or more performers of an ensemble assuming the role of a soloist is not possible in pure *musique saturée*, due to its techniques and aim of obscuring the material origin of the sounds used. In this case, even if a soloist or soloists would demonstrate their technical and musical proficiency in interaction with an orchestra, they would still do this using material that obscures their own soloistic identity apart from the orchestra.

It is perhaps not coincidental that, at the time of writing, Bedrossian's output for soloist and ensemble has so far limited itself to either vocal music (*Epigram I-III* for soprano and ensemble [2010, 2013/14 and 2018]) or music for soloistic ensemble (*Division* for bass clarinet, trombone, double bass, ensemble and electronics [2006]). One approach to this issue is offered by another composer and theorist of the *musique saturée* movement, Raphael Cendo, in his bass clarinet concerto *Action Directe* (2007), in which "[…] the soloist has to produce a monumental energy which allows him to emerge out of the sound mass played by the rest of the ensemble"[71]. Thereby, "the constant confrontation between the soloist and the ensemble pushes the performer to affirm his supremacy, to find an identity of his own in the context of the global auditive information."[72] This placement of musical material and roles directly links Cendo's approach with historical approaches to the concerto, of which Keefe claims that "late eighteenth- and nineteenth-century writers often consider active interaction between the concerto soloist and the orchestra an ideal foil for 'excessive' solo virtuosity"[73]; "excess" being one of the key concepts in Cendo's theoretical writings[74].

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quelle est son origine matérielle, quelles techniques de jeu, quelle combinaison de timbres le génèrent — ni même, à un niveau poétique, *où il va*, ce qu'il est censé évoquer, ce à quoi il fait référence: son identité est instable, voire *hybride*." translation: Jean-Charles Beaumont/Kaspar Querfurth; Bedrossian's italics)

[70] Keefe, Simon P. (2005), "Theories of the concerto from the eighteenth century to the present day", in: Keefe (ed.) *The Cambridge Companion to the Concerto*, Cambridge: Cambridge University Press, 2005

[71] Cendo, Raphael (2007), *Note de programme for* Action Directe [Online] Available at: http://brahms.ircam.fr/works/work/20702/, accessed 3. 11. 2017 (original French: "Ici, le soliste doit produire une énergie monumentale qui lui permettra d'émerger de la masse sonore jouée par le reste de l'ensemble." translation: Kaspar Querfurth)

[72] Ibid. (original French: "La constante confrontation entre le soliste et l'ensemble pousse l'interprète à affirmer sa suprématie, à trouver une identité qui lui est propre dans le cadre de l'information auditive globale." translation: Kaspar Querfurth)

[73] Keefe, Theories of the concerto, p. 9

[74] see for example Cendo, Excess of gesture and material; discussed in chapter 1.5

My own approach to this problem in *Absicht* was to stratify the used musical material into two distinct categories of sounds, which are played as entirely separate layers by the ensemble, and to place the soloist as the sole member of the instrumental ensemble who is able to fuse both strands into a whole, as the outcome of a gradual process. This also was conceptualized as a reversal of Bedrossian's theory outlined above that the saturated sound obscures its instrumental origin, because here the soloist becomes audible as a soloist only through the overlaying of different materials.

The first, "pure", category consists of a series of linear ideas, which are harmonized in different chordal densities or laid out in different degrees of vertical melodic density and for the most part played in an ordinary fashion relative to the instrument. The second category consists of a continuous underlying tremolo, which is in addition coloured in according to a constantly repeating sequence of playing techniques. This sequence consists of, again, "pure" sounds — played *tremolando* but with no other timbral modification —, "hybrid" sounds — played *tremolando* but with additional modifying playing techniques that combine the pure sound with a noisy component, e.g. slight overpressure on string instruments — and "noise" sounds — played *tremolando* but using playing techniques that do not involve any kind of pitch, e.g. air sounds.

The playing techniques used effect a constant maximum level of horizontal rhythmic density; variation and formal delineation of this state is introduced by the stacking of different layers of rhythmic values, which constitutes a vertical rhythmic density. The notion of vertical rhythmic density seems at first a paradox, rhythm being a musical parameter that unfolds through time and therefore is assigned to the horizontal plane of musical organization. However, even though the audible change effected through a high vertical rhythmic density — as for example in mm. 301-303 — is perceived as an increase in horizontal rhythmic density, it is organized through a stacking of rhythmical layers, which corresponds to the vertical plane.

This overlaying of playing techniques does again relate to certain practices used by composers of the *musique saturée* movement (see for example the opening of Raphael Cendo's *Tract* for 7 players [2007], in which the tubax produces a distorted, unpredictable sound by the combination of overblowing, rapid tremoli and *smorzando*[75]); however, it is here used to further vary and define the sound quality of a background layer and has through both its relatively quiet dynamics and its low degree of timbral density no connection with the the aesthetics of instrumental excess.

[75] Cendo, Raphael (2007), *Tract* pour 7 musiciens, manuscript, m. 1

3.2. Use of density for formal delineation

3.2.1 Vertical pitch density

The layer of "pure" sounds in the orchestra is characterized by a sequence of chord progressions harmonizing an upper line. During each part of the piece, these chords undergo a gradual development in the number of simultaneously sounding pitches, which constitute a vertical pitch density. Figure 3.1 below shows as a general example the development of these values for the opening of the piece[76].

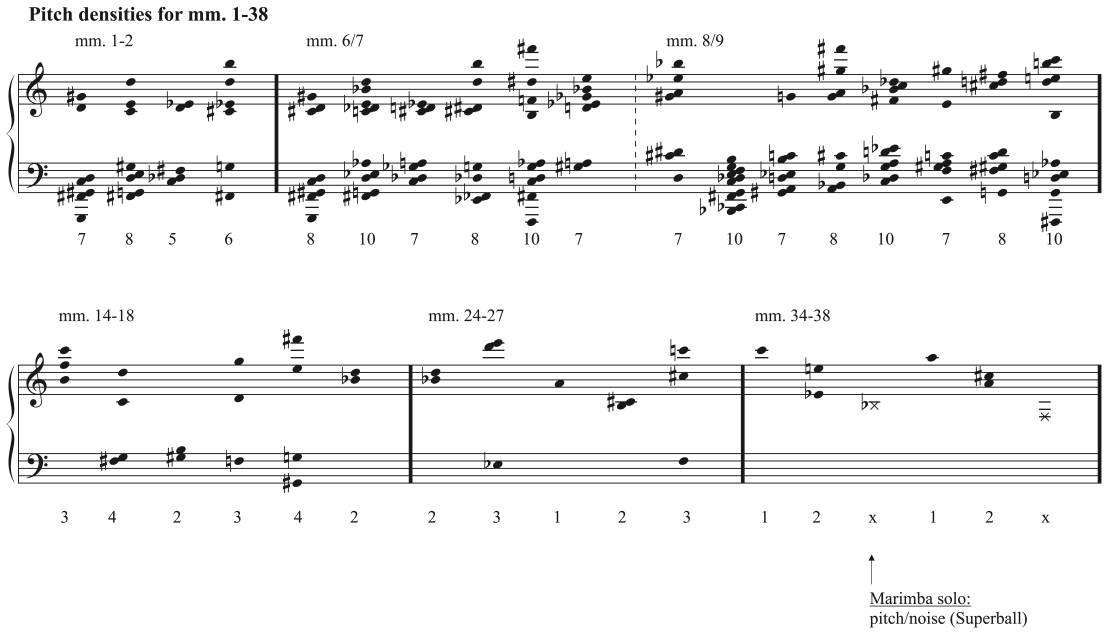

Figure 3.1 — vertical pitch densities for mm. 1-38

As can be seen, the overall density scheme of this section traces a short rise to a maximum density level (7-8-5 to 8-10-7) and then a gradual decline (3-4-2 to 1-2-x). This scheme is also structurally mirrored, both within each smaller section and the overall shape of the entire first part, as can be seen from table 3.1 below. This shows that, through detailed organization of vertical pitch densities, it is possible to precisely delineate an overall shape of a large-scale musical structure.

1.1 (mm. 1-40)	6 - 8 - 5	8 - 10 - 7	3 - 4 - 2	2 - 3 - 1	1 - 2 - x
1.2 (mm. 41-69)	6 - 8 - 5	3 - 4 - 2	8 - 10 - 7	6 - 8 - 5	3 - 4 - 2
1.3 (mm. 70-106)	3 - 4 - 2	6 - 8 - 5	3 - 4 - 2	2 - 3 - 1	
1.4 (mm. 107-139)	2 - 3 - 1	3 - 4 - 2	2 - 3 - 1	1 - 2 - x	1 - 2 - x soloist only
1.5 (mm. 140-168)	1 - 2 - x	2 - 3 - 1	1 - 2 - x	x - 1 - x	

Table 3.1 — vertical pitch densities for part 1 (mm. 1-168)

[76] The crossed-out noteheads in mm. 34-38 denote a hybrid sound between noise and pitch as a value "below" 1 (= single pitch). These sounds are assigned to the soloist playing with a superball mallet as a prefiguration of the later soloistic material, which will be discussed in subchapter 3.

This conceptualization of pitch density is linked to Pierre Boulez' analysis of the "L'artisanat furieux" section of his *Le marteau sans maître* in his article *Éventuellement…*[77]. However, Boulez differentiates between a theoretical aggregate of pitches derived from pitch multiplication and an actual sum of tones arrived at by eliminating common tones — the same pitch class in different octaves — in an aggregate that are produced through the multiplication process. The chords in *Absicht*, which are arrived at through a similar multiplication process, include common tones; the possible negative effect this could have on the perception of the vertical pitch density scheme is discussed in subchapter 3.4.

3.2.2 Vertical melodic density (mm. 169-290)

The second part of the piece uses as its constituent material for the layer of "pure" sounds not a linear chord progression but different simultaneously played melodic materials. This simultaneity constitutes a vertical melodic density, which is then used for the overall formal organization of this part, similar to the use of vertical pitch density described above for parts 1 and 3. The different values of vertical melodic density used are:

- single lines (e.g. mm. 239-242)
- 2- or 3-part counterpoint (e.g. mm 173/174)
- false mixtures, which through the lens of counterpoint form a single line, albeit one that is still shaped in its colour by several stacked lines (e.g. mm. 197-199)
- broken lines, which radically lower the horizontal melodic density per phrase (e.g. mm. 204-208)
- broken lines played solely with untuned percussion instruments, similar to the use of pitch/noise hybrid sounds in part 1 (e.g. mm. 230-232)

Table 3.2 shows the overall development of this vertical melodic density:

2.1 (mm. 169-192)	single line	3-part counterpoint	false mixtures	single line	broken line
2.2 (mm. 193-213)	2-part counterpoint	3-part counterpoint	false mixtures	2-part counterpoint	2-part broken line
2.3 (mm. 214-238)	false mixtures	3-part counterpoint	single line	broken line	broken line (only percussion)
2.4 (mm. 239-264)	single line	false mixtures	broken line	broken line (only percussion)	piano solo (vertical pitch density 5-6)
2.5 (mm. 265-290)	single line	2-part counterpoint	false mixtures	single line	broken line

Table 3.2 — vertical melodic densities for part 2 (mm. 169-290)

[77] Boulez, Pierre (1952), "Possibly…", quoted from: Boulez, Pierre, *Stocktakings from an Apprenticeship*, translated by Stephen Walsh, Oxford: Clarendon Press, 1991

As can be seen, each smaller section of part 2 forms a similar rise-and-fall shape to the smaller sections of part 1.

3.3. Construction of soloistic identity

The distinguishing role of the soloist in relation to the orchestra is the ability to draw on both strands of the fundamental material — "pure" and "hybrid" sounds. During the course of the piece, the soloist gradually combines both strands to form his own soloistic identity apart from the orchestra. This combination is achieved through the use of two types of mallets. The first and more prevalent of the two is a superball mallet: a rubber ball with a specific raw surface affixed to a mallet shaft or knitting needle and then dragged across the surface of an instrument. Used on marimba plates, this mallet produces a quiet, perforated sound which still retains its pitch content. The second is a coin that adds a buzzing sound to a resonating plate. These sounds are the most direct connection *Absicht* has with the sound world and methods of sound production of the *musique saturée* movement, especially passages such as the beginning of Raphael Cendo's *Tract* drawn on above. Both techniques effect a sound quality which mixes both pitched and unpitched sounds. This overlap of different sound qualities connects these playing technique to the "hybrid" background layer of the orchestra.

The overall development of the solo part throughout the piece traces a line from an almost direct association of the soloist with the orchestra at the start of the first part to a high degree of independence from the orchestra in the third part. Throughout the first part, the marimba doubles the upper line of the linear chord progression with ordinarily played sounds, thereby becoming a part of the orchestral material. To this structure, short hybrid sounds — played with the coin and later with superballs — are added, creating a complementary rhythm with the orchestral layer for each of the phrases outlined above.

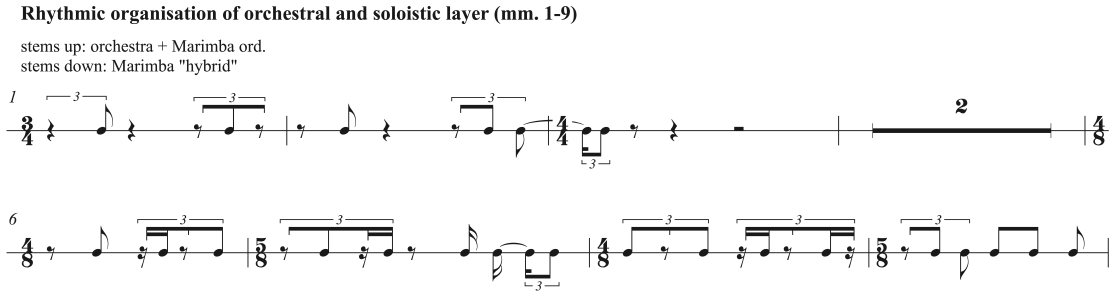

Figure 3.2 — complementary rhythms for the first two phrases of section 1.1

The rhythmic cells of the marimba "hybrid" layer for the first five phrases are repeated for each subsequent phrase structure, but fitted into the different lengths of the phrases determined by the linear chord progression. In this way, the relationship between a mostly constant density of

attacks and a constantly changing horizontal frame, accounts for the bulk of the rhythmic development in the solo part.

The "fitting-in" of the rhythmic cells was calculated using the software OpenMusic[78]. An overview of the first phrases of 1.1 to 1.5 is given below. In almost all cases the calculated rhythm proved to be needlessly complex for the purposes of this piece and was rewritten with semidemiquaver-triplets as the smallest value. The original calculated rhythm is shown in smaller print below the modified rhythm used in the piece. Additions to the rhythmic cells are shown by the marking "+1".

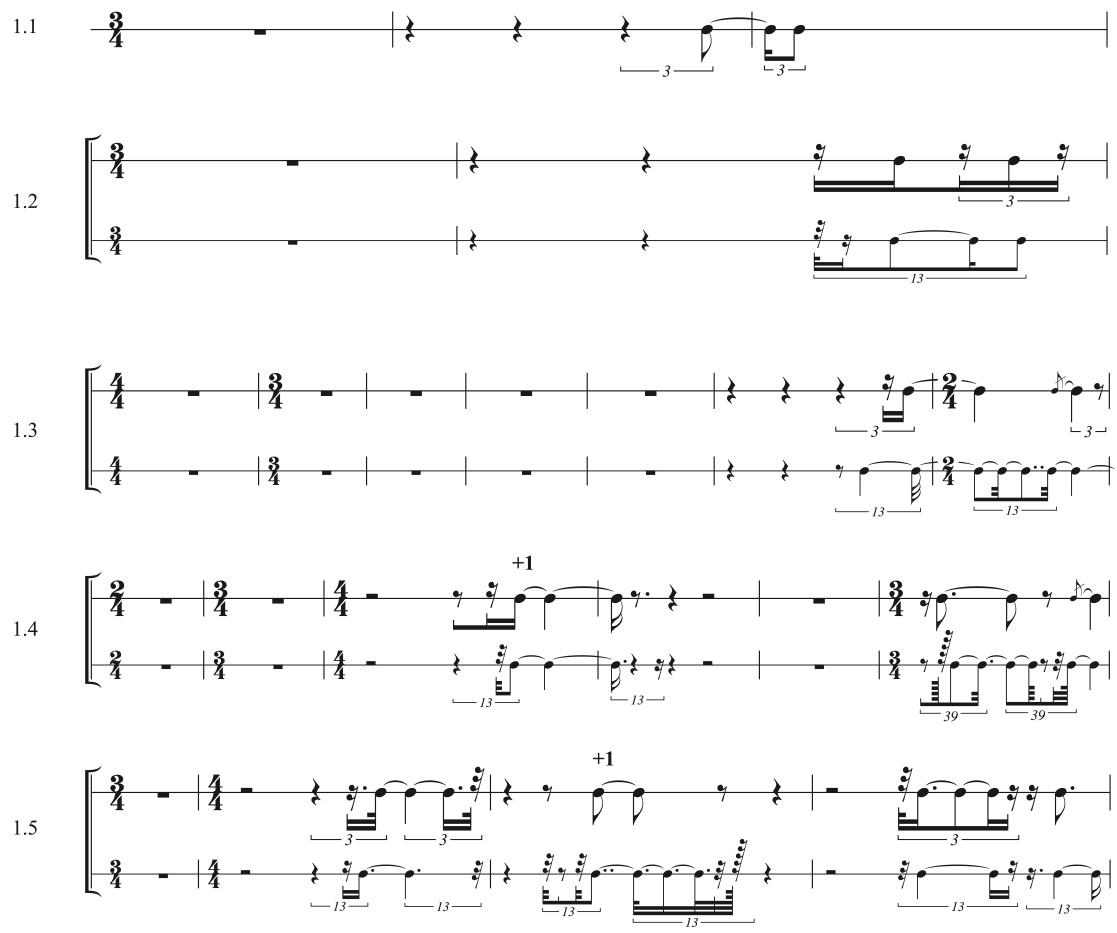

Figure 3.3 — development of soloistic rhythmic material for the first phrases of 1.1-1.5

A first degree of soloistic identity is thus reached in the first part by the displacement of hybrid material from its original function as a complimentary part of the orchestral texture, facilitated by the use of constant horizontal rhythmic density within a changing timeframe.

[78] A LISP-based composition software developed by Carlos Agon, Gérard Assayag and Jean Bresson at IRCAM and first released 1998, which is widely used in — amongst others — algorithmic and spectral composition contexts. Version used: 6.12. The manipulation of horizontal frames forms the central compositional focus of *bloßes Zubehör der Maschine* and *streifen* and is further explored in these two pieces and their commentaries.

In the second part, the marimba retains its setup from the first part, doubling pitches from the orchestra's melodic lines in rhythmic shapes similar to the ones used in part 1. This abandonment of the direct doubling of orchestral shapes constitutes a further emancipation of the soloist from the orchestra. Additionally, the fitting-in of rhythmical structures into different timeframes established by the phrase lengths of the orchestra is retained from the first part. The frames in question however are much shorter in comparison to the phrases of part 1, resulting in a much more cramped outcome of the variation of the rhythmic cells outlined above. These cells thus shift from being perceived as unconnected sounds, as in part 1, to motive-like figures, again as an effect of a scheme of horizontal rhythmic density.

The third part primarily uses the melodic and rhythmic material of a series of small interludes that appear throughout the piece to conclude the 5-phrase structures (for example in mm. 67-69), chained together to form long melodic lines and further coloured in by the use of "hybrid" playing techniques. However, here these techniques do not create a static background, but further articulate the linear material through different forms of maximal horizontal rhythmic density. Thus, a synthesis between the linear and static elements is achieved. This synthesis however remains exclusive to the soloist.

3.4. Conclusions

The only so far performance of *Absicht* has shown some considerable conceptual difficulties in the piece. Firstly, the achievable dynamics using the superball technique on a marimba are on the low end of the dynamic range, which sometimes works quite well in quiet orchestral settings (e.g. mm. 164-168) but sometimes renders this crucial strand of soloistic material inaudible (e.g. mm. 193-199). The superball also does not reliably produce a resonant sound on every plate of a given instrument; this quality also varies considerably between different instruments. A more appropriate use of this technique would therefore lie in the context of chamber or solo music, in which the fragility of the resultant sound would be more clearly perceivable.

However, the collaboration on the solo part prior to the performance showed that the superball can be used in more differentiated ways than what is written in the score. Especially the possibility of using the "press roll"-technique — which is usually used on snare drums to achieve very dense and continuous rolls and is not possible with ordinary marimba mallets due to the lack of rebound — opens up greater articulatory and dynamic possibilities while maintaining the hybrid quality of a perforated but pitched sound, especially in regards to short durations or louder material.

The second conceptual difficulty lies in the audibility of the system of vertical pitch density. While the outlined scheme of vertical pitch densities works very well as a compositional

method, the audible results of these densities proved less efficacious. This could have different reasons. Firstly, the closely spaced vertical pitch density values used throughout *Absicht*, such as 6-8-5 or 3-4-2, do not provide enough audible difference to translate the formal scheme into a listening experience. An implementation of a similar formal scheme using a wider scale of contrasts in density values would therefore be a worthwhile next step in exploring the possibilities of this idea. Another way of resolving this issue in this piece would be to reinforce the formal scheme through the use of more contrasting dynamics and gestural "signposts" at important structural breaks.

The other reason for this lack of effectiveness lies in the constitution of the chords in question. As described above, the density values used in the conception and writing of the piece refer to the number of simultaneously sounding pitches – not pitch-classes. This number is used as a merely numerical value, without taking into account acoustic phenomena that could possibly impede the perception of the precise number of pitches. Depending on the musical context however, intervals such as the octave and the perfect fifth can be subject to timbral fusion, which "[...] arises when the auditory system interprets certain frequency combinations as comprising partials of a single complex tone."[79] This phenomenon could interfere with the perception of the horizontal pitch density scheme and therefore with the perception of the large-scale formal plan. Both these acoustic implications of working with density as well as the vertical organization of timbral density therefore pose questions that need to be addressed in further research.

A further outcome of *Absicht* concerns the relation of intuitively composed material and statistically set up density processes. To the interrelations already encountered in *Sammlung*, *Absicht* adds the question of fidelity to a source. While it would have theoretically been possible to accurately transcribe the stretching and contracting processes used to vary rhythmic material in the solo part, I decided to compose more or less accurate approximations. These adhere more closely to a shared pulse with the ensemble while still suggesting the complex relations that generate the rhythmic variation. In this way, the hybrid function of the soloist is not just reflected in the approach to timbral organisation, but also in the approach to rhythm. Still, the approximations can be considered less detailed — less informationally dense — forms of the "correct" stretchings, which remain unheard in their precise form. This additional interplay of original and approximation — high density of detail and low density of detail — would also become important for subsequent pieces in my research activity.

[79] Huron, David (1991), "Tonal Consonance versus Tonal Fusion in Polyphonic Sonorities", in: *Music Perception*, Vol. 9, No. 2, Berkeley: University of California Press, p. 135; paraphrase of DeWitt, Lucinda A. and Crowder, Robert G. (1987), "Tonal fusion of consonant musical intervals: The oomph in Stumpf", in: *Perception and Psychophysics*, Vol. 41, Madison, Psychonomic Society

4. *bloßes Zubehör der Maschine* for baritone and bass flute

4.1. Introduction

bloßes Zubehör der Maschine (German for "mere accessory of the machine") was commissioned by the Birmingham Contemporary Music Group for the *Wilde Lieder — Marx.Music* project which took place in 2018 on the occasion of Marx's bicentenary. The initial brief was to write a piece for either an ensemble of flute, clarinet, percussion, piano, violin and violoncello or a duo of voice and an instrument of my own choice. My first idea was to write a piece for the ensemble scoring; however, after I made a few sketches, the brief was altered to the current scoring of baritone and bass flute to accommodate a different, earlier performance opportunity of the piece. I decided to retain the ideas I sketched out for the ensemble version and develop a duo version out of them. Because of the high level of both horizontal rhythmic density and timbral differentiation in the original sketch — dependent on six performers — this fundamental reduction in instrumental forces seemed to me to be an interesting opportunity to explore the link between density and single-instrument polyphony.

The piece sets two texts: *Die zwei Sterne*, a love poem by the young Karl Marx, written for his then-fiancé Jenny von Westphalen (of which one stanza, which explicitly names her, was omitted), and an excerpt from the *Communist Manifesto*, written by Karl Marx and Friedrich Engels, dealing with the alienation of the worker from his labour. At the start of the piece, the text of the poem is sung by the baritone and the manifesto excerpt is spoken by the flautist through the flute; later on, from p. 8 onwards, both performers share the manifesto text.

bloßes Zubehör der Maschine is based on a constant superimposition of three separately handled materials. The first of these is a more or less constant melodic line, with which the baritone sings the text of the Marx poem. This line is also taken up and continued by the flute to allow for the words to be enunciated. The second is a string of periodic impulses, of which a constantly increasing number is selected per formal section. These impulses form a rhythm which is used for the spoken manifesto text. The third element consists of nonverbal sounds that "splinter off" of the text and the melodic line. The following commentary will first discuss each of these elements on its own before discussing how they were superimposed.

4.2. Constituent layers

The melodic line was sketched out in long phrases, one for every line of the poem. Through the phrase lengths of the melodic line and their connection to the overall stanza/section formal scheme, *frames* are established, in which the level of density of the other constituent parts of the

piece can be measured and thus varied and brought into a larger overall structure. The phrase lengths are structured as follows:

Lines	**Number of measures (tempo and bar length remains constant)**
1	14
2	14
3	10
4	10
5	14
6	14
7	10
8	10
9	12
10	12
11	12
12	12

Table 4.1 – lengths of melodic lines

The initial idea for the setting of the manifesto text was to distribute the syllables of the text into the aforementioned phrases with a gradual increase in density. This gradual increase was later modified by the inclusion of two sudden peaks in the second and eleventh line — as shown in table 4.2 — to further shape the overall density development.

Line	**Number of syllables**
1	1
2	11
3	3
4	4
5	5
6	6
7	7
8	8
9	8
10	9
11	19
12	5

Table 4.2 – distribution of syllables

To organize the syllables rhythmically, different periodic rhythmic grids were used. For every available length of a melodic line, a different grid was created that starts on the second crotchet of the line (second beat of the first 2/4 bar) and then fits 19 impulses into the remaining length. The distance between the start of the periodic grid on the second beat of the line and the end of the phrase thus establishes another frame in which horizontal density can be measured. To give two examples, which are used for the setting of the manifesto text, a phrase length of 10 bars (20 crotchets) would have even crotchets as a result:

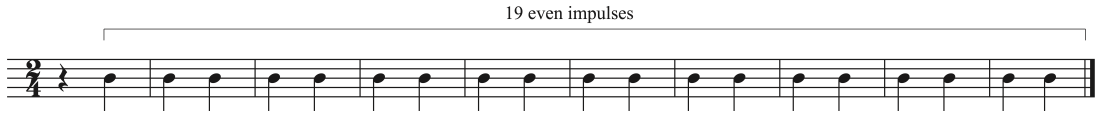

figure 4.1 – periodic rhythmic grid for length of 10 bars

A phrase length of 13 bars (26 crotchets) would have this result:

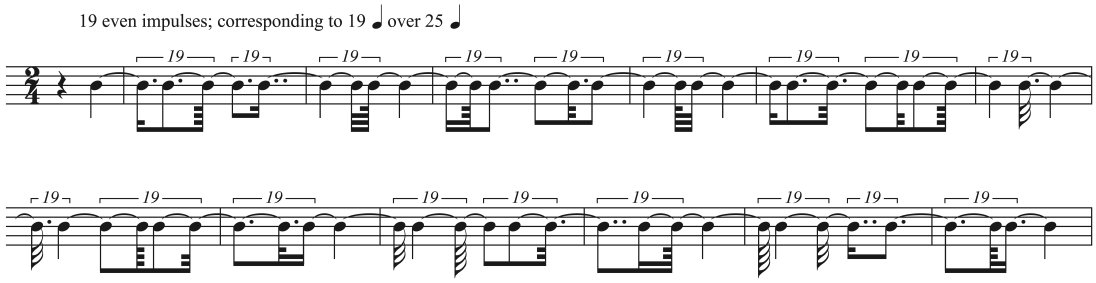

figure 4.2 – periodic rhythmic grid for length of 13 bars

For the final setting of the text, a different number of impulses depending on the context provided by the melodic line (usually within breaks or sustained notes) and corresponding to the syllable count of the line was selected from the grid and then superimposed onto the melodic line.

The effect of this increase in horizontal rhythmic density of the spoken word layer is on one hand a gradual emergence of the manifesto text throughout the piece. Because the manifesto text is only used sporadically at the beginning of the piece due to its low horizontal rhythmic density value, its verbal content is presented in a highly disjointed fashion and its meaning is mostly obscured. It can in this state also easily be confused with the non-verbal material. In the later parts of the piece, the continuity of the text is more apparent, due to its higher horizontal rhythmic density that preserves its sentence structure to a higher degree. On the other hand, this gradual emergence also causes a gradual interference with the text of the poem, generating a

conflict that leads to outright confusion and abandonment of continuity of both texts in the latter parts of the piece.

The third layer of material used in *bloßes Zubehör der Maschine* is comprised of non-verbal material. It is used throughout the piece to provide additional motivic and sonic material as well as to reinforce the density scheme and is structured in a similar way. To differentiate the non-verbal from the verbal material, an array of available sounds that were drawn from the texts, but could also be understood as sounds in their own right, was determined for the baritone. Afterwards, these sounds were matched with sounds for the bass flute. These associations are: unvoiced [s]/unvoiced [s] spoken through flute; unpitched [t]/unpitched [t] spoken through flute; pitched [r]/*flatterzunge*; pitched [z]/air sounds with faint pitch[80].

Similar to the manifesto text, the non-verbal material is also organized by the use of rhythmic grids. These grids are based on four basic rhythms, which are assigned to one of each type of non-verbal material.

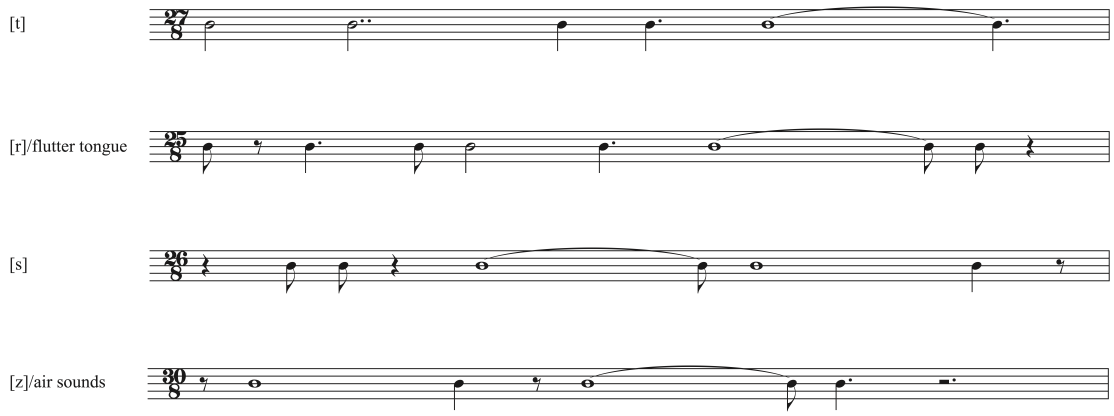

Figure 4.3 — four basic rhythms

In a similar fashion to the treatment of the periodic rhythmic grids described above, these basic rhythms were fitted into the temporal frames given by the melodic line. These resultant rhythms then were superimposed to form polyphonic rhythmical grids, with each voice corresponding to one of the used sounds. Because this process, both for the periodic grids and the basic rhythms, again resulted in needlessly complex rhythmical structures, two steps were taken to simplify the results. Firstly, the results were converted into MIDI-files and then reconverted into notation by opening them in the score typesetting program Finale and defining a hemidemisemiquaver (and its tuplets) as the smallest permissible value. This effected a still complex, but more legible rhythmical grid.

[80] In a first version, this associated flute sound was a [z] spoken through the instrument with a random, low, fluctuating pitch. This proved to be hard to realize on the bass flute and the present alternative (air sounds) was substituted.

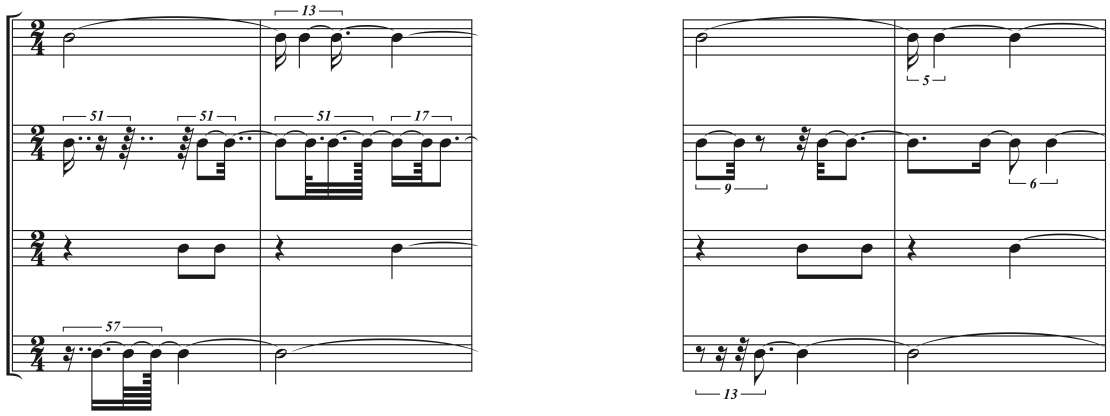

Figure 4.4 — resulting rhythmical grid calculated by OpenMusic and simplified (MIDI-)version

To include this layer into the piece, a number of impulses per polyphonic rhythmical grid was superimposed on the already existing superimposition of the two text-settings, similar to the first superimposition of the manifesto text. The number of chosen impulses again corresponds to a large-scale density scheme, in which the number of appearances of a given non-verbal material per line is organized.

Line	**[r]/flutter**	**[t]**	**[s]**	**[z]/air sounds**	**Total**
1	1	1	1	1	4
2	10	9	6	7	32
3	1	1	1	1	4
4	1	1	1	2	5
5	3	1	2	3	9
6	5	3	3	4	15
7	7	5	4	5	21
8	9	7	5	6	27
9	10	9	6	7	32
10	11	10	7	8	36
11	12	12	9	9	42
12	9	7	9	9	34

Table 4.3 — density scheme for non-verbal material

This overall shape of this scheme mirrors and reinforces the density scheme for the manifesto text.

The second superimposition also allowed for a further reduction of the rhythmical complexity of the fitting-in process, by choosing a simplification based on the already existing rhythmic context. A difference to the use of the manifesto grid arises in the handling of the different sounds: Whereas the impulses for both [t] and [s] — the two purely noise-based sounds —

simply trigger the production of these sounds, the impulses for [z]/air sounds and [r]/flutter — the two sounds that combine noise and pitch — serve as a starting point for small motifs and figurations. This different approach to sound development, as well as the differentiation of the available sounds in the entire piece into sung pitch with text, spoken text, pitched noise and unpitched noise — which all follow different forms of organization — serves to create an intricate single-instrument polyphony that suggests a far larger ensemble than the two players involved in the piece.

4.3. Superimposition and compositional choices

To give a concrete example of the compositional process, three selected crotchets (mm. 123, first crotchet; m. 124, second crotchet; m. 125, first crotchet) from the beginning of the penultimate line (mm. 123-134) — which features the highest degrees of density — will be analysed more closely.

The basic material for the superimposition process consists, as described above, of a melodic line, a rhythmic layer of periodic impulses for the spoken text — which for this line reads “von dem nur der einfachste, eintönigste, am leichtesten erlernbare” — and four different rhythmic layers for the non-verbal material. These are shown in figures 4.5-4.7:

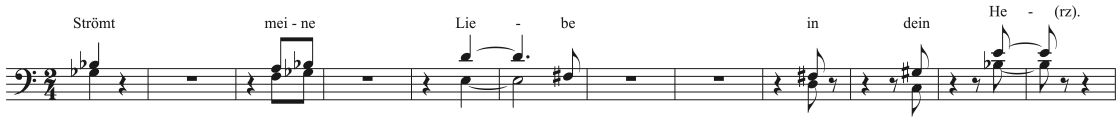

Figure 4.5 — melodic line for mm. 123-134 (upper voice: baritone; lower voice: bass flute)

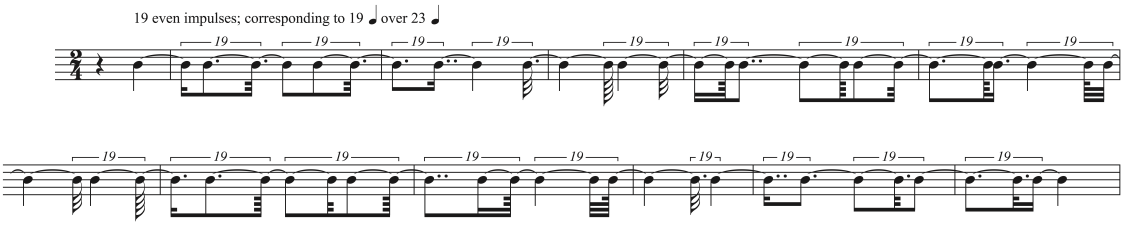

Figure 4.6 — periodic impulses for mm. 123-134

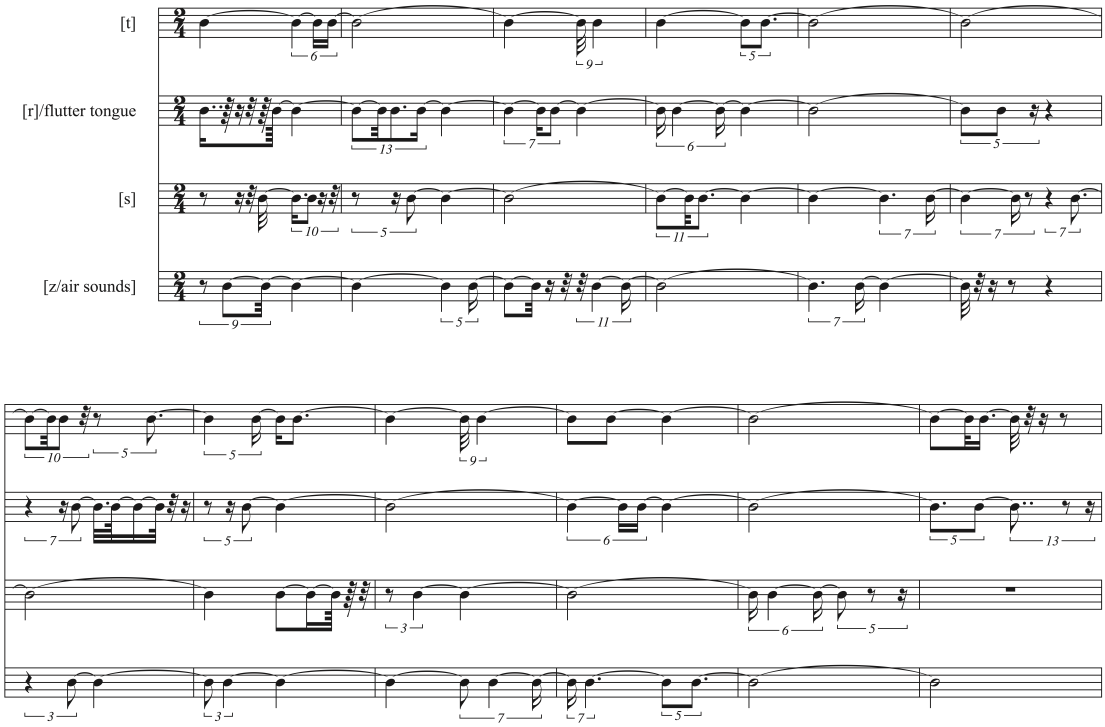

Figure 4.7 — rhythmical grid for non-verbal sounds for mm. 123-134

These materials were then superimposed onto each other. The compositional task encountered here was on one hand to orchestrate the different sounds onto the two available instruments, and on the other hand to negotiate between the different layers, which in many cases would have cancelled each other out. As will be shown, the superimposition process in the end effected significant changes to the notation of the rhythmic network from the sketches shown above to the final score.

The first crotchet of m. 123 calls for:

- an a-sharp sung by the baritone on the downbeat
- an f-sharp played by the bass flute on the downbeat
- a [t] sound on the downbeat
- an [r]/flatterzunge sound on the downbeat
- a [z]/air sounds-sound after four hemisemiquaver-nonuplets
- an [s] sound on the last hemisemiquaver
- an [r]/flatterzunge sound on the last hemidemisemiquaver

Already, this first crotchet calls for measures that were not taken elsewhere in the piece, due to the density of concurrent events. The four sounds on the downbeat were conflated into two sounds by using the “r” in “strömt” and calling for an exaggeration of this sound in

performance. The [t] sound was assigned to the bass flute and combined with the g-flat as an especially sharp and accented articulation. This is the only occurrence in this piece of sung text also including non-verbal material and the [t] sound used in conjunction with pitched material; both associations blur the line between the verbal — with which the flute counterpoint is associated — and non-verbal layers.

The [z]/air sounds-sound after four hemisemiquaver-nonuplets was rhythmically simplified to start after one quaver-triplet — in other words, one hemisemiquaver-nonuplet too early — and assigned to the bass flute. Here, it can be seen that the rhythms in the non-verbal layers function as impulses and not as precise durations: the flute motif fills out the remaining two quaver-triplets, while the source rhythm extends to almost the entirety of the next measure.

The [s] sound on the last hemisemiquaver was assigned to the baritone. Here, the precise rhythm was again simplified; this time, due to its proximity to the next beat, to a grace note. This was originally done to de-emphasize the precise rhythmical relationship between crotchets 1 and 2 of m. 123, which seemed to me to be hard to attain at the given tempo and ultimately of less importance than an approximate version of the rhythm. However, this came into conflict with the even later [r]/flatterzunge sound on the last hemidemisemiquaver. Because I felt that this note could neither be even approximately placed into the temporal space of the crotchet, nor practically synchronized with the already existent grace note, this impulse was omitted altogether.

A similar process is used throughout the piece. However, when compared with the sketches shown above, the final score for the most part uses far simpler rhythms still. This is becauseafter an initial version of the score, which tried to retain as much rhythmic complexity as possible from the initial sketches, a second, more simplified version was produced. This simplification process will be shown with an example from the same passage. As a holdover from the first crotchet of m. 124, the baritone finishes a gesture encompassing three semiquaver-sextuplets from the second crotchet of m. 124. He was then originally asked to start the next gesture — in hemisemiquaver-quintuplets — on the last semiquaver-quintuplet, which would spill over into m. 125, and then finally land on the spoken syllable on the last quaver-triplet of the same crotchet. This amount of rhythmical detail — and many other similar instances — seemed to me excessive in light of the prescribed tempo and the lack of a concrete pulse. In the final score, the hemisemiquaver-quintuplets were changed into regular hemisemiquavers; the onset of the gesture was placed on the last semiquaver instead of the last semiquaver-quintuplet. Another example of this would be the bass flute's septuplet on the first crotchet of m. 125, which was also changed to hemisemiquavers. These two examples are shown in figure 4.8; a similar procedure of subtle simplification was used throughout the entire score.

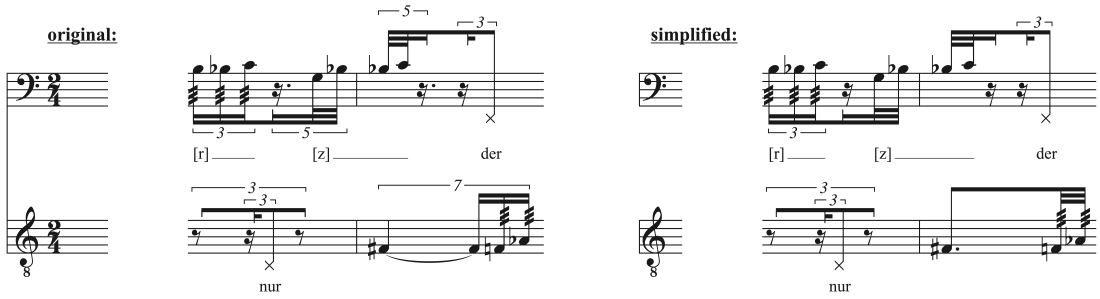

Figure 4.8 — mm. 124 (second beat) and 125 (first beat), original and simplified versions; articulations and dynamics omitted

4.4. Aesthetic context

bloßes Zubehör der Maschine is linked in its approach to sound, its fragmentation of the used texts and the source of the texts to the work of the German composer Helmut Lachenmann, especially his early pieces *Consolation I* and *Consolation II* for 16 singers and 4 percussionists (1967). In his essay *Die gefährdete Kommunikation* (The Endangered Communication), written in 1973, Lachenmann characterizes his compositional approach to these two pieces thus:

> "To avoid misleading elements of style, what I then wanted to make was a music that made the idea of structure its own as a strictly ordered field of relationships, like Luigi Nono practiced it in his [integral] serialist period. In my music however, sound types of various kinds should take the place of the rigidly point-like sound of Nono: attack- and decay processes, impulses, static colours, fluctuations, textures, structures. In its components, this idea of structure therefore required a purely empirically defined sound experience that became independent from any tonal expectation. This experience had to be uncovered. The 'structure-sound', of which I then spoke in a theoretical context, was a constructed term to counteract the reification of the isolated sound effect by its integration into a rationally ordered construction; a term that was reversible and — as a 'sound-structure' — showed its abstract and formal aspect like the 'structure-sound' showed its concrete and empirical.
>
> From this point of view, I set a text in *Consolation I*, and separated the phonemes from their linguistic context, thus uncovering their acoustic aspect and integrated it together with the instrumental actions of the percussionists into a new context. Thus, only a sort of percussive, affect-laden overall gesture, that colours over onto the expressivity of the percussion sounds, remains of the linguistic gesture. Text becomes acoustic material in the same way that the entire acoustic material, including the percussion, assumes linguistic intensity."[81]

[81] Lachenmann, Helmut (1973) "Die gefährdete Kommunikation", in: Häusler (ed.) *Helmut Lachenmann: Musik als existentielle Erfahrung. Schriften 1966-1995*, Wiesbaden: Breitkopf & Härtel, 1996, p. 101 (original German: "Was ich damals machen wollte, um mißverständlichen

Direct connections to this approach can be found in *bloßes Zubehör der Maschine*. Here as there, the music is built on a strictly ordered field of relationships, akin to integral serialist approaches to composition, but connecting to specific sound *types* rather than only sound "points". Both pieces also share a procedure of separation of phonemes from a linguistic context.

There are, however, two crucial differences. Firstly, in *bloßes Zubehör der Maschine*, the phonemes of the texts are not separated from their linguistic contexts from the outset, but are gradually forced into this separation by the overall development in density. This implies a different function of the text in the piece. In Lachenmann's *Consolations*, the text is mostly used as a repository of phonemes and sounds, while the text as text is, by his own admission, "[...] not understandable anymore"[82]. Lachenmann contends that "to 'compose' a text beyond setting it — that must mean: to intervene into its set order and react to it"[83]. *bloßes Zubehör der Maschine* follows a very similar idea in that the way the text is set directly intervenes into the structures of the text by means of superimposition and gradual fragmentation. However, compared to the *Consolations*, here the texts as texts are an important factor beyond their sonic components, because their gradual development from understandable to not understandable — achieved by the use of density schemes — offers a possible interpretation of the overall piece. Because of the high density of sonic and textural materials that over time overlap and interfere with each other, the concerns of both love and worker's rights which are given voice by the texts

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Stil-Elementen zu entgehen, war eine Musik die sich den Begriff von Struktur als streng geordnetem Beziehungsfeld zu eigen machte, so wie Luigi Nono ihn in seiner seriellen Schaffensperiode praktiziert hatte. An die Stelle des starr punktuellen Klangs bei Nono aber sollten bei meiner Musik Klangtypen verschiedener Art treten: Ein- und Ausschwingungsprozesse, Impulse, statische Farben, Fluktuationen, Texturen, Strukturen. In seinen Komponenten setzte dieser Strukturbegriff demnach eine rein empirisch definierte, gegenüber tonaler Erwartung verselbstständigte Klangerfahrung voraus. Die galt es freizulegen. Der 'Struktur-Klang', von dem ich damals in theoretischem Zusammenhang sprach, war eine Begriffskonstruktion, um der Verdinglichung des isolierten Klangeffekts entgegenzuwirken durch dessen Integration in ein rational geordnetes Gefüge; ein Begriff, der umkehrbar war und als 'Klang-Struktur' seinen abstrakt formalen Aspekt herauskehrte wie zuvor als 'Struktur-Klang' seinen konkret empirischen.
Unter diesem Gesichtspunkt habe ich in *Consolation I* einen Text vertont, dabei die Phoneme aus ihrem sprachlichen Zusammenhang herausgelöst, so ihren akustischen Aspekt freigelegt und diesen zusammen mit den instrumentalen Aktionen des Schlagzeugs in einen neuen Zusammenhang integriert. Vom sprachlichen bleibt so noch ein quasi perkussiver, affektgeladener Gestus, der auf die Expressivität des Schlagzeugklangs überfärbt. Text wird zum akustischen Material im gleichen Maße wie das gesamte akustische Material, einschließlich des Schlagzeugs, sprachliche Intensität annimmt."; translation: Kaspar Querfurth)

[82] see: Lachenmann, Helmut (1968), "Consolation II für 16 Stimmen", in Häussler (ed.), *Helmut Lachenmann: Musik als existentielle Erfahrung. Schriften 1966-1995*, Wiesbaden: Breitkopf & Härtel, 1996

[83] ibid., p. 377 (original German: "Einen Text übers Vertonen hinaus 'komponieren' — das muß heißen: in die durch ihn gesetzte Ordnung eingreifen und auf sie reagieren."; translation: Kaspar Querfurth — "composing a text" here explicitly refers to setting a text into music; the English expression *to compose a text*, which refers to the writing of a text, is not idiomatic in German.)

are slowly muddled and in the end hardly understandable. A parallel could be drawn from this increase in density of voices to the unfolding of recent and not-so-recent political developments such as the 2016 American presidential election, the lead-up to the parliamentary vote on the EU divorce bill leading towards Brexit in the UK, or — to use an extreme example — the divisions among left-wing political forces in the immediate aftermath of the Great Depression, which played a crucial role in the advance of fascism[84]. All these arguably decisive political contests saw the left disagreeing to various degrees on different policy issues, ultimately failing to coalesce the density of political voices into one platform and thus cancelling each other out to the benefit of right-wing or reactionary parties in the final polls. This failure could be argued to be mirrored in the interference and ultimate cancelling-out of the used texts, which was musically organized via density schemes.

The other difference between *bloßes Zubehör der Maschine* and Lachenmann's *Consolations* concerns the expectation of tonal contexts. In his aforementioned essay, Lachenmann claims that the effort to understand art out of the "[...] perspective of a prestabilized order [...]"[85] such as tonality is a self-delusion, leading to the situation that "in reality, art is [...] nothing but a pretext for society to reassure itself of its intact self-perception by means of its functioning language"[86]. Later, he contends that "even in traditional music, the spark that gives a work of art its sheen flashes only where the functioning of tonality as a language is not anymore self-evident, but becomes newly conscious as a result of autonomous handling of the material"[87]. On the one hand, it is not self-evident either that whatever sheen a work of art might or might not have is a result of this suspension of the functioning of tonality or any other autonomous handling of the material. On the other hand, the use of sounds — which are now commonly referred to under the umbrella of *extended techniques* — as well as compositional strategies and aesthetic concerns that are characteristic for Lachenmann's output have arguably in recent years

[84] The political situations and the overall unfolding of these events can not be discussed here in detail. Examples of discussions of these events include: Sides, John (2017), Did enough Bernie Sanders supporters vote for Trump to cost Clinton the election? *The Washington Post* [Online] 24th August, Available at: https://www.washingtonpost.com/news/monkey-cage/wp/2017/08/24/did-enough-bernie-sanders-supporters-vote-for-trump-to-cost-clinton-the-election/, accessed 3. 11. 2019; Jones, Owen (2017), Labour is in a unique bind over article 50. *The Guardian* [Online] 19th January, Available at: https://www.theguardian.com/commentisfree/2017/jan/19/labour-article-50-jeremy-corbyn-vote, accessed 12. 08. 2019 and Hobsbawm, Eric (1995), *The Century of Extremes*, London: Abacus, p. 104 and — for comparison — p. 123

[85] Häussler (ed.), Musik als existentielle Erfahrung, p. 99 (original German: "[...] aus der Perspektive einer prästabiliserten Ordnung [...]"; translation: Kaspar Querfurth)

[86] ibid., p. 99 (original German: "In Wirklichkeit ist Kunst so nichts als ein Vorwand für die Gesellschaft, sich anhand der funktionierenden Sprache ihres intakten Selbstverständnisses zu vergewissern."; translation: Kaspar Querfurth)

[87] ibid., p. 99 (original German: "Auch in der traditionellen Musik blitzt der Funke, der dem Kunstwerk seinen Glanz gibt, dort erst auf, wo das Funktionieren der Tonalität als Sprache nicht mehr selbstverständlich bleibt, sondern als Resultat autonomen Umgangs mit dem Material neu bewußt wird."; translation: Kaspar Querfurth)

become a language as well as a "prestabilized order" of appropriate contemporary compositional practice in their own right. This thought might be corroborated by a response Lachenmann himself gave to an interview question about his musical legacy: "But there is a term in the contemporary music scene: 'Lachenmann-Style'. It makes me want to vomit"[88]. This recent development sets a context in which it could be argued that the deliberate setting up of a sound-experience and the use of compositional approaches that are not dissimilar from Lachenmann's works but differ in crucial parts — in other words, the use of "misleading elements of style", of either the "Lachenmann-style" variety or of traditional art-song composition, such as understandable text or emphasis on unbroken linear material — could be another way to express the aforementioned density of voices and opinions that ultimately serve to confuse a message or an action; and also, by expressing it, a way to highlight this confusion, or, as Lachenmann himself might put it: "Refusing communication for the sake of endangered communication [...]"[89]. This, too, was one of the goals of my piece.

4.5. Conclusions

Several conclusions can be drawn from *bloßes Zubehör der Maschine*. Firstly, the use of large-scale density schemes that organize the overall length of the different sections of a piece as well as the number of appearances of a given material within them allows for locally varied and finely attuned musical contexts while at the same time allowing these contexts to be part of a large-scale formal development.

This local variation is again a result of the collision between several numerical schemes and their more intuitive deployment. However, while the rhythms used in *bloßes Zubehör der Maschine* are subject to a process of rhythmic simplification similar to *Absicht*, they show that this process does not need to be necessarily intuitive but can also be relegated to a numerical scheme, in this case an algorithmic MIDI-transcription — the rhythm becomes one more accessory of a machine. On the other hand, this opens up different avenues to expand the vocabulary of the relationship between freely composed material and the rigid constraints posed by the density schemes, such as the selection of rhythmic impulses from the statistical grid and the melodic filling-out of the established frames.

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[88] GEMA (2015), *Interview mit Helmut Lachenmann* [Online] Available from: https://www.gema.de/aktuelles/interview-helmut-lachenmann/, Accessed: 27. 11. 2018 (original German: "Aber es gibt da einen Begriff in der Neue-Musik-Szene: 'Lachenmann-Style' [sic]. Da kommt mir das Kotzen."; translation: Kaspar Querfurth)

[89] Häussler (ed.), Musik als existentielle Erfahrung, p. 103 (original German: "Kommunikation verweigern um der gefährdeten Kommunikation willen [...]"; translation: Kaspar Querfurth); this might be part of the point of Lachenmann's own recent controversial orchestral piece *Marche fatale*.

Finally, density can not only be used in an abstract fashion to numerically organize musical material. On the contrary, it can be used as a tool in text settings to musically reinforce an interpretatory or aesthetic idea. In the case of this piece, density schemes are used to organize musical material in such a way that they confuse and muddle the integrity of the texts used and thus shine a specific light on the ideas discussed in them, as well as on the association between them that was created by their superimposition in one piece.

5. *4 Abbilder* for string quartet

5.1. Introduction

4 Abbilder (German for "4 Depictions"; similar to *Ab-sicht*, the compound word suggests a literal translation into "down-images") was written for the Archipel Academy 2018 in Geneva, Switzerland. Its central idea was derived from the measuring units *dpi* (dots per inch) or *ppi* (pixels per inch). These are used in digital image processing to quantify the image resolution of scanners or monitors by relating the density of occurrence of a small unit — such as a dot or a pixel — to a larger frame, in this case an inch. A larger amount of pixels or dots could therefore result in a more detailed image than a smaller amount, depending on the source image.
Similar ideas can be found in different visual art movements. Photorealistic painters, such as Chuck Close, Robert Cottingham or John Salt, use a high amount of local visual information to minutely trace photographs in their paintings. John Salt, in his painting process, "[...] projects a 35-mm slide on the canvas and lays out a detailed drawing […]. Then, following the lines, he creates hundreds of finely chased cut-outs for thin air brush glazes".[90] This is a direct parallel of the technical measuring process outlined above, used for artistic purposes.

Both the measuring units and the visual aesthetics closely relate to the definition of density in music as the amount of musical information in a given timeframe. The central idea of what finally became *4 Abbilder* was to explore ways with which to translate these ideas from the visual realm into musical structures. An interesting opportunity to investigate this idea seemed to be to take a single, easily graspable musical material — analogous to the static subject of a

[90] Chase, Linda, "Mehr als das Auge fassen kann: Sehen und Wahrnehmung in der fotorealistischen Malerei", in: Letze (Ed.) *Fotorealismus: 50 Jahre hyperrealistische Malerei*, Ostfildern: Hatje Cantz Verlag, 2013, p. 25 (original German: "[...] projiziert ein 35-mm-Dia auf die Leinwand und legt eine detaillierte Zeichnung an […]. Dann schneidet er den Linien folgend Hunderte fein ziselierte Schablonen für dünne Airbrush-Lasuren aus"; translation Kaspar Querfurth). A similar approach to visual art on the very opposite scale of density can be found in the *Pixel Art* movement, often found in retro-styled video games.

painting — and investigate the effects of different density schemes on it, both locally and as a part of a large-scale form. A number of questions were therefore developed from these preliminary notions:

- Which kind of material can be a fitting "main material" that can still be recognised in different densities of information?
- In what way can this material be then altered so that differently detailed versions of the same material can be produced?
- How can these versions be set up in a large-scale form to convey their shared origin?
- In what way do the details of the main material need to be distributed among the players for ease of performance?

Because these questions suggested a composition process which derived most of its details from one single, initial source — what is called the "main material" in the set of questions above —, most of these questions needed to be answered as the first step of compositional activity and not as the final outcome of the piece. My decision was to take a central melodic line — mostly without harmonic or rhythmic accompaniment — as the main material, which would then be modified by various means. Every formal section of the piece would include a full statement of this melodic line, but would only include some of the modifying material. By isolating the central material in such a way, the focus could be put on the differences made audible through the repetitive formal scheme; the melody could act as the foil to its own changing detail over the course of the piece.

5.2. Construction of the central melodic line

The pitch material of the central melodic line was for the most part determined by an early idea for the sound colours used in the piece. In conceptualising the array of sound colours, I had the thought of using short, local microtonal inflections. These would — analogous to expanding the image resolution — offer a temporarily higher "resolution" of pitches than the 12-tone equal temperament used in the main material of the piece. For ease of performance, these microtonal pitches were chosen to be produced by the 5^{th} and 7^{th} harmonics of the open strings of the instruments, which are audibly "out of tune" in comparison to equal temperament by -14 and -31 cent respectively. To guarantee the possibility of microtonal inflection of every pitch in the central melody, its pitch material was therefore limited to the available 5^{th} and 7^{th} harmonics of the open strings of the string quartet (in the respective standard tuning). Figure 5.1 shows the list of all available 5^{th} and 7^{th} harmonics in the string quartet setting, with the fingerings on the lower stave and the result on the upper stave.

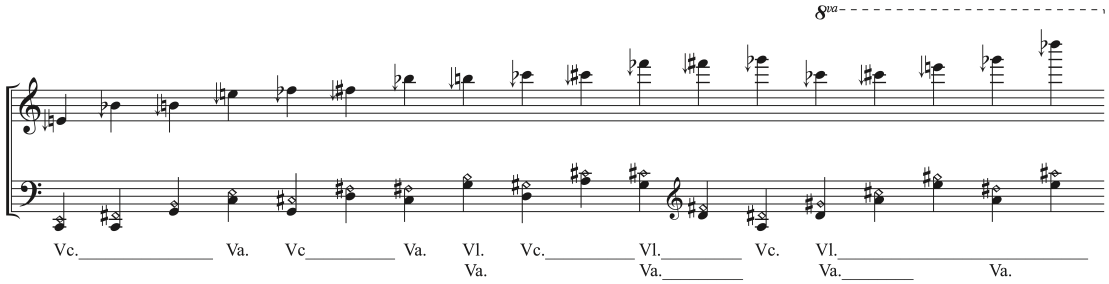

Figure 5.1 — list of available 5th and 7th harmonics. Arrows outside of accidentals denote lowering of pitch by 14 cents; arrows within accidentals denote lowering of pitch by 31 cents

Both pitch and rhythmic development of the line were constructed separately using a collection of basic melodic and rhythmic shapes and then added together. These rhythmic shapes were also later used to organize the placement of timbral colourings for most of the quartet. As a last step, the melody was reinterpreted into 12-tone equal temperament for later use as a foil for microtonal inflection.

5.3. Timbral rows

The arguably most complete version of the melodic line is stated in the second section (mm. 42-66), in which it is played by the second violin and further added to by a diverse array of sound colours produced by the other instruments, similar to the timbral row procedure used in *Sammlung*.The timbral row used here is not a succession of fixed sounds. Instead, it consists of a succession of sound families, which each encompass a collection of sounds that move through gradations from noise to pitch[91]. The sound families are as follows (for explanations of abbreviations, see the preliminary pages of the score):

Type	**Sounds**
Pitch (arco)	unpitched on bridge → msp → arco ord. → microtonal inflection
Pitch (pizz.)	pizz. behind bridge → pizz. msp → pizz. ord. → harmonic/microtonal pizz.
Vibrato (arco)	s.v. → poco vibr. → exaggerated vibr.
Vibrato (pizz.)	pizz. ord. → lasciar vibrare + vibr. → glissando
Bow pressure	unpitched on bridge → flaut. st → arco ord. → pitched scratch noise → unpitched scratch noise
Noise (pizz.)	unpitched → ord. → pitched Bartók-pizz. → unpitched Bartók-pizz.[92]
Bowing type	legno tratto → legno/crini tratto → arco ord.
Battuto type	unpitched legno battuto → unpitched crini battuto → pitched legno battuto → pitched crini battuto

Table 5.1 — sound families for second part

[91] Some sounds, like the unpitched bowed sound on the bridge or a normal pizz., are shared between different sound families; in both, they serve as one point in the scale of the sonic gradation.

[92] The Bow Pressure and Noise (pizz.) families move from noise to sound and back to noise, in contrast to the other sound families

The first statement of the row is heard from the pizzicato behind the bridge in the viola in m. 42 up to the pizz. *molto sul ponticello* in m. 45 and consists of the following sounds:

1	**2**	**3**	**4**	**5**	**6**	**7**
pizz. behind bridge	microtonal inflection	exaggerated vibr.	pitched Bartók-pizz.	legno tratto	unpitched noise on bridge	pitched legno batt.
8	**9**	**10**				
unpitched scratch noise	microtonal inflection	pizz. glissando				

Table 5.2 - timbral row for mm. 42-45

This row includes every sound family encountered above. Special prominence — a higher horizontal density of appearance — is given to the "Pitch (arco)" sound family. A statement of the row as a row of sound families instead of timbres would read like this:

1	**2**	**3**	**4**	**5**	**6**	**7**
Pitch (pizz.)	Pitch (arco)	Vibrato (arco)	Noise (pizz.)	Bowing type	Pitch (arco)	Battuto type
8	**9**	**10**				
Bow pressure	Pitch (arco)	Vibrato (pizz.)				

Table 5.3 - timbral row for mm. 42-45 (sound families)

With every reiteration of the row, the positioning of the sound families remains static; however, the concrete sound played on a rhythmic impulse is substituted with a different sound from the same family, in a more or less strict sequence. The already more prominent "Pitch (arco)" family gives a higher prominence — a higher horizontal density of appearance — to the "microtonal inflection" sound. This bias was used as a compositional device to realize the initial idea of a central melody modified by short microtonal inflections and is used in the remaining sections of *4 Abbilder* to explore the idea of differently detailed versions of the main melody by shifting and narrowing the bias to different sound families.

While each section retains the main melody, the amount of available timbral material is thereby drastically reduced to one or two sound families per section. The first section (mm. 1-41) focusses on two different timbral rows, the first derived from the "Vibrato (arco)" sound family and the second from the "Battuto type" sound family. The third section (mm. 67-107) focusses on a version of the "Pitch (arco)" sound family, extending the available sonic material given in table 5.1 by the inclusion of pitched *flautandi*. One notable feature of the third section is that it is the only one of the five that exclusively uses one single sound family. Section 4 (mm. 108-133) combines the sonic filtrations of sections 1 and 3 by using an extended version of the "Bowing type" family as well as the "Battuto type" family. The final section (mm. 134-174)

shows the starkest sonic contrast used in the piece. Here, the available sonic materials do not correspond to the entire content of one sound family. Instead, only two sounds from different sound families are used: microtonal inflections and unpitched scratch sounds[93]. These sounds are then used to approximate a reprise of the sonically much more detailed first section.

Taken as a whole, sections 1 and 3-5 of *4 Abbilder* repeat on a larger scale the idea of giving precedence to a particular sound in a timbral row by increasing its horizontal density. Because all selections of sound families that form the timbral rows given in this subchapter were drawn from the main complete array, they could still be argued to include the omitted sound families, however with a density value of zero.

5.4 Conclusion

4 Abbilder shows a different deployment of density than previously encountered. By using a shared source material for each section of the piece and then colouring in this material using different selections of sound families, differently detailed versions of one single material were obtained. The repetitive structure of the piece, which is based on five complete statements of the melody, changing only the base tempo, reinforces the perception of these different states of timbral density.

This repetitive structure can also be seen as a direct reference and translation of the initial visual art that served as inspiration to the piece, with the second section and its highest degree of timbral density being analogous to images in high resolution or full colour and the other sections analogous to lower resolution renderings of the same image. A small degree of ambiguity is however introduced by not explicitly highlighting the original image from which the depictions are drawn, which could have been done by for instance placing the most detailed version of the main melody at the beginning of the piece, akin to a "Theme and Variations"-type form. Thereby, it is called into question which of the five formal sections are the *4 Abbilder* of the title and which is the original that is being depicted. This shows that a higher density of detail does not necessarily need to be associated with greater clarity of form but can through its context also be used to introduce ambiguity and even uncertainty about the meaning and aesthetic value of the elements used in a piece.

[93] There are two exceptions. Measures 161-165, which correspond to the pause measures of the main melody, use the opposite sound from the "bow pressure" sound family — unpitched noise produced on the bridge. Also, m. 173 substitutes the scratch tones with muted Bartók-pizzicati as an ending gesture.

6. *streifen* for flute, clarinet, violoncello and piano

6.1. Introduction

As mentioned in its introductory sub-chapter, *bloßes Zubehör der Maschine* was originally planned as a piece for small ensemble before its main ideas were reworked into the present duo for baritone and bass flute. I however still wanted to further explore the original sketches that I made before the change in concept and scoring. *streifen* (German for both "stripe" and "stripes", as well as for "to graze" or "to brush against") is the result of this exploration. As such, it is concerned with many ideas that were already investigated in *bloßes Zubehör der Maschine*, primarily horizontal frames as a way of measuring and working with density. Because *streifen* was written without a specific brief and, after a certain point, mostly without reference to an external source material, the range of possibilities inherent in this idea could here be tested in a far more extensive and abstract manner than in the preceding piece. In the end, both pieces share little surface similarity despite their common compositional techniques and concerns. Some of this is due to the material chosen for each piece — *streifen*, like *Sammlung*, features a central melody that is further developed by adding timbral articulations, while *bloßes Zubehör der Maschine* treats its central melody as one layer among many and does not further modify it. Their largest differences however can be found in the ways extremes of density inform both the immediate surface appearance of the piece as well as their large-scale development.

Initially however, the piece was inspired by a remark made by Igor Stravinsky about Stockhausen's *Carré* (1959-60) and by association about serialist compositions of that time. In his estimation, "[...] *Carré* shares with all of its kind of music […] the monotony of the run, as regular as a milk train, from dense to simple, movement to stasis, loud to soft, high to low, *tutti* to *solo* — and the no less regular return trips."[94] While this remark is easily applicable to many other pieces outside "this kind of music" — for example the Introduction of Stravinsky's *The Rite of Spring* (1912), with its famous bassoon solo, its subsequent gradual increase in different densities and development from movement to stasis, and its sudden return trip to its initial soloistic state at figure 12[95] —, it does still ask a valid and fundamental question about the formal design and development of density-centred compositions: in which ways would it be possible to place the movement between extremes of density as the central large-scale formal or developmental idea of a piece without at the same time directly calling attention to this idea.

Stravinsky refers in his comment to parameters of sound — loud and soft, high and low, densely orchestrated and soloistic — as well as overall behaviours — dense and simple, movement and

[94] Craft, Robert and Stravinsky, Igor (1972), *Themes and Conclusions*, London: Faber & Faber, p. 26

[95] Stravinsky, Igor (1913), *The Rite of Spring*, London: Boosey & Hawkes, 1997, pp. 1-9

stasis. He does not however refer to the possible interplay between the different parameters or behaviours. My definition of density as not solely applicable to pitch or rhythm but to any parameter could, together with its implications and possibilities for parametric polyphony, shine a new light on this remark. If density values could be transferred from one parameter to the other, it would be possible to "free up" or "reset" for further, freer development a given parameter that accumulated a certain degree of density at a certain point, while still retaining the same degree of density in a different parameter. This would still fulfil Stravinsky's criticism — because the parameter that had before built up a certain degree of density would then decrease — but at the same time counteract it — because the density value that was reached would at the same time remain in place, albeit moved to a different parameter. An example of this procedure will be shown in chapter 6.3.1; however, after arriving at a first shift in density in this manner only two minutes into the piece, I felt this initial idea had nowhere to go once it was stated. This effected a fundamental shift in focus in the rest of the piece — which eventually came to run to about 19 minutes — and a further exploration of ideas first encountered and worked on in earlier pieces; primarily, as alluded to in the first paragraph, *bloßes Zubehör der Maschine*.

In this preceding piece, rhythmic variation came primarily from two procedures: a change in the length of horizontal frames while keeping the horizontal rhythmic density as well as the rhythmic proportions inside the frame intact; and a superimposition of different rhythmic strands subjected to this first procedure. The lengths of the frames themselves did not however vary beyond three different values. Also, all superimposed rhythms were synchronised within one frame, without any offsetting or "bleeding into" other frames. In *streifen*, I wanted to push both ideas further. What particularly interested me was the effect that a wide variety of frame lengths could have on the material contained within them. On the one hand, a very wide frame could stretch out and thereby separate the impulses of a continuous rhythmic structure to such a degree that the structure itself would not anymore be perceivable. On the other hand, an extremely short frame could have a similar effect by compressing the structure in such a way that new configurations could be created by a possible overlap or even a necessary omission of information. Also, offsetting the starting points of different superimposed frames could allow for a greater variety of surface activity and open up interesting and ambiguous approaches to formal development.

Reading further on in Stravinsky's remark about *Carré*, he cites Alban Berg as being the originator of the kind of formal developments he criticises in Stockhausen and his contemporaries; however, he contends that "[...] Berg was too great an artist to show his hand."[96] While the extent to which Stockhausen, or Berg, or Stravinsky himself "showed their hands" too much — or just enough — is not the question of this thesis, the quote does highlight

[96] Craft and Stravinsky, Themes and Conclusions, p. 26

a central concern and research question of *streifen*, which is present both before and after the shift in focus: whether it is possible to "conceal one's hand" about the precise workings of large-scale developments using density.

6.2. First part (mm. 1-34)

The first 12 measures of *streifen* establish most of the material subsequently used in the piece. The most conspicuous is a long melody, which is throughout played by the clarinet and is framed by measures of general pauses. The lengths of the horizontal frames established in this way change constantly throughout the entirety of the piece and provide a means of rhythmic variation through stretching and contracting processes, similar to *bloßes Zubehör der Maschine.* This melody is modified by a network of timbral articulations, which are supplied by the rest of the ensemble. In a further similarity to preceding pieces, playing techniques of the different instruments were associated and grouped into sound families, which are here set up as a scale going from unstable and fast-moving pitched sounds to percussive sounds with as little pitch as possible.

The deployment of the timbral articulations forms a density development in its own right. Because their on- and offsets are unsynchronised, they form rhythmical patterns that can be differentiated by the number of rearticulations sounding simultaneously. This creates a vertical timbral density, again similar to preceding pieces, but this time incorporating a wider range of values. Figure 6.1 shows the clarinet melody as well as the timbral density value. Pauses refer to one single base timbre (that of the clarinet); *crescendi* from nothing are counted as part of one full crotchet.

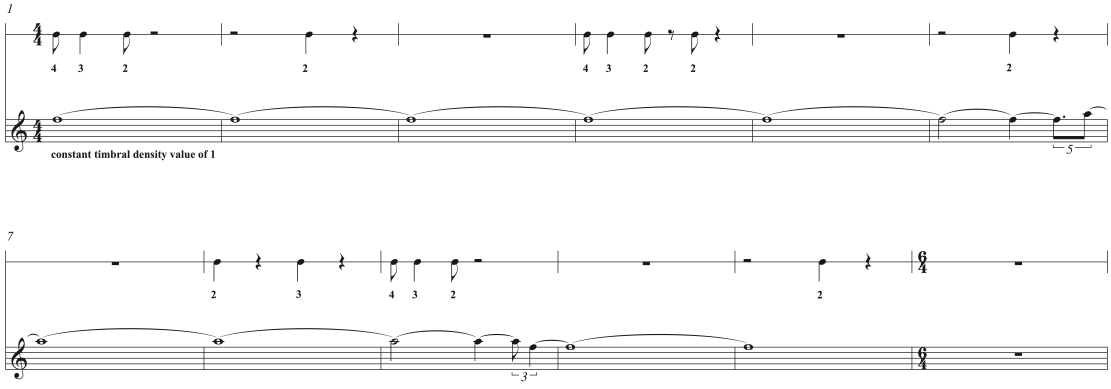

Figure 6.1 — clarinet melody and vertical timbral density for mm. 1-12

Measures 13-24 further expand both the basic sonic material and the rhythmic structures of the first 12 measures. Every instrument except the clarinet was assigned two sounds and each of these sounds was then connected to a separate rhythmic layer derived from different combinations as well as rhythmic strechings of rhythmic cells based on the piano structure in

mm. 9/10 (see figure 6.2). Finally, another two layers connected to sounds that are not solely linked to one single instrument were added. As done before in *Absicht* and *bloßes Zubehör der Maschine* to create the rhythmic layers, the rhythmic cells were "fitted into" different temporal frames via the use of OpenMusic. The overall frame of this section was initially determined to consist of 11 measures (44 crotchets). In the fitting-in process, either an entire cell was fitted into these 11 measures, or both cells were fitted into smaller frames that combined would add up to the full 11 measures. Figure 6.2 shows the initial rhythmic cells and the outcome of the rhythmic fitting process[97].

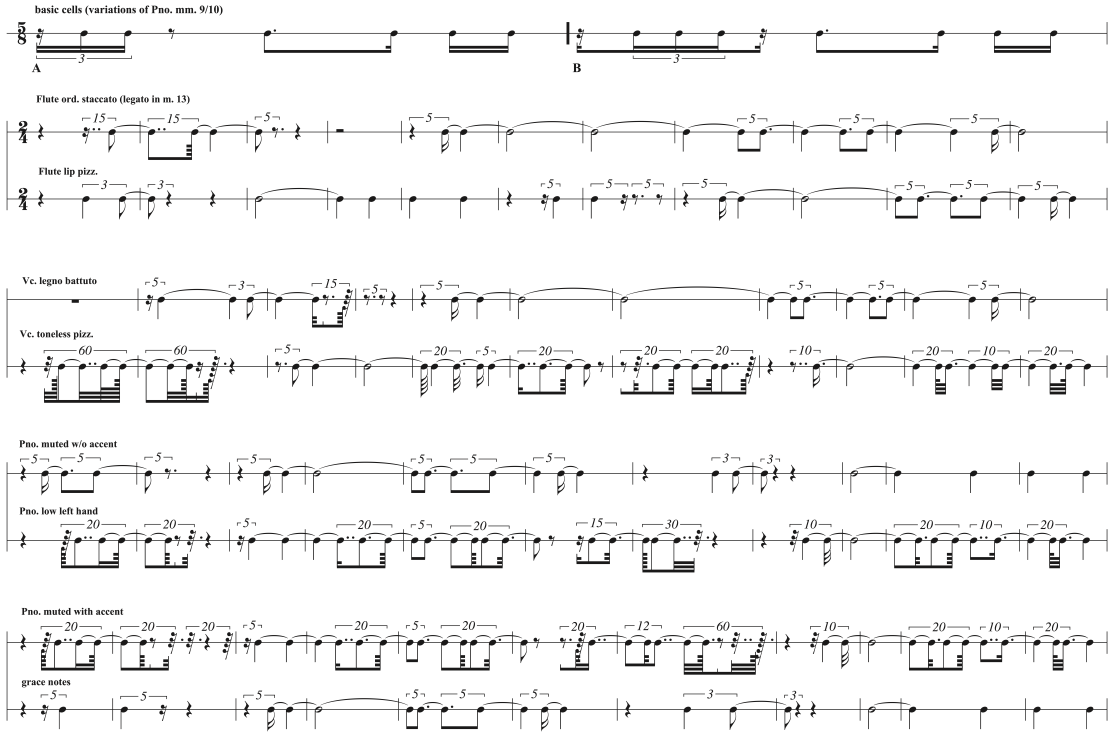

Figure 6.2 — basic cells and rhythmic layers for mm. 13-24

The resulting network of sounds was then superimposed onto a continuation of the initial 12 measures of the piece. Also, local exceptions with regards to overlap of material and rhythmic complexity were made in the superimposition process, much like those shown in chapter 4.3.
Measures 25-33 use the same procedure, however with changed parameters. Instead of a frame of 11 measures (44 crotchets), the frame into which the rhythmic layers were fitted was reduced to 34 crotchets. This resulted in more tightly compressed rhythmic layers. However, while the

[97] *streifen* was first notated in doubled note values and in 4/8, with a tempo of quaver = 70. After finishing the piece, I renotated the entire score into its current state by doubling the tempo and halving the note values for ease of reading. However, the sketches — which were done at the computer — remain in their original form. They are given here as originally notated.
I also decided to present the rhythmic fitting-in process using versions of the OpenMusic outputs imported into Finale via MusicXML. However, Finale renders the more complex rhythmic resolutions, such as 60-tuplets, differently from OpenMusic. The matter of handling these rhythms in the final score is discussed further below.

absolute horizontal rhythmic density, as we perceive it, is undoubtedly higher than in mm. 13-24, the horizontal rhythmic density relative to the frame stays the same as before. This difference becomes the main motor for rhythmic and textural variation throughout *streifen*.

6.3. Further development of horizontal rhythmic density

6.3.1 Reassignment of density values

The main idea of measures 34-46 was to refer back directly to Stravinsky's comment about density referenced earlier. Having arrived at a high value of horizontal rhythmic density in mm. 25-33, I wanted to investigate how to further develop this density value without resorting to the inevitability of immediately decreasing it. Because the value stood for a number of sounds from different sound families, my thought was to retain the number of impulses — and with it the horizontal rhythmic density — but to simultaneously restrict the allocated sounds to one single sound: the "same-note rearticulation" sound family already encountered in the beginning of the piece. While in the end there still is a decrease and increase in horizontal rhythmic density, it does not at first take place on the level of musical gestures that Stravinsky dismisses in his comment.

The clarinet melody of mm. 34-44 constitutes the next frame in which a central rhythmic cell is developed, in a similar way to the two sections before. The cell in use here is a version of the rhythmic structure of the vertical timbral density layer shown in figure 6.1, and is shown in Figure 6.3.

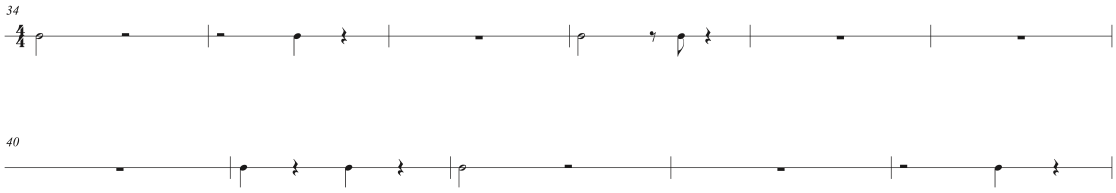

Figure 6.3 — rhythmic cell for m. 34 ff.

This cell was used to generate the continuation of the density value of mm. 25-33. To this end, the number of rhythmic impulses in this section were counted[98], revealing a horizontal rhythmic density of 55 impulses. The rhythmic cell given above however has a horizontal rhythmic density of only 8. In order to arrive at a similar level of horizontal rhythmic density, the cell was repeated 8 1/2 times — resulting in an overall length of 68 impulses over 184 crotchets, an increase of 13 impulses — and then fitted into the frame of 44 crotchets.

[98] The rhythmic impulses do not necessarily correspond to the sum of impulses of the basic cells used to generate the rhythms (these would be 14 cells x 6 impulses each = 84 impulses), because some impulses occur in rhythmic unison and are counted as one impulse.

As before, this procedure yielded a rather impractical rhythmic structure, made up entirely of complicated 23-tuplets. To transcribe these into more manageable rhythms, the procedure of importing the OpenMusic output into Finale by way of MusicXML and then simplifying the output via MIDI, as seen before in *bloßes Zubehör der Maschine*, was used. The output of the MIDI transcription is shown in Figure 6.4.

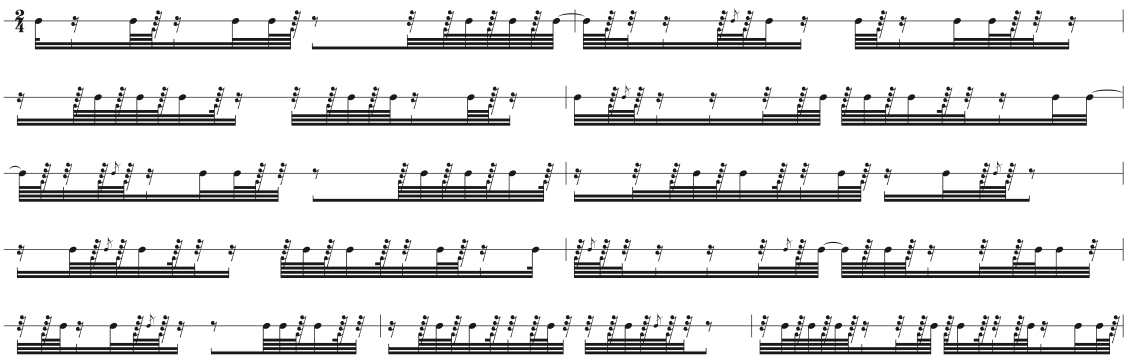

Figure 6.4 — MIDI output of rhythmic structure of mm. 34-44

This output could be more practically used for composition, even though there was another round of simplifying done for ease of playing. This final round did not correspond to any algorithmic scheme and was done intuitively; sometimes by moving certain rhythmic values to more easily countable spots in the measure, sometimes by omitting rhythmical values entirely. The resulting rhythmic structure was then, as in mm. 1-12, used as the basis for the organization of vertical timbral density.

The reassignment of density values from triggering sonically discrete events — belonging to different sound families and sometimes even forming gestures of their own — to triggering colourings of a central melody in a certain sense constitutes a way out of the dead end Stravinsky saw in density-based composition. While doing so does not necessarily free the composer from increasing or decreasing density values, the issue can be, as it were, side-stepped by confining density-based developments to one single parameter, in this case timbre. This frees up other parameters of the musical syntax to different developments and allows for the integration of density-based compositional schemes with other methods of composition. A further example of this "polyphony of approaches" — a polyphony of frames and of densities — will be shown in chapter 6.4.

6.3.2 Large-scale application

Having arrived at the point at which the initial question of the piece was addressed only two minutes into the piece — and not wanting to end the piece after two minutes — a new idea for the remaining length of the piece had to be found. This was where the idea of exploring the

effects of a large range of different frames on an initial material, which would not change its horizontal rhythmic density, came into play. In a rather radical move, the procedures used for mm. 1-33 were entirely discarded and the procedure outlined in chapter 6.3.1 was adopted for the remainder of the piece. The central melody was then written in a way that the horizontal frame defined by it would continuously expand up to a certain point (m. 195) and then gradually contract. The timbral density layer would in its turn retain the procedure described above and fit its rhythmic cell — the 8 ½ times repeated timbral density rhythm of mm. 1-12 — into the newly generated frame. To highlight this difference, I will focus on the outcome of the two most extreme frame lengths.

The longest frame length — 280 quavers, which corresponds to 35 measures in 4/4 metre — can be found in mm. 157-195. Similar to figure 6.4, Figure 6.5 shows the MIDI output for this frame length.

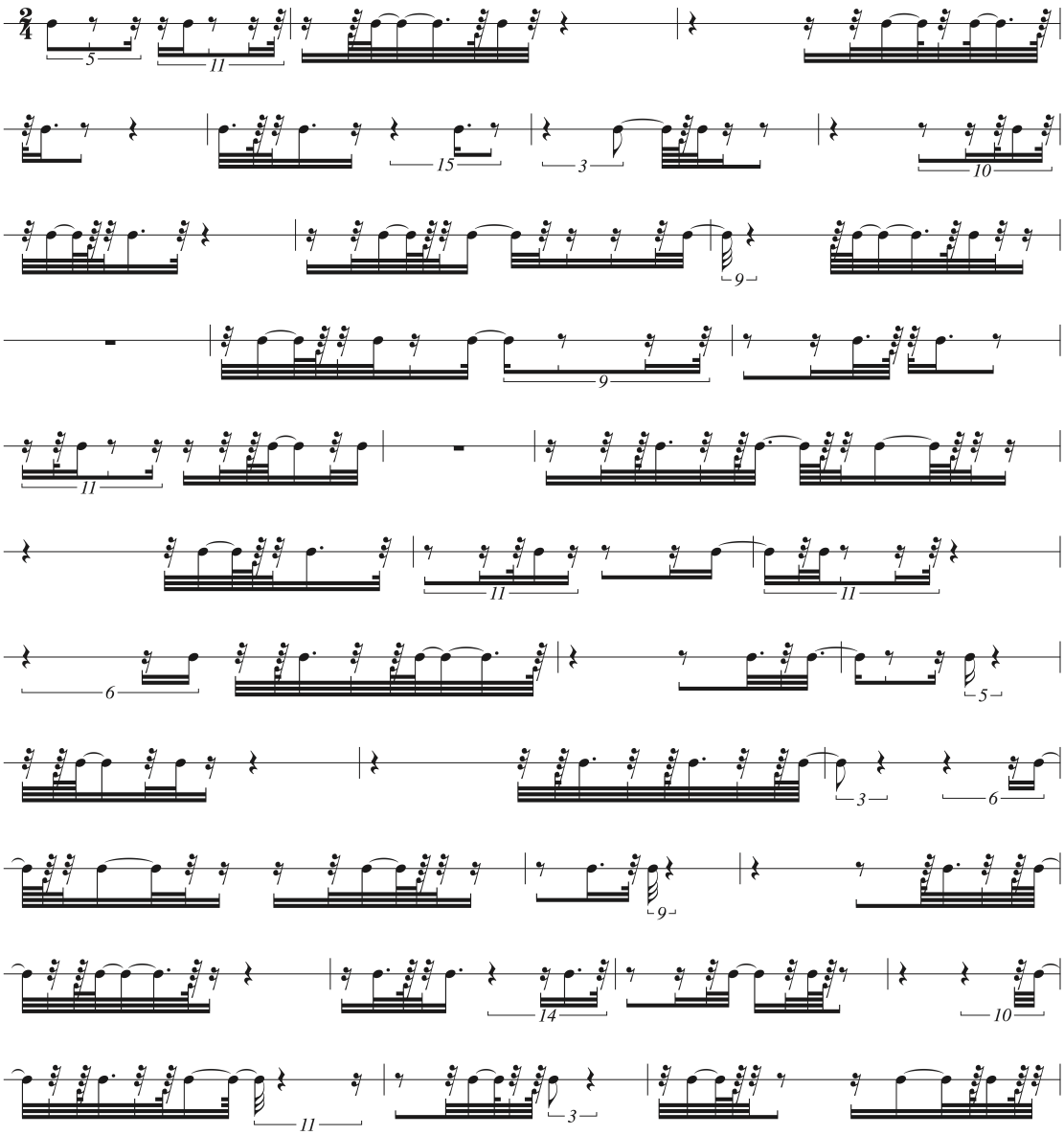

Figure 6.5 — MIDI output for longest frame length (280 quavers; mm. 157-195)

As can be seen, the degree of horizontal rhythmic density over the entire section is much lower compared to mm. 34-44, even though the number of impulses within the frames stays the same from section to section. The resulting rhythm was again adapted to the score with regards to ease of performance and cues from the immediate musical surroundings.

This extreme stretching of the rhythmic structure is very likely to erase any rhythmic associations to the initial form encountered in mm. 34-44. This is because of two reasons that directly relate to density. Firstly, because the distance between each impulse is considerable, it is unlikely that impulses perceptually group together to form a rhythmic sequence that could act as a call-back to the initial form. This is exacerbated by the initial form itself, the shape of which is less made up of discrete rhythmical groupings but more of isolated impulses in rapid, but irregular succession. Secondly, the layer of vertical timbral density is constantly interfered with by a second layer, which draws attention from the unity of the timbral modification layer. The origins of this layer will be discussed in detail in chapter 6.4.2.

The shortest frame length — 1 quaver — can be found in mm. 330, 332, 335, 337, 339, 340 and 343; often multiple times in one measure. Figure 6.6 shows the theoretical outcome of the fitting-in process for this frame length.

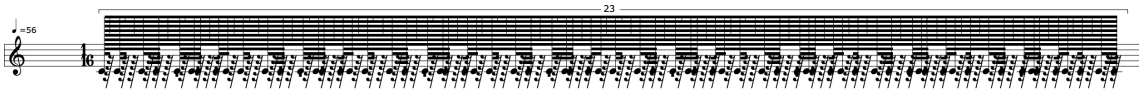

Figure 6.6 — OpenMusic output for shortest frame length (1 semiquaver in the sketches, corresponding to 1 quaver in the score [see footnote 97])

Here, even the initial OpenMusic outcome shows that the brevity of the available time window in which to state the contracted timbral modification rhythm puts the overall developmental idea under considerable strain. The MIDI transcription performed by Finale is not anymore legible; nor indeed is the resulting rhythmic structure of the fitting-in process playable by a human performer. Even before, starting at m. 298, the identity of the timbral modification layer becomes tenuous because of the high density of events as well as the amount of overlap with the other active layers — the counterpoint layer and the additional layer, which will be discussed in chapter 6.4.2, and which at this point occupies a similar sound-world to the timbral variation layer. Therefore, the timbral variation layer is from this point onwards not necessarily dropped from the structure, but is freely "written in" whenever the other layer — marked with accents in the score — is silent. Also, to ensure playability, the rhythmic differentiation is in the last few sections modified to mostly use semiquavers.

6.4. Polyphony of frames

6.4.1 Melodic counterpoint layer

The fitting-in procedure described above is joined and complemented by three additional layers of activity. Of these, the most closely associated in development with the main timbral modification layer and the frames established by the central clarinet melody is a broken melodic line, which serves as a counterpoint to the continuous clarinet line and can throughout the piece be found in the piano part. Its initial occurrence is in the frame of mm. 34-44 and its subsequent development is analogous to the development of the timbral modification layer, with the rhythm of its first statement taken as a central rhythmic cell and then fitted into the different horizontal frames. The effect of disassociation from the initial form of the rhythmic cell that was discussed above can also be found in this layer; in fact, this effect is likely to be even higher because of the lower horizontal rhythmic density of the central rhythmic cell.

6.4.2 Sonic counterpoint layer

A second counterpoint layer, which calls back to the beginning of the piece, is introduced from the fourth beat of m. 66. Both in terms of rhythmical distance and — except for the bass register notes of the piano — pitch, the initial impulse in m. 66 and the subsequent impulses in mm. 69 and 74 mirror the tutti impulses of mm. 1, 4, 9, all of which are originally instances of the added timbral density of 3; the instances of an added timbral density below 3 are handled in a freer manner.

Because this structure is based on an earlier frame, it could be argued that two different frames are superimposed here. A crucial difference between the two is that while the primary frame is clearly signposted by the general pauses between the phrases of the clarinet melody, the second layer does not have pauses and its frames follow each other immediately, thereby obfuscating the frame boundaries. Furthermore, upon reaching m. 82, the new frame established by the second layer goes beyond the frame of the clarinet melody and into the pauses which have so far delineated these latter frames. From this point on, every time the frames of the second layer bleed into a pause of the first layer, both the sonic and pitch material of the second layer change for the duration of the pause. While the piano retains its material of low tremoli or grace notes, the flute switches to sustained pizzicati on the notes f#4, g#4 and f5[99] and the violoncello to muted pizzicati.

Within the clarinet layer, the counterpoint layer goes on to include introduce grace notes, which are gradually developed into short three-note motifs. To distinguish the recollected sections from each other — to establish the frame boundaries — every new frame begins with a

[99] Because flute pizzicati work best in the lowest octave of the instrument, the last pitch is played *ord.* .

fortissimo accent, which breaks out of the overall sonic structure of the piece (see for example m. 124 or m. 139).

The interference caused by the different layers adds an element of distraction and uncertainty over the precise unfolding of their large-scale density schemes. This could be seen as another method to use density strategies to structure and develop initial material while simultaneously diverting attention from them. The distinction between the two layers is finally dropped in m. 266. Here, the sonic material associated with the recollected rhythmical structures is suddenly matched with the timbral modification layer, almost completely blurring the lines between the two layers. The main reason for the change in sonic material is the eventual brevity of the clarinet melody frames. Because these frames would still have to contain the timbral modifications, the counterpoint and the recollection layer, the decision was made to conflate the first and the last of these layers for ease of playing. A method of distinguishing both layers is introduced in m. 272, from which point on the recollection layer is always accented. The pauses which frame the clarinet line still include the recollection layer with its sonic material before the sudden change in m. 266 (see for example m. 275-278).

6.4.3 Piccolo counterpoint layer

A final contrapuntal layer can be found in the piccolo part of the third section. Like the first layer, this layer is also based on a freely composed melodic line that is subject to timbral modifications and is framed by pauses. The melodic space between the frames has a constant length of 22 crotchets[100]. Variation in the overall shape of this layer, as well as its relation to the other layers, is introduced by the variable, irregular length of the pauses which frame the melodic lines.

Similar to the clarinet layer, the piccolo layer also incorporates timbral modification. Here however, the timbral modification is not part of a large scale process but serves to reinforce the delineations of the frame boundaries. Every new start of a piccolo phrase is modified by a combination of a glissando and *Flatterzunge*; every end of a phrase is modified by a glissando.
The combination of regular frame lengths with irregular pauses shows another way in which frames can be used to generate variability of formal design, especially when superimposed onto other musical contexts. In the last stretch of the piece, from m. 306 onwards, this variability is further enhanced by the aforementioned inserts[101].

[100] The only exceptions to this are the very first line in mm. 213-219 and the penultimate line in mm. 325-332, both of which last for 21 crotchets, as well as the incomplete last line from mm. 337-343, which segues into the coda.
[101] Due to the way the inserts appear out of the "regular" texture, sometimes additional crescendi from nothing were added into pause bars (see m. 333), or rhythmical values were cut short (see m. 305).

6.5. Conclusion

Because *streifen* has not yet been performed, it is not yet possible to draw conclusions from a rehearsal and performance process. It is possible however to comment on the different compositional strategies that are employed throughout the piece to ensure the concealment of the compositional structures at play, such as the shifting of density values, the fitting-in of rhythmical cells and the superimposition of different musical layers.

The superimposition process provides the most salient modification of the outward appearance of density-based compositional schemes. Because of the interference between the different layers, the listener's attention is likely to be divided between them and less likely to follow the unfolding of the density schemes.

Another method that is used in *streifen* to hide compositional schemes can be seen when comparing its base material to *bloßes Zubehör der Maschine*. While the latter piece features an almost unbroken, single-minded and monotonous process of increasing density throughout its runtime — which is very easy to trace — *streifen*'s unfolding of density schemes is more varied. This shows both in the dialectic of increase and decrease of information, which in *streifen* is not a straightforward increase but a large-scale ebb and flow, as well as in the different ways density procedures lead into each other: the aforementioned shifting of density values, but also the superimposition of different, unsynchronised density schemes.

Finally, this modification also forms a meeting point between the two poles of intuition and numerical organisation discussed in the preceding chapters. Because the amount of information in the numerical organisation becomes excessive in different parts of the piece — for example in the overdifferentiated rhythmic ratios of mm. 13-24 (see figure 6.2) or in the extreme contraction of the shortest frame length (see figure 6.6) — an intuitive intervention of modification, displacement or plain omission of notes became necessary to even arrive at a playable version of the statistical outcome. Because they are thus made incomplete, the sonic result becomes harder to trace to its generating method.

A further intervention was made after the piece was finished by inserting small phrases that resemble the established main structure of the piece — a melody and its timbral modification — but mimic it in an intuitive way. These can be found in mm. 99-101, 125/126, 135/136, 162/163, 180-183, 306, 313, 316, 320, 334, 341, as well as the concluding coda in mm. 344-348. Because of their close, but — by the lack of a statistical organisation and a slightly higher tempo — different nature, they call the structural identity of the piece into question and introduce an element of uncertainty. Contrary to the uncertainty in *4 Abbilder* though, the

uncertainty is introduced here not through a scheme of differently dense repetitions, but by a break from a scheme of differently dense repetitions.

It could be argued that such a concealment — and in many cases such a modification — of the density schemes defeats the point of using them in the first place or makes their very existence in the piece a somewhat tenuous proposition. Even though this approach does indeed not guarantee a to-the-letter — or rather to-the-note — holistic approach towards composition, this compositional deployment of density can show how it can act as a tool for a first pass at structuring the large-scale development of a piece up to a considerable level of detail, while retaining a common source for the materials used in the piece.

7. *launenhaftes Licht* for orchestra

7.1. Introduction

launenhaftes Licht[102] was written for the 2019 Orchestral Artistry workshop at the Guildhall School of Music and Drama, London. In this piece, I wanted to address and further develop ideas and problems encountered in earlier pieces. One of the problems was the idea of microtonal "colouring-in" in *4 Abbilder*. In this piece, the attempt to include short microtonal inflections by the use of 7th and 5th harmonics on the open strings of the instruments proved to be ineffective because of the very short duration of these inflections — which rendered the microtonal displacement almost inaudible — and the lack of a fixed equally tempered pitch, which made correct intonation difficult. This resulted in a lack of clear differentiation between pitches that were deliberately "out-of-tune" and those that were just hard to tune in the first place. I wanted to explore this idea again after having gained the conclusions above from this pieces' rehearsal process.

In *4 Abbilder*, the microtonal colouring-in was also restricted to a melodic, horizontal plane. A second strand of *launenhaftes Licht* was therefore developed as a means to investigate the development of microtonal harmony of different "resolutions" and relates back to the idea of framing encountered in *bloßes Zubehör der Maschine* and *streifen*. Both of these pieces dealt with the idea of frames of different length as a means of arriving at variations of internal configurations exclusively in a horizontal sense. Exploring the same idea on a vertical plane,

[102] German for "capricious light". The title is drawn from a description of a fireplace in the ballad *Die Füße im Feuer* (The Feet in the Fire) by the Swiss writer Conrad Ferdinand Meyer (1825 – 1898).

referring to harmony and vertical pitch density, seemed to me to be an interesting means to structure the vertical colouring-in that was not developed in *4 Abbilder*. From these preliminary ideas, I developed a set of research questions:

- Can different framings be used to generate variations of a basic chord in a similar manner to the way different framings can generate variations of a basic rhythm?
- Do the minute details that result from algorithmically generated stretching and contracting effected by shifting frame boundaries translate to a similarly detailed, and possibly even microtonal, harmony when applied to vertical frames?
- How can these different microtonal pitch resolutions, both harmonic and melodic, be practically rendered with an orchestra?
- How do melodic microtonal inflections need to be conceptualized and scored in order to make them audible?

The orchestral scoring of *launenhaftes Licht* seemed for me to be an ideal medium to investigate these questions. The idea of non-tempered harmonics in the string section could be used again, but it could also be expanded due to the availability of two double basses, which can access a wider range of natural harmonics with more ease than other string instruments. Furthermore, the availability of a harp, a piano and of pitched percussion could provide the necessary foil for these non-tempered pitches, due to their relative inflexibility of pitch. Finally, the array of microtonal pitches could be expanded by the use of the non-tempered 5^{th}, 7^{th} and 11^{th} partials on the brass instruments.

7.2. Part 1

7.2.1 Harmonic and melodic development

In order to address the impractically short durations of microtonal difference in *4 Abbilder*, the main idea of the first two parts of *launenhaftes Licht* was to present the underlying harmony of the music in long-held chords, against which the difference would be more easily audible. Figure 7.1 shows the central, diatonic chord on which Part 1 is based, as well as three more fine-tuned versions of it, progressively adding semitones, 7^{th} harmonics and 5^{th} harmonics[103].

[103] the natural harmonics used in the piece that are "out-of-tune" compared to equal temperament are the 5^{th} (-14 cents), 7^{th} (-31 cents; approx. a 1/3-tone) and 11^{th} (-49 cents; approx. 1/4-tone). For the accidentals used in the score as well as this commentary, see p. ii of the full score (explanation of symbols).

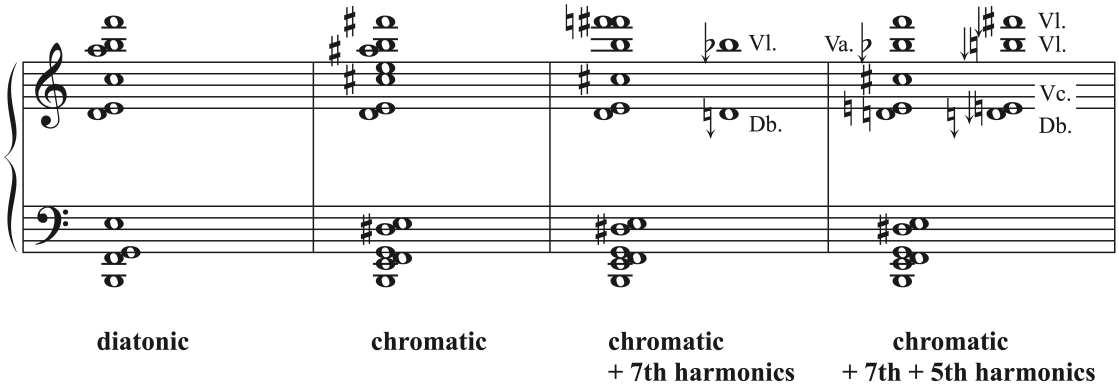

Figure 7.1 — chordal material for part 1

The spacing of the source chord was deliberately chosen to allow for additional, microtonally displaced pitches to be highlighted. These additions constitute increases in vertical pitch density, going from 10 pitches to 12, 14 and 15. However, an additional form of variation in effect here is an increase in microtonal resolution; the variants of the source chord become more and more detailed not only through an increase of vertical pitch density, but also through an increase in the different types of microtones used. This value could be called the *vertical tuning density* of a chord.

As mentioned above, in *bloßes Zubehör der Maschine* and *streifen* a horizontal frame was established as the distance between the start and the end of a given stretch of time. Similarly, a vertical frame could be defined as the distance between the lowest and the highest pitch of a chord. However, variations of the boundaries of horizontal frames similar to those used in the earlier pieces — in which the proportions of one central, static rhythm were stretched or contracted according to varying phrase lengths — would in the vertical dimension have resulted in wildly different chords with different internal characteristics. In order to actually arrive at different resolutions of one single chord, which would mirror the different versions of the same rhythm resulting from the modification of a horizontal frame, it is the vertical frame that has to remain mostly static in order to highlight shifting microtonal content within it. In the example shown in Figure 7.1, this frame is constituted by the bottom note of B1 and the top note of F#6[104]. Therefore, the variation within the frame could not simply be algorithmically generated as in the two pieces before, but was determined intuitively as described above, similar to the frame boundaries in *bloßes Zubehör der Maschine* and *streifen*.

The same gradations of tuning also govern the melodic material of this section played by the horns, harp, piano, double basses and trumpets. Because of their fixed equal-temperament

[104] The uppermost boundary of the vertical frame has to be given as F#6 and not as F6, even though the latter is the uppermost note of the first chord, because the diatonic resolution of this first chord does not include the pitch class F#.

tuning, harp and piano serve as a-foil against which the constantly shifting microtonal context of the melody and harmony can be perceived as a deliberate change in density of microtonal detail, rather than as a shaky intonation as was the case in *4 Abbilder*. The melody itself is often laid out in the form of a hocket between different instruments. The use of hocketing allows for the melodic use of different microtones that might be easier to reach in certain instruments, such as for example the flattened D4 in m. 5, which is an easily reachable double bass harmonic.

In a final step, the melody was underlaid by the corresponding variant of the central chord. Figure 7.2 shows a reduction of the first part into an annotated short score.

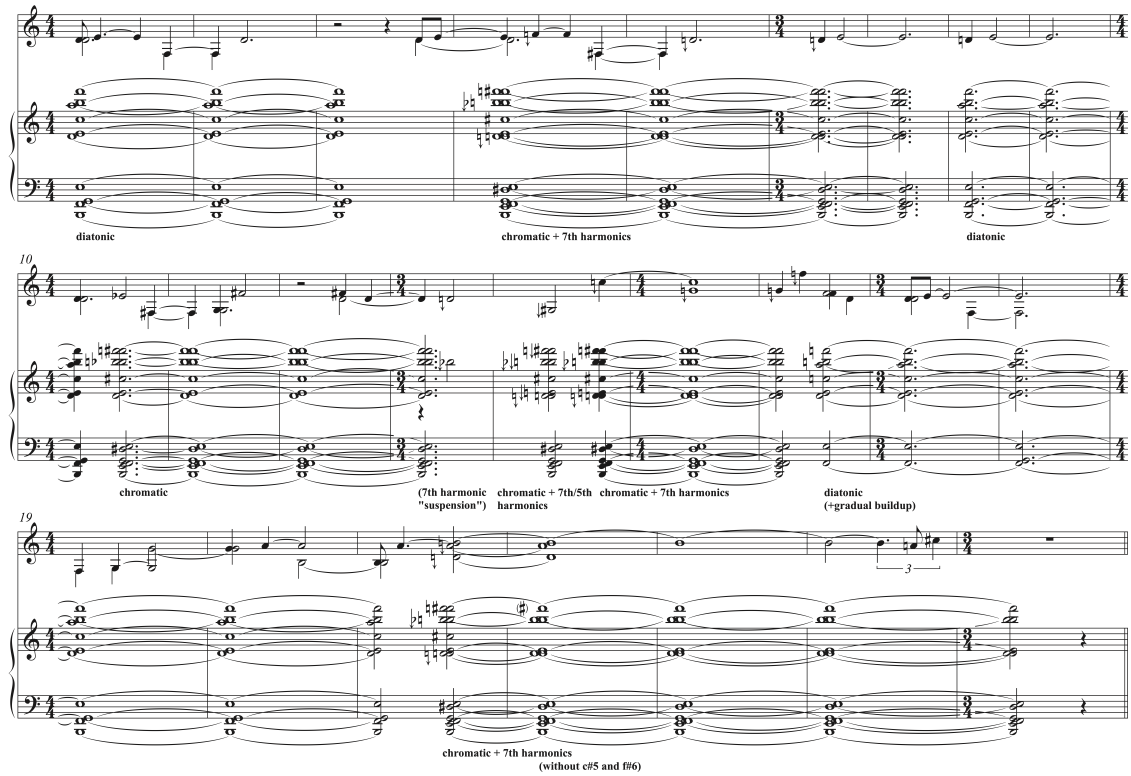

Figure 7.2 — annotated short score of section 1

7.2.2 Rhythmic network

Throughout most parts of *launenhaftes Licht*, the harmonic structure is not outlined as merely a succession of held chords. Instead, the surface appearance of the harmonic material is an amalgamation of three layers of presentation:

- held pitches; usually as string harmonics, ordinary flute pitches or de-tuned brass notes
- short impulses; played using short timbral mordents in the upper winds, or using *ricochets* in the upper strings[105]

[105] The mounted clave played by the second percussionist sounds as part of this layer; however, structurally it belongs to the lower, alternating layer.

- alternations between two pitches of the underlying harmony in the lower register of the orchestra (bass clarinet, bassoons, trombones, celli and double basses).

Both of the latter layers share different periodic rhythms as their central means of structuring. These rhythms determine in the upper layer the rate of rearticulations of a single, non-held pitch and in the lower layer changes between the two assigned pitches. Looking at the upper layer first, table 7.1 shows for mm. 1-3, 8-10 (1st beat) and 16 (3rd beat)-21 (2nd beat) a superimposition of seven sub-layers of periodic rhythmic activity:

Instrument(s)	**Durations (in semiquaver-triplets)**
Oboe 1	21
Cor Anglais	11
Clarinet 1	8
Violins I 1 and 2	10
Violins I 3 and 4	15
Violins II 1 and 2	18
Violas 1 and 2	13

Table 7.1 — rhythmic structuring for mm. 1-3 (diatonic harmonic density)

This stacking of rhythmic sub-layers forms another instance of vertical rhythmic density, as encountered before in *Absicht*. While the number of concurrent sub-layers remains constant throughout part 1 up to the third beat of m. 21, the durations — and therefore the rate of rearticulation — change together with the changes in harmonic resolution. Tables 7.2 to 7.4 below show the values for the other three harmonic densities.

Instrument(s)	**Durations (in semiquaver-triplets)**
Oboe 1	19
Cor Anglais	9
Clarinet 1	6
Violins I 1 and 2	8
Violins I 3 and 4	13
Violins II 1 and 2	15
Violas 1 and 2	11

Table 7.2 — rhythmic structuring for mm. 10 (2nd beat)-13 (chromatic)

Instrument(s)	Durations (in semiquaver-triplets)
Oboe 1	16
Cor Anglais	8
Clarinet 1	5
Violins I 1 and 2	7
Violins I 3 and 4	9
Violins II 1 and 2	12
Violas 1 and 2	15

Table 7.3 — rhythmic structuring for mm. 4-7, 14 (3rd beat)-16 (2nd beat) (chromatic + 7th harmonics)

Instrument(s)	Durations (in semiquaver-triplets)
Oboe 1	9
Cor Anglais	5
Clarinet 1	11
Violins I 1 and 2	4
Violins I 3 and 4	7 (counting from start of measure to first articulation)
Violins II 1 and 2	6
Violas 1 and 2	8

Table 7.4 — rhythmic structuring for mm. 14 (first two beats) (chromatic + 7th harmonics + 5th harmonics)

The distances between each change in tuning density, and therefore in durational values, form horizontal frames and the periodic rearticulation within each sub-layer and horizontal frame form horizontal rhythmic densities. However, this again shows a markedly different approach towards framing compared with *bloßes Zubehör der Maschine* and *streifen*, and also to the approach to vertical frames so far encountered in *launenhaftes Licht*. In the former two works, horizontal frames were of variable length and their content was stretched or contracted depending on that length. The vertical frames in *launenhaftes Licht* stayed constant, while their inner content changed. Here both frames and content change according to their place in the overall structure of the piece as well as their association to a harmonic progression. This sometimes leaves distances between rearticulations unfinished, as in the oboe part of m. 3, or in the Violin I 1 and 2 part of m. 10.

The superimpositions of different rhythmic sub-layers create four different vertical rhythmic densities for the four different vertical harmonic densities. A look at the mean durations of the four vertical rhythmic densities — 13.7 for diatonic; 11.5 for chromatic; 10.2 for chromatic + 7th harmonics; 7.1 for chromatic + 7th and 5th harmonics — reveals a mirroring of the level of

microtonal detail in the level of rhythmic detail: the more vertically dense a chord is, the more horizontally dense it is rearticulated from within. Figure 7.3 shows the vertical rhythmic density for the upper layer of mm. 1-21; figures in circles indicate the rate of rearticulation in semiquaver-triplets.

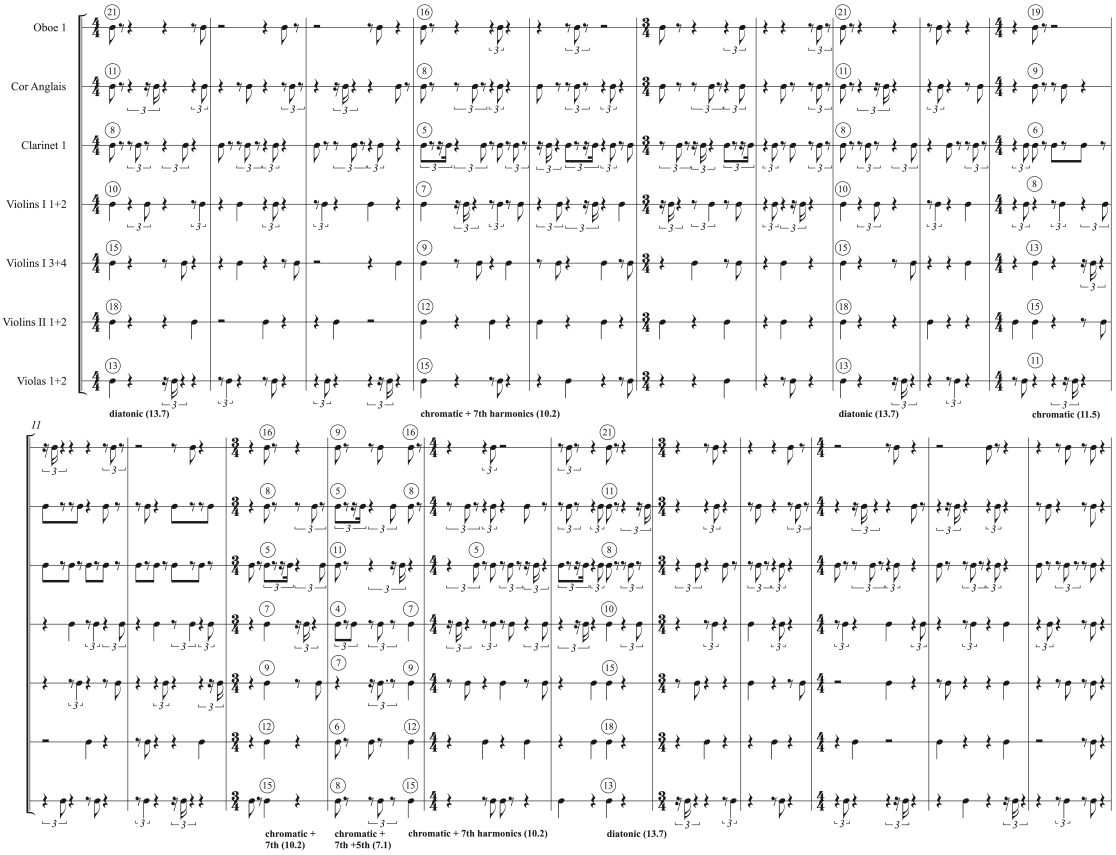

Figure 7.3 — vertical rhythmic density for part 1 (mm. 1-21), upper layer

The lower layer uses a similar scheme. Because every voice in this case consists of at least two instruments alternating between two pitches, a constantly held chord that is rearticulated from within is created (see for example bassoon 2 and violoncelli 1-3 in mm. 1-3). As with the upper layer, different rhythmic layerings can be tabled to establish the same sort of connection between horizontal rhythmic density and vertical tuning density. In contrast to the upper layer, the lower layer shows a large amount of inconsistency in the number of concurrent sub-layers. However, the mean durations — 21.6; 19.25; 19; and 5.4 — still mirror the increase in horizontal rhythmic density found in the upper layer.

7.3. Further variations and developments

The second part mostly follows the same set-up as the first. Here however, the chord progression does not only make use of variants of one chord, but changes between the original chord and an additional one, both with their respective microtonal variants.

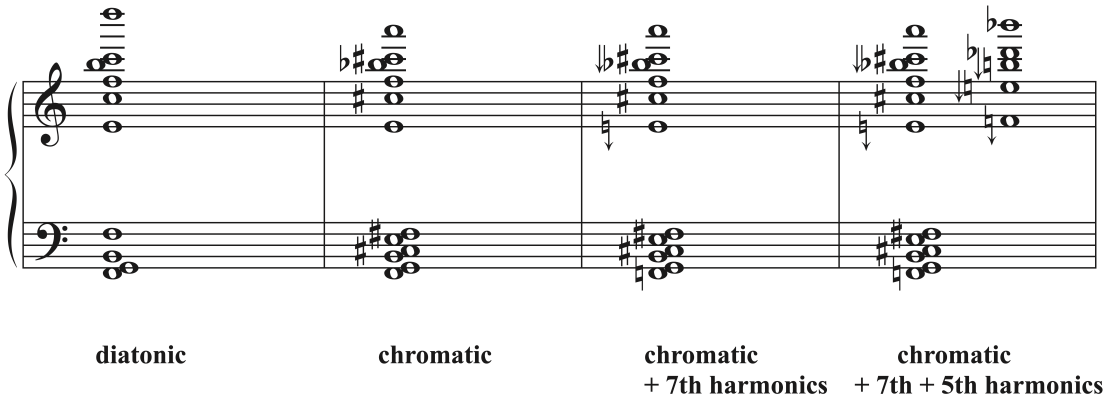

Figure 7.4 — additional chordal material for part 2

The continuous shifts between two different basic chords and numerous variants reach a point at mm. 39-46 (letters D to E) in which the rate of chord changes, as well as the rate of change in resolution, come together to create a complex network of shifting harmony. Here, a large number of factors — melody, vertically dense harmony and small interruptions by a combination of bass clarinet, bassoons and violoncelli or string tremoli played tonelessly on the bridge — come together to create what is probably the overall densest passage in the piece, in which chordal information in the end had to be modified or left out to accommodate all moving parts, similar to the last section of *streifen*.

Part three, starting at letter E, shifts the two-part melody that has so far characterised the melodic surface of the piece from the horns to the oboes. The oboes stay in a juxtaposition of diatonic and chromatic material; microtonal inflection is instead supplied by the two muted trumpets, who shadow the oboes during their long held notes by imitating their preceding material using pitches on the 11th overtone, which flattens them by about a quarter-tone. Here, I also made a significant instrument-related mistake: While writing the passage, I had assumed that the 11th overtone of the trumpets matches that of the horns, when it is of course one octave higher. This issue will be addressed in the conclusion.

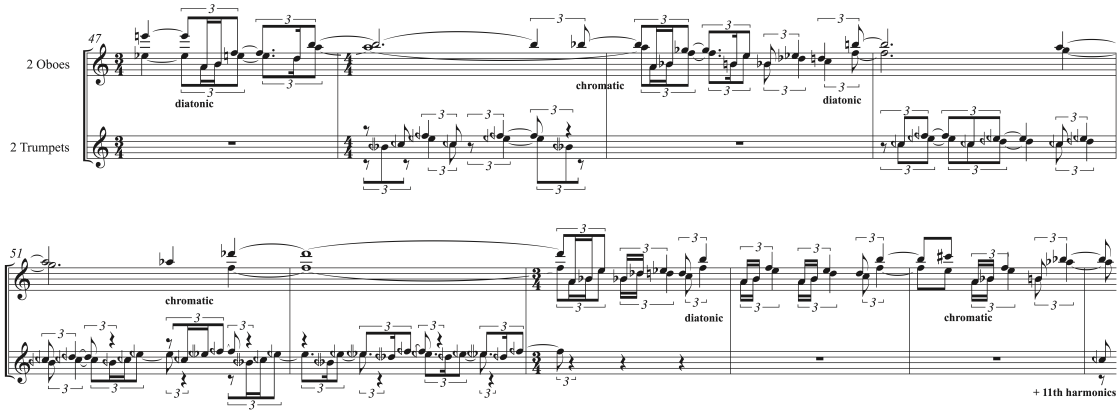

Figure 7.5 — reduction of mm. 47 (letter E) to 56 (1st quaver)

The fourth part shifts the melodic material to the piano, which is here made to sound "out of tune" by the violas, which suddenly expand the tuning density of the melody by the use of 7th harmonics right after the piano has played the same note in its equal temperament. An example of this can be found at letter I (mm. 84-91) and is given in figure 7.6.

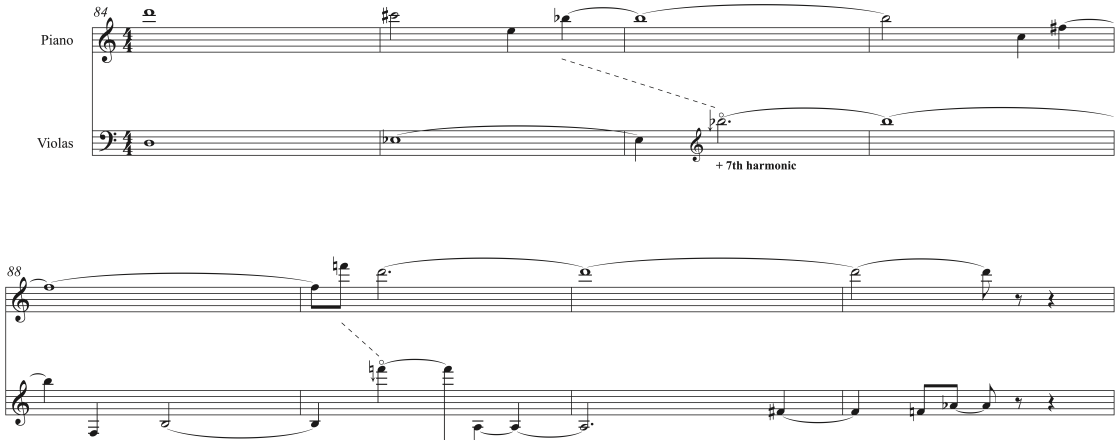

Figure 7.6 — annotated reduction of mm. 84-91

In the fifth part, the melodic material is again shifted to the horns and trumpets, starting from m. 123. This material is almost entirely derived from the underlying string chords and consists of microtonal variants of their pitches, gained from non-tempered partials. This procedure creates what are probably the most conspicuous extensions of tuning density in *launenhaftes Licht*, because of the immediate microtonal clashes. To further highlight the melodic derivation, figure 7.7 shows a short score of mm. 123-129.

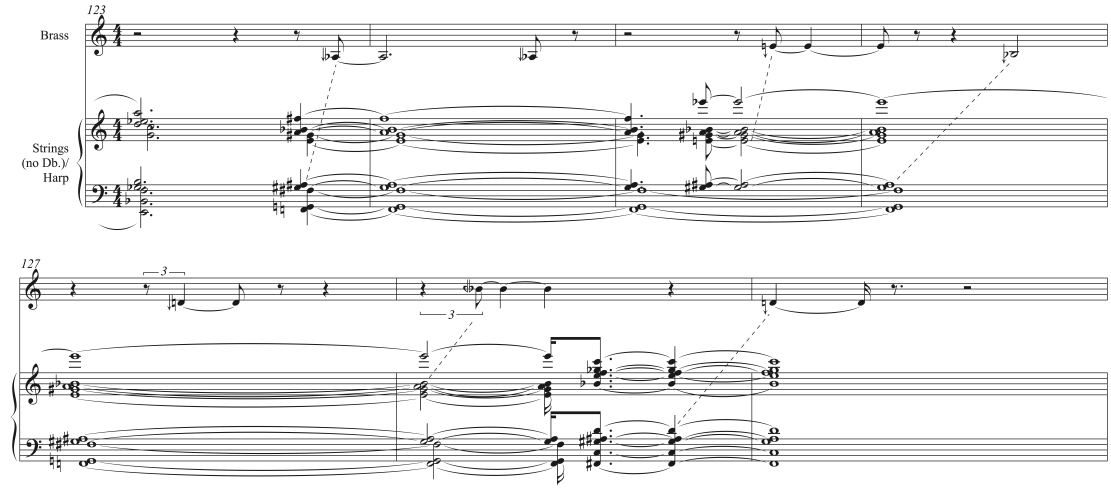

Figure 7.7 — annotated short score of mm. 123-129

Finally, the sixth part moves the melodic material to the two clarinets. Both instruments share the same basic pitch material. Clarinet 1 exclusively plays in equal temperament; clarinet 2 plays similar pitch material as harmonics, which differ considerably from the other clarinet's

tuning. The underlying harmonic progression cycles through a succession of a whole-tone chord, a chromatic chord and one chord using 7th and 5th harmonics. Here however, the melody and the harmonic progression are entirely de-coupled. Figure 7.8 shows an annotated short score for mm. 167 (letter Q) – 177.

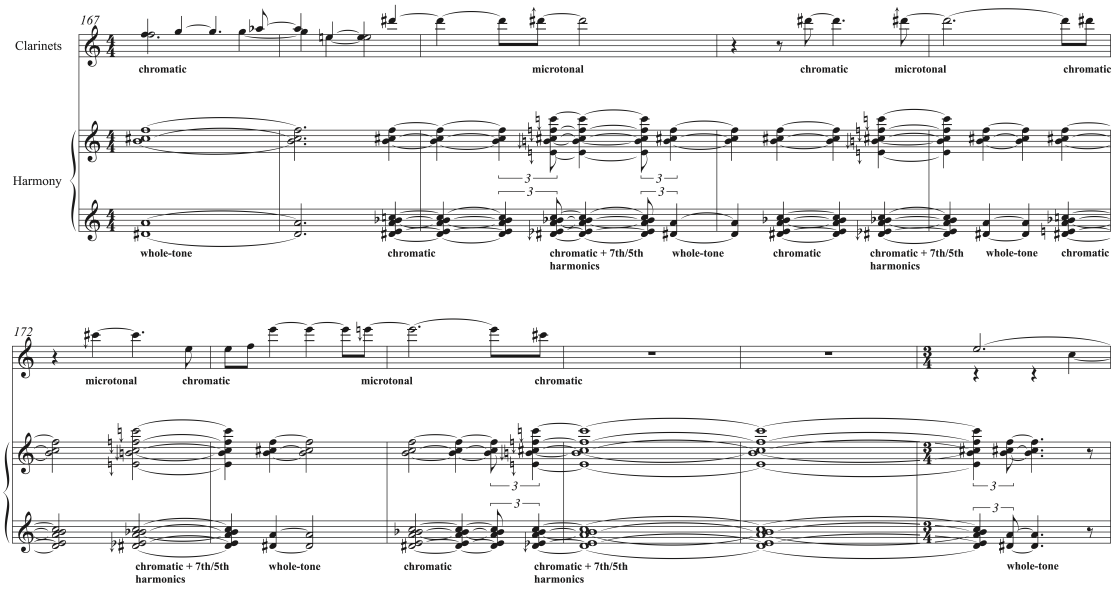

Figure 7.8 — annotated short score of mm. 167-177

The piece ends with a remembrance of the opening measures at letter R. A new element is introduced by the double bass glissandi, which are also the last instrumental sound heard in the piece. The glissandi form another version of the idea of contrasting tuning densities. The entire microtonal pitch-space in a frame of C2 to F#1 is traversed, instead of only a selection based on different tunings or scales. This ends the piece on the highest tuning density encountered so far. In contrast to the approach taken before however, this manifestation of tuning density requires a horizontal as well as a vertical plane.

7.4. Conclusions

The only rehearsal of *launenhaftes Licht* showed that in principle, the methods regarding the design of microtonal melodic and harmonic variants described above did make an audible difference, in contrast to the brief, almost inaudible and hard to execute inflections in *4 Abbilder*. However, the rehearsal process also revealed fundamental flaws in the conception of the piece, especially with regard to the method microtones were selected.

As mentioned above, one of the initial ideas of the piece was to make use of — and possibly expand on — the microtonal possibilities inherent in the orchestral scoring, such as non-tempered harmonics in the strings and clarinets or non-tempered partials in the brass. In

rehearsal, this proved to be highly inefficient. The procedure to arrive at these pitches seemed unintuitive to the orchestral players. Furthermore, it turned out that the lengthening of the tubing of the brass instruments in question — which is the effect of depressing a valve — by itself effects a de-tuning of the initial partial. Therefore, precise microtonal pitches of the sort used in *launenhaftes Licht* would not be more easily reachable by the use of non-tempered partials. In the rehearsal, the brass players instead used slight differences in intonation to arrive at the indicated microtone. While this provided an approximation of different gradations of tuning, it did not entirely reflect the precisely measured way the microtonal harmony was initially set up.

In the string parts, one of the major problems was the relationship between the available string size and the amount of *divisi* in the score. The high amount of musical information that had to be distributed to the fixed orchestra size[106] sometimes necessitated that relatively unstable harmonics, such as the 5th or 7th, had to be assigned to only one or two players. In the entire orchestral context, these harmonics were then likely to be drowned out by the other instruments.

A revised score could address some of these issues. For example, the audibility of the string writing in general and the harmonics in particular could be addressed by expanding the prescribed string size (while taking into consideration parts of the piece in which the sound of a smaller string section is part of the point, such as the solo violins in mm. 47-72). In case of the brass microtones, a different way of indicating microtonal difference that takes into consideration the solutions found by the brass players in the rehearsal would need to be found. This could for example be a system in which chromatic accidentals — or even microtonal accidentals, such as quarter-tones — are extended with modifiers that indicate to intone the pitch slightly sharp or flat.

These revisions would alter the piece in a quite fundamental way. A change in string size would most likely move the piece from a chamber orchestra setting more towards a standard orchestral size. Even more crucial, a revision of the way microtonal shadings are presented in the score and then performed by the players would require a different approach towards microtones in general. As initially conceived and written, the different microtones used would "line up" between the brass and the strings, because they were based on tunings found in the overtone series and therefore accessible by the use of harmonics, which both instrumental groups share. If the microtonal writing for the brass would be decoupled from this set-up, as the change from using harmonics to using intonation would imply, the association would be lost. Correctly tuning microtones in an orchestra between different instrumental groups without the use of harmonics would on the other hand most likely require a far clearer — less dense — orchestral

[106] The Orchestral Artistry workshop for which *launenhaftes Licht* was written has a maximum scoring of 2.2.2.2 — 4.2.2.0 — 2 perc. harp. piano — 6.4.4.3.2

texture. A new version of the piece would therefore need to radically rethink an approach to harmony — it might even in the end need to be a new piece entirely.

Despite these fundamental conceptual problems, I decided to include *launenhaftes Licht* in this portfolio because it highlights interesting information about the applicability of framing to the vertical plane. Furthermore, it shows exciting theoretical possibilities for the inclusion of microtones in an orchestral setting — such as the "de-tuned" piano in section 3 — and effective ways to overcome some questions of microtonal writing that were not sufficiently solved in *4 Abbilder*. The practicality and playability of different gradations of microtonal harmony, as well as further exploration of vertical harmonic framing however remain avenues for research; either as a revision of *launenhaftes Licht* or in further pieces.

8. *ein Perspectiv, oder vielmehr die Farbe des Glases* for violin, piano and field recording

8.1. Introduction

ein Perspectiv, oder vielmehr die Farbe des Glases (from here *Perspectiv*) was written in 2019 for the annual Strings + Piano workshop at the Guildhall School of Music and Drama, London. The idea for the piece first arose from a long-held desire to engage creatively with various aesthetic movements in recent contemporary composition that concern themselves with the relation between "every-day" sounds and "art". Composers of the *Diesseitigkeit*[107] aesthetic, such as Hannes Seidl, put their compositional focus on the "[...] concrete sound [...]"[108] of the environment instead of onomatopoetic representations like "[...] the birds in Beethoven's *Pastorale*, which had for reasons of tonality harmonically adapt to their surroundings."[109] Maximilian Marcoll, another composer connected to this movement, extends this notion of concrete sound to mean "[...] sound that is fixed on a medium, repeatedly accessible and therefore in all its phenomenological complexity available as material"[110].

Concrete materials in this sense also play an important part in the writings and work of Johannes Kreidler. Over various compositions and essays, Kreidler seeks to develop a "substance-aesthetic turn" (*gehaltsästhetische Wende)*[111] based on reference to extra-musical phenomena and new technologies and theoretically founded on the writings of the German

[107] *Diesseitig* is the German antonym to *jenseitig* (beyond). Since this antonym does not exist in English, a close approximation of *Diesseitigkeit* would be *This-side-ness* or *Here-ness*.
In addition to their compositional work, most composers discussed in this chapter are also prolific essayists. An in-depth discussion of *Diesseitigkeit* and New Conceptualism is beyond the scope of this thesis and the present discussion will limit itself on the impact both had on writing *Perspectiv*; for further reference, most essays connected to these aesthetics are available on the respective websites of the composers in question.

[108] Seidl, Hannes (2008), *diesseitig* [Online] Available from: https://archive.org/details/Diesseitig/page/n1, accessed 17. 05. 2019, p. 1 (original German: "[...] den konkreten Klang [...]"; translation: Kaspar Querfurth)

[109] ibid., p. 1 (original German: "[...] die Vögel in Beethovens Pastorale, die sich aus Tonalitäts-gründen harmonisch ihrer Umgebung anpassen mussten."; translation: Kaspar Querfurth)

[110] Marcoll, Maximilian (2013), *Konkret — Transkription in der aktuellen Musik* [Online] Available from: http://marcoll.de/text/articles/Konkret.pdf, accessed 17. 05. 2019, p. 1 (original German: "[...] der auf einem Medium fixierte, wiederholt abrufbare und dadurch in all seiner phänomenologischen Komplexität als Material verfügbare Klang gemeint."; translation: Kaspar Querfurth)

[111] see for example *Zum "Materialstand" der Gegenwartsmusik* [Online] Available from: http://www.kreidler-net.de/theorie/materialstand.htm, accessed 14. 05. 2019, and Kreidler, Johannes (2010), *Digital Natives oder Digital Naives?* [Online] Available from: http://www.kreidler-net.de/theorie/kreidler__digital-naives-oder-digitalnatives.pdf, accessed 14. 05. 2019. An in-depth essay collection on the gehaltsästhetische Wende which includes both essays can be found in Kreidler, Lehmann, and Mahnkopf (2010), *Musik, Ästhetik, Digitalisierung — Eine Kontroverse*, Hofheim: Wolke Verlag

philosophers Niklas Luhmann and Harry Lehmann[112]. While this turn is dependent on many factors, such as media theory, concept art and theories of the so-called digital revolution, Kreidler also shares an interest in "every-day" sounds with the *Diesseitigkeit* composers. He writes that "there is electronic music that sounds like outer space and electronic music that everyone has at home and that emerges from pop music, advertising, noise. This listening experience can be used for New Music[113]. Then, the music is 'linked' to the real and is in accordance with the conditions of the lived-in world. This would be similar with field recordings."[114]

Seidl and Kreidler seem to regard material as entirely objective, as for example in Seidl's use of a recording of the concert space before the performance in his piece *The Art of Entertainment* (2006), that is then played back during performance to create "[...] a difference, which lets the every-day before or outside of the concert situation appear"[115], or Kreidler's claim that "Sound and semantics are two sides of the same coin. […] Vibrato is classical-romantic lustre, scratch-sounds are an idiom of New Music of the past forty years, et cetera."[116] Marcoll at first seems to agree when he claims that by relating music back to a concrete occurrence, "the buck of contingency is partly passed on to the profane source material or the situation of its coming into being. While without transcription the undivided responsibility for everything that was written lies with the composer and he or she needs to grapple with the problem of avoiding arbitrariness, with transcribed sounds the selection is at first contingent; however, the structure of the selected material then dictates a great deal of detail decisions. Moreover, the recourse [to a

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[112] see for example Luhmann, "Das Medium der Kunst", in: Luhmann, *Aufsätze und Reden*, Stuttgart, Reclam, 2001 and Lehmann, Harry, "Avantgarde heute. Ein Theoriemodell der ästhetischen Moderne", in: *Musik & Ästhetik*, Vol. 38, Stuttgart: Klett-Cotta, 2006; both quoted in Kreidler, Materialstand

[113] New Music is here understood as an aesthetic term and not simply as newly written music. Throughout his writing, Kreidler concerns himself with contemporary composition as an avant-garde practice; see for example: "New Music should be New Music and not modern classical music" (Kreidler, "Standartsituation", in: Kreidler, Mahnkopf, Lehmann, *Musik, Ästhetik, Digitalisierung*, p. 128; original German: "Die Neue Musik soll Neue Musik sein, und nicht moderne klassische Musik"; translation: Kaspar Querfurth)

[114] Kreidler, Johannes (2009), *Institutionen komponieren* [Online] Available from: http://www.kreidler-net.de/theorie/kreidler__institutionen_komponieren.pdf, accessed 21. 05. 2019, p. 2 (original German: "Es gibt Elektronische Musik, die nach Weltraum klingt und die, die jeder zu Hause hat und aus der Popmusik, Werbung, Rauschen dringt. Diese Hörerfahrung kann man auch für Neue Musik verwenden. Dann ist die Musik real 'verlinkt' und entspricht den Bedingungen der Lebenswelt. Ähnlich ginge es mit Feldaufnahmen."; translation: Kaspar Querfurth)

[115] Seidl, Diesseitig, p. 3 (original German: "[...] eine Differenz, die den Alltag vor oder außerhalb der Konzertsituation aufscheinen lässt."; translation: Kaspar Querfurth)

[116] Kreidler, Materialstand, p. 9 (original German: "Klang und Semantik sind zwei Seiten derselben Medaille. […] Das Vibrato ist klassisch-romantischer Schmelz, die Kratzgeräusche sind Idiom der Neuen Musik der vergangenen vierzig Jahre, et cetera."; translation: Kaspar Querfurth)

concrete sound] charges the re-synthesized sound semantically."[117] However, the process of transcription, which is central to some of his work — and central to *Perspectiv* —, for him reconfigures the relationship of a composer towards his or her material in a fundamental way: composition becomes "[...] a form of reading of the subjective reality [...]"[118] and transcription "[...] can therefore be seen as a compositional intervention, in which the composer filters the source material, emphasizes certain aspects or attributes and neglects others as insignificant."[119] The "[...] leeway [...]" that a composer has in this process "[...] can vary considerably and is dependent on the density of acoustical information."[120] This would imply a certain amount of a subjective element in working with concrete sounds.

Transcription is also an important part of the compositional practice of Joanna Bailie. However, she differs from the thoughts of Marcoll, Seidl and Kreidler on concrete material by explicitly distinguishing real sounds from digitally recorded sounds, in whom through the recording process "information is necessarily 'lost' […], or at least discarded with the remaining data subsequently reconstituted into a whole by a computer algorithm."[121] This, Bailie claims, can lead to the wrong assumption that digital recordings "[...] possess an essential one-on-one, authentic relationship to the thing that they have recorded"[122]. On the other hand, she also poses the question whether this "[...] loss of information incurred by sampled formats [could] also be regarded as a helpful reduction of a bewildering continuous reality"[123].

My main question in *Perspectiv* was whether different applications of theories about density explored in previous chapters could be used to further differentiate processes of transcription of concrete sounds. This question also had a critical impetus: to me, the claim that certain sounds

[117] Marcoll, Konkret, p. 1 (original German: "Der Schwarze Peter der Kontingenz wird teilwese [sic] an das zu Grunde liegende profane Klangmaterial bzw. die Situation seiner Entstehung weitergeschoben. Während ohne Transkription die ungeteilte Verantwortung für alles Geschriebene beim Komponisten oder der Komponistin liegt und er oder sie sich mit dem Problem der Beliebigkeitsvermeidung herumschlagen muss, ist bei transkribierten Klängen zunächst die Auswahl kontingent, die Struktur des ausgewählten Materials diktiert dann aber eine große Menge der Detailentscheidungen. Darüberhinaus lädt die Rückbindung den resynthetisierten Klang semantisch auf."; translation: Kaspar Querfurth)

[118] ibid., p. 4/5 (original German: "[...] eine Form von Lesung der subjektiven Wirklichkeit [...]")

[119] ibid., p. 5 (original German: "[...] kann damit als kompositorischer Eingriff verstanden werden, in dem der oder die Komponierende Filtrierungen des Ausgangsmaterials vornimmt, bestimmte Aspekte oder Eigenschaften betont und andere als nicht signifikant vernachlässigt."; translation: Kaspar Querfurth)

[120] ibid., p. 5 (original German: "Der Spielraum […] kann dabei stark schwanken und hängt von der Dichte der akustischen Informationen ab."; translation: Kaspar Querfurth)

[121] Bailie, Joanna E. C. (2017), *Transcribing Reality: how the nature of audio and visual media have affected culture, perception, and the role of the artist.* Submitted for the degree of Doctor of Philosophy. London: City, University of London, p. 16; compare also chapter 1.5

[122] ibid., p. 16

[123] ibid., p. 16

would have one specific semantic meaning always seemed highly reductive. Different outcomes of different density schemes applied to the same source material could highlight the wealth of compositional opportunities contained in one sound sample and would, perhaps, contribute to the discussion about the use of concrete sounds in composition.

To directly relate *Perspectiv* to aesthetics of *Diesseitigkeit* and the substance-aesthetic turn, different aspects of these aesthetics were included in the design of this project from the start:

- The initial and highly traditional scoring of violin and piano was supplemented by the inclusion of electronics, in this case the playback of the source sound file.
- The source sound file is a field recording of a park, prominently featuring sounds of traffic and birdsong, including a car horn and a bird singing a diminished triad. This can be argued to be a common combination of sounds in every-day life.
- The field recording was sourced from the website freesound.org, where it was uploaded under the title *just birds.wav* by the user Littlebrojay[124] and licensed under the Creative Commons 0 license[125].
- All sound sources — both on the sound file and on stage — arguably transport a variety of highly semantic meanings, for example through the scoring or the diminished triad sung by the bird on the recording.
- Digital technology was liberally used in the transcription process.

8.2. Transcription process

8.2.1. SPEAR analysis

The first stage of the compositional process focussed on finding a method of transcription for the source sound file. Because one of the main ideas for the piece was to work with the sound file in different levels of harmonic and rhythmic density, a method had to be found that allowed for these levels to be present in the transcriptive process. My goal was to obtain at the end of the process different transcriptions of the sound file in traditional western notation format; and to be able to directly define the parameters of the rhythmic values as well as the vertical pitch density used for these transcriptions, which would then be used as compositional material. To this

[124] Freesound (2013), *Freesound - "just birds.wav" by Littlebrojay* [Online] Available from: https://freesound.org/people/Littlebrojay/sounds/195437/, accessed 23. 04. 2019

[125] Creative Commons 0 is a license that says that "The person who associated a work with this deed has **dedicated** the work to the public domain by waiving all of his or her rights to the work worldwide under copyright law, including all related and neighboring rights, to the extent allowed by law." (bold-face in original); quoted from Creative Commons, *Creative Commons — CC0 1.0 Universal* [Online] Available from: https://creativecommons.org/publicdomain/zero/1.0/, accessed 23. 04. 2019

purpose, different computer softwares were tried out; in the end, the transcriptions were done using a combination of the softwares SPEAR[126], Max/MSP[127] and Dorico[128].

Firstly, the sound file was opened in SPEAR. The wide array of frequencies resulting from SPEAR's initial analysis proved to be much too detailed — in fact, too dense — to be of any particular compositional use, because their continuous band of pitches would render any pitch selection virtually meaningless (see figure 8.1).

Figure 8.1 — initial SPEAR analysis of source sound file. x-axis indicates time in seconds, y-axis indicates frequency in Hz, partial thickness indicates velocity; note also the recording artifact at the very end of the sound file.

To put the sound file to compositional use, the decision was taken to focus mostly on the birdsong present in the sound file. To this end, a second analysis was made in which all partials below 2000 Hz as well as above 7500 Hz were filtered out, with the exception of a brief cluster of sounds between seconds 10 - 11 and ca. 500 – 1220 Hz to retain the sound of a car horn, as well as a section between seconds 21,5 and 24 and ca. 1280 – 2000 Hz to retain a part of birdsong that approximately forms a G# diminished triad; these being conspicuous components of the recording that I wanted to retain. Further to this, all partials below an amplitude of -45 Db were deleted. This greatly reduced the density of information present from the sound file (see figure 8.2).

[126] As its website succinctly puts it, "SPEAR is an application for audio analysis, editing and synthesis", developed by Michael Klingbeil; quoted from Klingbeil, Michael (2018), *SPEAR Homepage* [Online] Available from: http://klingbeil.com/spear/, accessed 23. 04. 2019

[127] A programming software for audio and video developed by the company Cycling '74

[128] A scorewriting software developed by Steinberg.

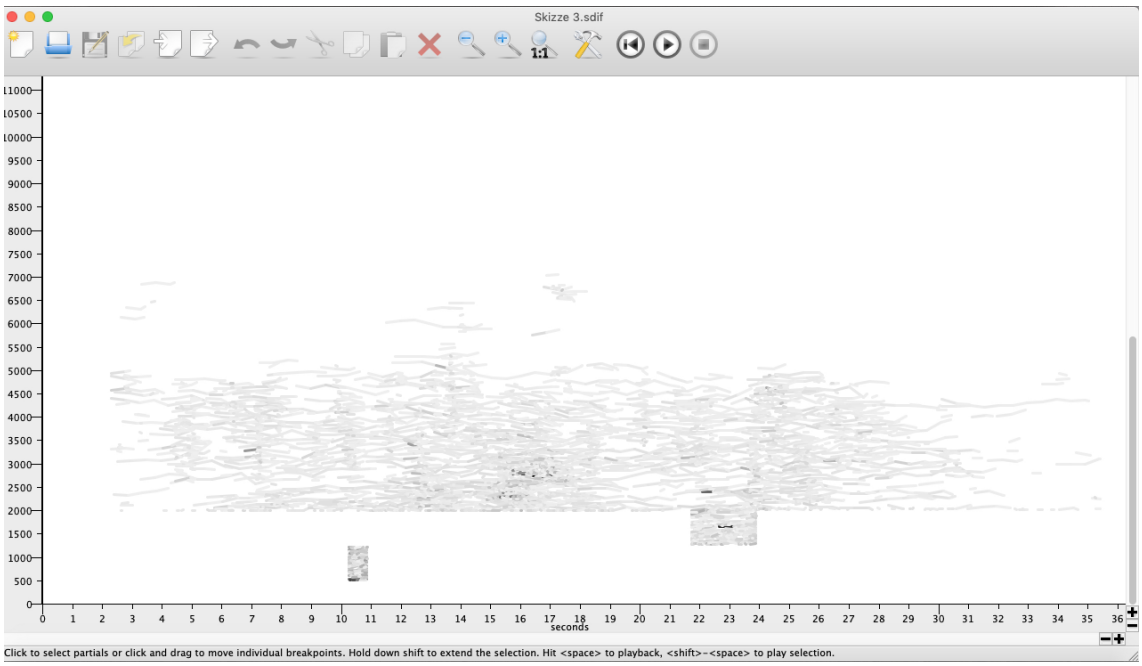

Figure 8.2 — first filtering of initial SPEAR analysis.

While the initially chosen frequency bands were not further modified, further iterations of filtering by loudness were made, down to a threshold of -33 Db (see figure 8.3), prompted by demands from the later composition process.

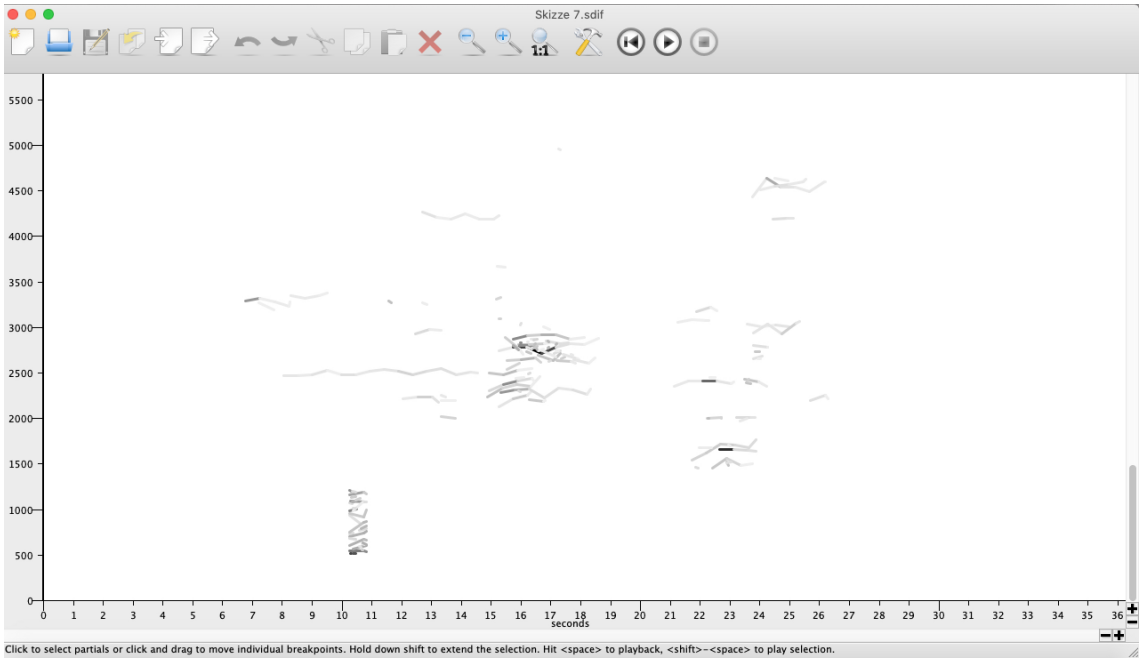

Figure 8.3 — first filtering of initial SPEAR analysis with additional removal of partials below a -33Db threshold

The filterings were saved as .sdif files for further use in a Max/MSP patch.

8.2.2. Transcription with Max/MSP and Dorico

As the next step, a Max/MSP patch was adapted from an online tutorial by Michele Zaccagnini[129] that would convert the data of the .sdif file into western notation[130]. This was done using two suites of extensions to Max/MSP called *Bach* and *Cage*[131]. Figure 8.4 shows the patch used to obtain the transcriptions of the source sound file.

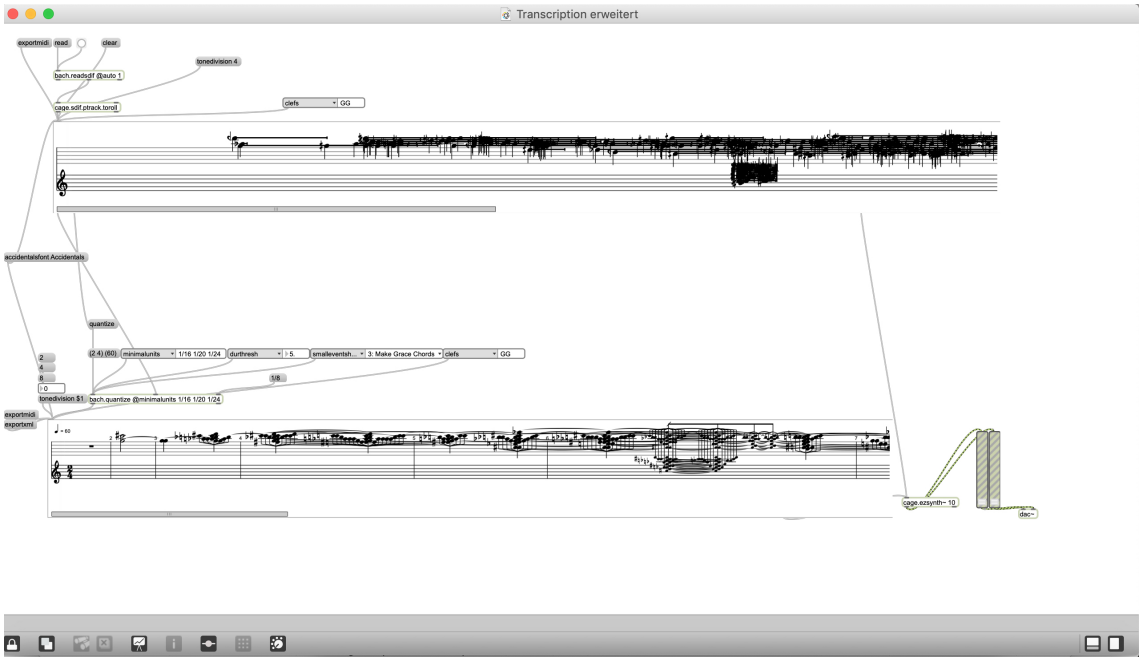

Figure 8.4 — Max/MSP transcription patch

The final version of this patch performs a transcription of a .sdif file based on:

- variable inputs for base rhythmic values
- a threshold after which an event to be transcribed is regarded as "too small to be quantized"
- rules for dealing with these events
- the size of the temporal frames (called "boxes" by Max/MSP) in which the quantization is carried out.

The result was saved as a MIDI file; as a final step, these MIDI files were opened in Dorico to obtain a printable version.

[129] Zaccagnini, Michele (2018), CVM#6-Intepolating resonant spectra [Online] available at https://www.youtube.com/watch?v=QVVSAlNV8Sw, accessed 02. 05. 2019

[130] SPEAR does give the notational equivalent of highlighted frequencies; however, it does not transcribe into a standard 5-line system.

[131] Bach, Cage and the sister module Dada, are suites of modules designed to further the capabilities of algorithmic composition in Max/MSP. Bach, for example, includes a scorewriting interface that Max/MSP on its own lacks.

By combining different filterings in SPEAR for the vertical dimension with the array of quantization parameters in Max/MSP for the horizontal, tools were established that allowed for a high degree of precision in the transcription process. This process could now be used to generate transcriptions in different vertical and horizontal densities of the initial sound file.

8.3. Different density strategies

8.3.1. Introduction

One important element of the overall structuring of *Perspectiv* is the constant repetition of the source sound file. The piece consists of 15 ten-bar phrases, of which the last bar is always a general pause[132]. In the first bar of every phrase, the playback of the sound file, which starts on the third beat of the first measure and lasts until the beginning of the eighth measure, is re-triggered by the performers or an assistant.

Most materials in *Perspectiv* are derived in different ways from the source sound file and will be discussed below. However, there are materials in *Perspectiv* that, while they relate to the sound file, do not correspond to the temporally fixed transcriptions described above. These include the almost constant layer of Gb6. While this g-flat is technically present in the initial wide cluster of pitches (see figure 8.1), its further development — including the complementary pitches that colour and form a counterpoint to the g-flat — was composed freely and independently from the sound file. In a similar fashion, the 2 to 3-note clusters in the left hand were derived from the analysis of the car horn sound at approximately 10 seconds of the sound file, but then treated independently from the source. A free variation in horizontal pitch density, based on the pitches C#5, D5 and Eb5 drawn from the analysis, was used to develop this layer.

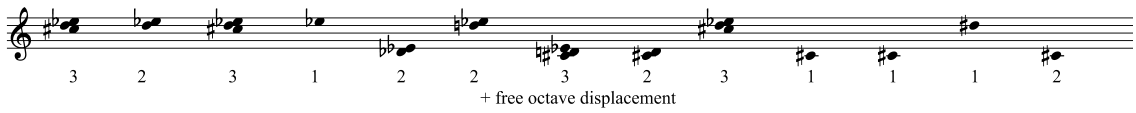

Figure 8.5 — freely developed car horn layer for mm. 3-9; numbers represent vertical pitch density

Finally, there are small melodic scraps and traces of diminished triads, which were drawn from the G#-diminished-triad that can be found among the birdsong of the sound file. These are also freely developed and inserted into the more fixed transcription material.

The "purest" manifestations of these more freely handled materials can be found on the first page. This is because this page —with the exception of the upper voice of the piano — was also

[132] The only exception to this is phrase 12, which is capped by 3 bars of general pause; see mm. 120-123

the first to be written, when the idea for the transcription process was to exclusively use a SPEAR analysis. Even though all the pitches in these materials relate to the pitch material found in the source file — which "fixes" these materials into the sound-world of the birdsong and traffic — I wanted the piece to have a more precise way of developing the relation between instrumental density and concrete sound. As mentioned before, SPEAR transcribes rhythmic succession only into space-time notation and not into standard rhythmic notation; in order to counteract this, the transcription process described above was devised.

8.3.2. Density of transcription

The most basic way in which the results from the transcription process were used in *Perspectiv* is the direct transferral of chords from the transcription into the piece, for example in mm. 21-30. Here, a filtering of the source file down to -40Db and a quantization with a box value of 1/2 produced a steady flow of crotchets (see figure 8.6)[133].

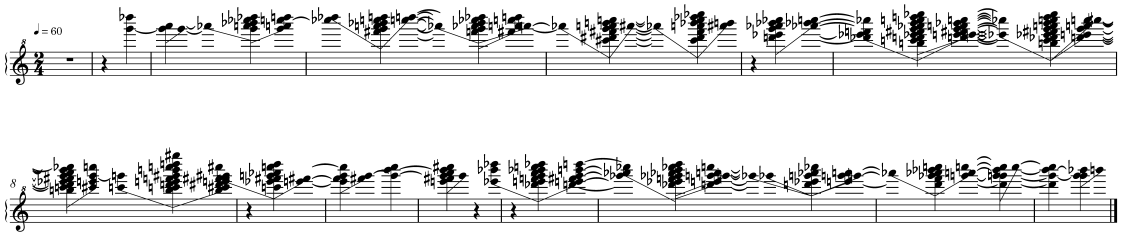

Figure 8.6 — transcription of source file; -40Db; box value 1/2 (sketches written in 2/4 instead of 4/4)

Of these, a number were selected and inserted into the piece at the corresponding positions in the 10-bar phrase of the score. This procedure appears in every 10-bar phrase of the piece and can usually be found in the chordal material of the uppermost voice of the piano part; in fact, mm. 21-30 is the only longer passage in which this material is shared between both instruments.

However, most other occurrences of this material are based on higher degrees of horizontal rhythmic density to allow for a greater variety of rhythmical placement. For example, in mm. 1-10, a transcription with the same filtering of -40Db, but with a box value of 1/16 produced a steady stream of chords in semiquavers (see figure 8.7).

[133] This procedure is analogous to a passage in Marcoll's article cited above, in which he links transcription to spectral analysis, which "[...] divides a sound progression into small bits of same length and looks at the sound of every one of these so-called 'windows' as a static sound that it then subjects to a frequency analysis."; see Marcoll, Konkret, p. 3 (original German: "[...] unterteilt einen Klangverlauf in kleine Häppchen gleicher Dauer und betrachtet den Klang jedes dieser sogenannten 'Fenster' als einen statischen Klang, den es dann einer Frequenzanalyse unterzieht."; translation: Kaspar Querfurth)

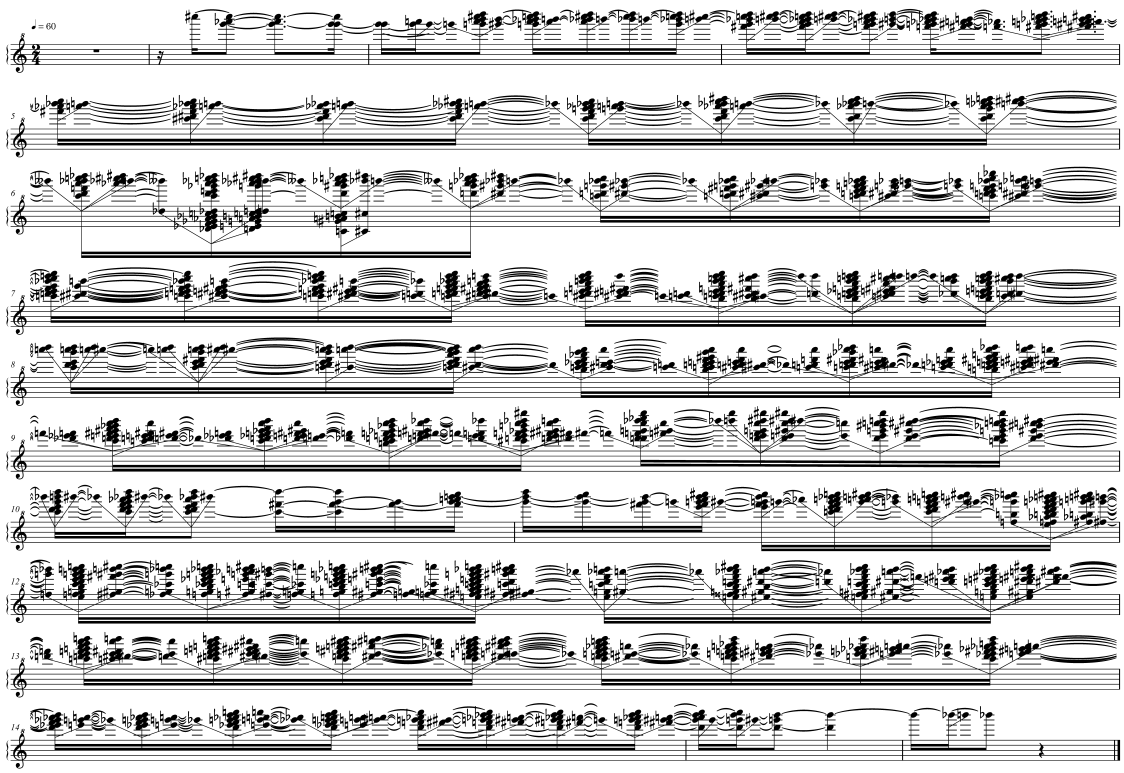

Figure 8.7 — transcription of source file; -40Db; box value 1/16

A second approach to using the transcription results in the piece can be found in much of the gestural material in the second part (mm. 31-60). Mm. 31-40 use a transcription based on a filtering threshold of -38Db and the box size 1/24, producing mostly straight semiquaver-sextuplets (see figure 8.8 on p. 88).

Out of this stream, single pitches were selected to form self-contained gestures, which however still relate to the birdsong present in the source file. In the two subsequent parts, this process is complemented by additional transcriptions, which produce continuous semiquavers (see figure 8.7), semiquaver-quintuplets, semiquaver-septuplets and demisemiquavers. By using different degrees of horizontal rhythmic density in the transcription process, the transcription can become more or less accurate — from a very broad summation of harmonic content provided by the even crotchets to a very precise representation in the even demisemiquavers. This difference is highlighted in the piece both by juxtaposition — for example in the sudden shifts between different rhythmic values in the upper piano part of mm. 42-48 — and also by superimposition — for example in the short bursts of gestural material in the upper piano part in mm. 53, 54, 56 and 57.

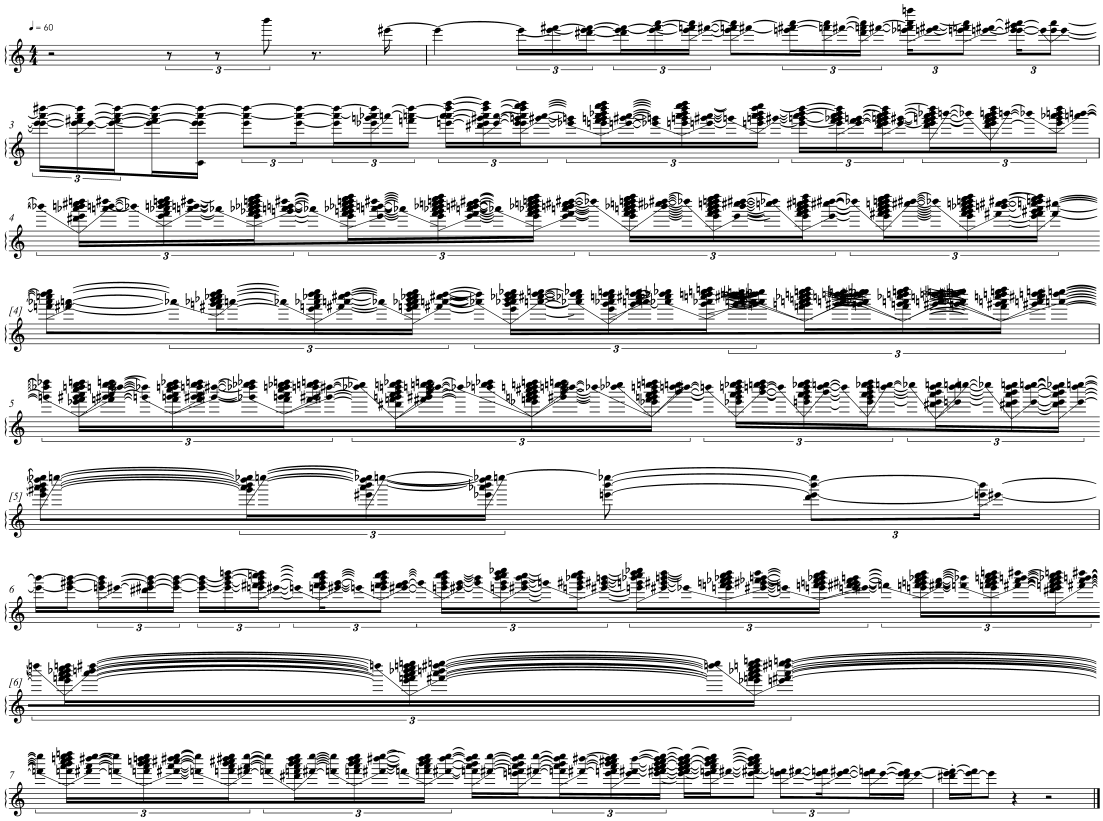

Figure 8.8 — transcription of source file; -38Db; box value 1/24

8.3.3. Melodic development

A final density strategy can be found in the gradual introduction of the melody that is prominently featured in the fourth part (mm. 91-122). This melody was arrived at through a similar selection process to the one used for the gestural material, described above. However, the transcription parameters here included a greater range of allowed minimal units which produced a greater variety of rhythms within the transcription, instead of a steady flow (see figure 8.9).

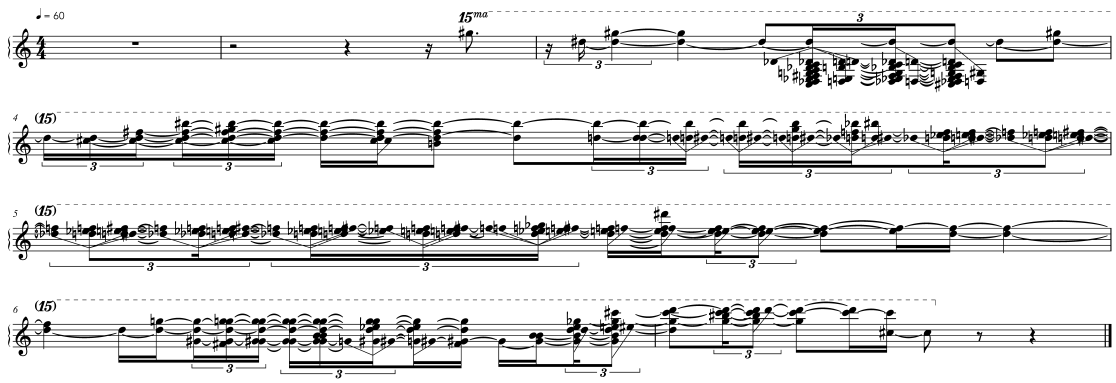

Figure 8.9 — transcription of source file; -33Db; minimal units 1/16, 1/20, 1/24

From this output, pitches were again selected that formed a self-contained melody. However, instead of stating this melody upfront, it is gradually introduced over the course of parts 2 and 3 (mm. 31-90). Figure 8.10 charts this gradual introduction, which culminates in mm. 101-110 with a continuous melody over almost the entirety of the phrase.

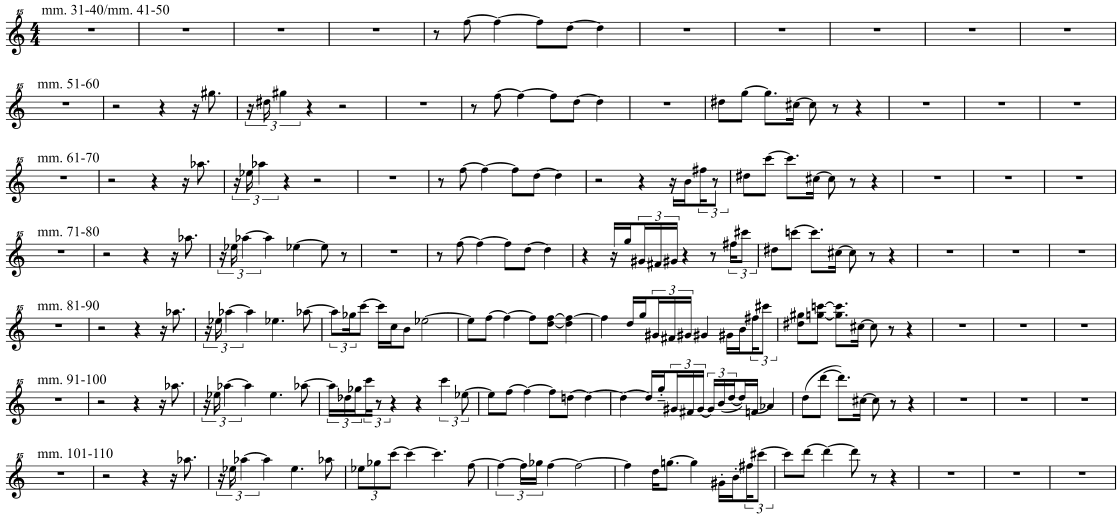

Figure 8.10 — gradual introduction of melody

This introduction can also be described as a gradual increase in density. However, this increase differs from the density developments examined so far in this thesis. Here, not only a single parameter is affected by an increase in density, but the notes themselves, which are combined from different parameters, in this case pitch and rhythm. This shows that while density strategies can be used to develop the minutiae of musical events, they can also be used to look at and work with musical material from a more general perspective; even though it is still possible to use the nomenclature used before and describe the development charted above as an increase in (horizontal) melodic density.

8.4. Conclusion

The variety of compositional techniques used in *Perspectiv* and described above show that density schemes can be used to make mediated sound sources accessible for composition beyond the mere use of them as samples. Looking at the inherent horizontal pitch density of a field recording shown by the transcription process, which is in most cases too high to meaningfully use for composition, and then devising ways to reduce and filter this level of density allows for detailed and wide-ranging compositional choices which still relate back to a source sound file.

This procedure on the other hand also shows the dependency on various "pre-filterings" that are in effect when working with field recordings. Even though *Perspectiv* is set up in a way to potentially tick several compositional boxes that would put it into the vicinity of pieces written under the *Diesseitigkeit* or New Conceptualism aesthetics, the transcription process shows that there is no "objective" transcription; choices persistently have to be made regarding the transcription parameters shown above (which are also themselves put into the process by choice and might well have been substituted by others), the choice of medium to transcribe into (in this case a standard western 5-line system), and the formal unfolding of the transcribed material.

Going back to the essays quoted at the start of this chapter, the findings of this chapter could also provide some clarity to the sometimes confusing argument Marcoll makes. It could indeed be said, as he claims, that after a material is chosen "the structure of the selected material then dictates a a great deal of detail decisions"; however, the "buck of contingency"[134] arguably does not even partly pass onto the source material itself but stays with the composer, who has to make sense of the "density of information"[135] inherent in it in some way.

It is here that an interpretation of the title could come into play. *Ein Perspectiv, oder vielmehr die Farbe des Glases* is a phrase taken from the novel *Godwi* by the German late-romantic writer Clemens Brentano[136]. In the novel, the protagonist Baron Godwi gives his definition of Romanticism, which for him is like "[...] an optical instrument or rather the colour of the glass [...]"[137]. In providing different readings of the source sound file, the density schemes described above could be seen as differently coloured glasses or lenses through which a reality is seen, interpreted and made available for compositional use, each time in a different way depending on the colouring; they could be one means of creatively providing the different "losses of information" Bailie speaks of that could help in making sense of a "bewildering reality"[138]. This multi-perspective approach to transcription and interpretation — including the dependency on choices described above — is highlighted in *Perspectiv* through the repetitive form generated by the constantly re-started, unprocessed playback; the source being read audibly stays the same, only the choices of what to use change from reading to reading.

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[134] for both quotes, compare footnote 117

[135] compare footnote 120

[136] Brentano's most famous work in the music world is probably his contribution to the poetry and song collection *Des Knaben Wunderhorn*, jointly authored with Achim von Arnim.

[137] Brentano, Clemens (1801), "Godwi", quoted from: *Kapitel 47 des Buches: Godwi von Clemens Brentano | Projekt Gutenberg* [Online] Available from: https://gutenberg.spiegel.de/buch/godwi-351/47, accessed 23. 04. 2019 (original German: "[...] ein Perspectiv oder vielmehr die Farbe des Glases [...]"; translation: Kaspar Querfurth)

[138] compare footnote 123; an example for this loss or modification of information can be found in Bailie, Joanna E. C. (2011) *Artificial Environments Nos. 1 to 5* for amplified ensemble and tape [Online] Available from: http://joannabailie.com/ files/8813/2553/9623/AE_full_score.pdf, accessed 11. 08. 2019, p. ii and iii

While it might be tempting to view a numerical, density-based approach as a substitute towards an objective way of dealing with concrete material — or even with composition itself — the repetitive form shows that it cannot supply this either. The choice of a certain density parameter, a certain density value or a certain density development at a particular instance could have been a different choice, as the repetition soon makes clear; what remains are different versions of a source, similar to *4 Abbilder*. This shows a final intersection between the poles of statistical and intuitive composition that could be seen in the preceding pieces; the use of statistical procedures, and the more or less strict adherence to them, ultimately depends on the intuitive choice to use them.

The reference to romantic aesthetics made by the title can be seen as a critique of the emphasis on the difference between concrete sounds and onomatopoeia made by Marcoll and Seidl in their articles quoted above. Marcoll writes:

> "Music created by transcription processes can be understood as a continuation of programme music of the 19th century, and indeed it is from time to time dismissed as 'Programme Music 2.0'. However, by transcribing a concrete sound development, something entirely different happens than in onomatopoetic music. For example, the barking dog that Vivaldi depicts in his *4 Seasons* probably never existed as a concrete sound. And even if it had, it does not matter: the sound morphology of a dog's barking — whether of a concrete dog or only an idea of it — is lost, because it is subsumed under a hierarchical artistic rule system. E major wins"[139].

He further claims that "the difference between onomatopoetic music and transcribed sounds lies in the difference between original and reproduction. In the case of onomatopoeia, the relationship is coinciding and depicting, with transcription it is causal and reproducing."[140] *Perspectiv* attempts to challenge this view. As further elaborated above, in mm. 91-122, only a melody is selected from the transcription of the source file. This melody is then harmonized by a sequence of seventh-chords, placing a reproduction of a natural world ungoverned by music

[139] Marcoll, Konkret, p.2 (original German: "Die durch Transkriptionsvorgänge erzeugte Musik kann als eine Fortführung der Programmmusik des 19. Jhds begriffen werden, hin und wieder wird sie denn auch als 'Programmmusik 2.0' geschmäht. Tatsächlich aber passiert durch die Übertragung eines konkreten Klangverlaufs etwas völlig anderes als bei der onomatopoetischen Musik. Beispielsweise hat es den bellenden Hund, den Vivaldi in seinen 'Vier Jahreszeiten' darstellt als konkreten Klang wahrscheinlich nie gegeben. Und selbst wenn, es spielt keine Rolle: Die klangliche Morphologie des Bellens — ob eines konkreten Hundes oder nur der Idee davon sei dahingestellt — geht verloren, weil sie einem hierarchischen Kunst-Regelsystem untergeordnet wird. E-Dur gewinnt."; translation: Kaspar Querfurth)

[140] ibid., p. 2 (original German: "Der wesentliche Unterschied zwischen onomatopoetischer Musik und transkribierten Klängen liegt im Verhältnis von Original und Reproduktion. Im Fall der Lautmalerei ist das Verhältnis koinzident und darstellend, bei der Transkription ist es kausal und reproduzierend."; translation: Kaspar Querfurth)

theory — which is however both by virtue of being a reproduction and by having been transcribed already transported into a artistic system of rules — into a suggested network of tonal relations. The sound morphology of the birds is thereby indeed lost in the hierarchical system of artistic rules conjured up by the harmony, as well as by the "classical-romantic lustre"[141] evoked by the violin's combination of high tessitura and vibrato and the traditional set-up of soloistic melody and pianistic accompaniment. This high tessitura and indeed the shape of the violin melody, both in pitch as well as rhythmic content, are however still based on the transcription — itself a hierarchical system of artistic rules — of the initial source sound file, thereby on the one hand blurring the distinction between the depiction of a source in an artistic system and reproducing it via transcription, and on the other hand indeed providing a link between aesthetics of *Diesseitigkeit* and 19th-century programme music. This blurring is further enhanced by the choice of a sound file in which a bird sings a combination of notes that closely resembles a diminished chord on g#, thereby already placing the hint of a hierarchical artistic rule system into the depiction of the real world used in the piece.

Using density to form different transcriptions of concrete sounds can therefore be seen as a way to treat the combination of recorded sound and live instruments with greater insight and care, and also as a way to link density techniques to more wide-ranging aesthetic contexts without necessarily resorting to text setting as in *bloßes Zubehör der Maschine*.

[141] compare footnote 116

9. Conclusion

9.1. Density as an aesthetic principle?

The main argument put forth in this thesis, as well as in the accompanying portfolio of compositions, was that density as a compositional concept does not merely refer to "a lot of notes", but rather describes the amount of musical events in a given parameter and a given frame. The analytical and compositional implications of this have already been argued in the conclusion of the introductory chapter as well as the commentaries to the submitted pieces. This concluding chapter will therefore focus on the aesthetic implications and possibilities resulting from this more precise formulation of the concept of density.

Even though, as argued in the first chapter, density as a term mainly originated in the post-war avant-garde as a byproduct of integral serialism, both the literature as well as the compositional research have shown that it does not need to be tethered to this aesthetic. The post-war avant-garde sought a radical break with the cultural past, which was viewed as irrevocably tainted by the Second World War and its causes and instigators. Integral serialism was therefore on the one hand seen as a rediscovery and extension of the past radical aesthetics of atonal or twelve-tone composition but on the other hand also seen as a critique of these aesthetics, that were — for some composers — despite their radical attributes too closely linked to the preceding romantic aesthetics[142]. However, with few exceptions, almost all composers and their works discussed in the literature review, as well as all the works in my portfolio of pieces, do not use density as the expression of a central serial idea, but as an ordering principle amongst many. The commentaries on my own portfolio of works furthermore show that density can be used to develop or shape further material that was at a first stage arrived at by intuitive means. It could therefore be argued that density forms a part of post-serial writing techniques; developed within or as a response to serial music, but not necessarily connected to an aesthetic or even ideological programme.

Writing techniques that were used for large-scale compositional designs in the pieces of this portfolio could also conceivably be used for smaller-scale procedures, which would not necessarily affect an entire piece but achieve a local effect, for example a sudden, but brief increase and decrease in density of events. This would divorce density techniques even further from a hard-and-fast aesthetic and turn them into compositional tools, to be used as needed for a specific musical outcome. However, it could be argued that even this would still link density with the aesthetics or ideology of, if not necessarily a serial system, then at least a numbers-

[142] see footnotes 2-4; for the latter critique of atonal or twelve-tone composition, see for example Boulez, Pierre (1968) "Schoenberg is dead", in: Boulez, Pierre, *Stocktakings from an Apprenticeship*, translated by Stephen Walsh, Oxford: Clarendon Press, 1991

driven approach to music analysis and composition, as opposed to for example a more improvisational manner of writing.

A common thread between the different compositional approaches and aesthetics discussed in this thesis, as well in as my own works, could be seen in their centering of information as their primary compositional focus. This seems particularly appropriate to the music of the 20th- and 21st centuries, which have seen an unprecedented increase in the amount and availability of information through the advent of mass media, so far culminating in the so-called digital revolution[143]. However, developing an aesthetic of density solely as an aesthetic of overabundance or over-information would be a limitation of the scope of density-based composition. As both the literature review and the portfolio of pieces have shown, density processes allow for a conceptualization of the number of musical events on a very high as well as a very low level, and also for a negotiation between the two. This could very well link density to composers who explore the sonic and aesthetic possibilities of silence, such as the aforementioned Wandelweiser collective around composers such as Antoine Beuger, Jürg Frey or Michael Pisaro — who in his article on the history of Wandelweiser remarks upon his first encounter with the music of Kunsu Shim that "Silence in music was not the cessation of sound, or even a gesture: it was a *different sound*, one with more density than those sounds made by instruments"[144] — or even their precedents in the American experimental school, such as John Cage or Morton Feldman. This reinforces the idea that density does not denote a specific value or degree, but rather a spectrum of and ultimately a perspective on the amount of musical information, to be used as a tool of a personal aesthetics and not necessarily an aesthetic in its own right.

9.2 Personal development — Aesthetics of uncertainty

Investigating topics of density more closely has also broadened my own array of compositional tools as well as my awareness of different aesthetic positions and the possibilities of creatively engaging with them. The writing process for two pieces in particular — *Perspectiv* and *bloßes Zubehör der Maschine*, which are to my mind the most successful of the portfolio as both

[143] On the other hand, an argument for an aesthetics of over-information or abundance for earlier musical aesthetics — such as the ones in which the aforementioned *Alpine Symphony* or *Spem in alium* were written — could be made with reference to the feeling of the sublime caused by "Greatness of dimension [...]", argued by Edmund Burke; see: Burke, Edmund (1757), *On the Sublime and Beautiful* [Online] Available at: https://ebooks.adelaide.edu.au/b/burke/edmund/sublime/part2.html#part2.8, accessed 11. 08. 2019, part 2, section 8

[144] Pisaro, Michael (2009), *Wandelweiser* [Online] Available from: http://erstwords.blogspot.com/2009/09/wandelweiser.html, accessed 11. 08. 2019 (italics in original). This is not to say that the aesthetic loosely shared by the Wandelweiser composers can be reduced to working with low states of density. A selection of different texts on aesthetics by this group of composers can be found at https://www.wandelweiser.de/texts.html

research and compositions — have brought greater clarity for myself regarding the relation of compositional craft to personal expression.

Perspectiv showed this by viewing a compositional aesthetic different from my own through the lens of density processes, which shone a different light on this aesthetic than its primary sources I was able to locate. This allowed me to formulate my own aesthetic response, in this case to *Diesseitigkeit* and/or New Conceptualism. *bloßes Zubehör der Maschine* showed that density processes can be used in text settings to conceptualize and make audible a musical reading of the used text — a "composed interpretation", to misappropriate a term used by Hans Zender to refer to his altered and re-composed versions of Schubert's *Winterreise* and Beethoven's *Diabelli Variations*[145]. This, again, enabled me to formulate a compositional aesthetic that could musically comment on societal issues, but also through referencing materials and strategies on an existing musical aesthetic, in this case Lachenmann's. However, *streifen* showed that the ideas and techniques developed as a response to a particular societal topic can — divorced from the context provided by setting specific texts — also serve as motors for the structuring of an entirely abstract piece.

Finally, an avenue for the further development of the expressive potential of density already latent in pieces included in the portfolio is the relationship between density and repetition. *4 Abbilder* and *Perspectiv* incorporate repetition of entire formal structures as a central element, as do *launenhaftes Licht*, *bloßes Zubehör der Maschine* and *streifen* to a lesser degree. It was shown that this repetition — far from providing a "true" form of the material in question and different related versions — can cast the identity of the used material into doubt and even call into question whether there is a "true" form at all. This uncertainty can be related to different extra-musical issues, from Joanna Bailie's "bewildering reality" (see footnotes 123 and 138) to the mass of information and technical advances in the digital age referenced above, in which the veracity of news sources gets harder to prove day by day. The focus on the artistic vocabulary of density in the present dissertation allowed only for a first, preliminary inquiry into this topic; a further study would likely need to expand the literature — both musically and theoretically — and also design its compositions more decidedly at this purpose. However, such a study into the

[145] Following Zender's conception, in a composed interpretation the means commonly attributed to the performing musician "[...] are in my version subjected to compositorial discipline and thus form autonomous processes that are overlaid onto the Schubertian original." This might constitute a method "[...] to break through the aesthetic routine of our reception of the classics [...]". See Zender, Hans (1993), "Notizen zu meiner Bearbeitung der Winterreise", in Hiekel (ed.), *Hans Zender — Die Sinne denken. Texte zur Musik 1975-2003*, 2nd edition, Wiesbaden: Breitkopf & Härtel, 2018, p. 221 ff. (Original German: "[...] werden in meiner Version kompositorischer Disziplin unterworfen und bilden so autonome formale Abläufe, die dem Schubertschen Original übergelegt werden" and "[...] die ästhetische Routine unserer Klassiker-Rezeption [...] zu durchbrechen"; translations: Kaspar Querfurth). In my misappropriation, the autonomous processes are not overlaid onto music, but onto texts.

relationship between density and uncertainty could show how density, in conjunction with other artistic concepts, might function as one of the motors for the development of an aesthetic that could shine an artistic light on issues of our times.[146]

9.3 Further research

Beyond this further aesthetic inquiry, the research outcomes elaborated in this dissertation present different avenues for further research into density. *streifen* has shown how density processes — especially contractions of horizontal frames, which were pushed to the limits of human performance capabilities towards the end of the piece — can radically transform the surface-level appearance of musical material. This transformation of material could be explored further by the combination of live performers with electronics. By using the latter to electronically apply the frame contractions to recorded live performances, density processes could theoretically be extended beyond the performers' capabilities. The use of technology to allow the performance of horizontally dense material beyond the reach of performers has already been investigated by — amongst others — Conlon Nancarrow in his *Study for player piano No. 21 (Canon X)* (see chapter 1.6); however, the use of live-electronics would allow for the inclusion of live performers in addition to the electronically processed sound.

A last starting point for a quite different study of density altogether would be an inquiry into the perception of density. While this topic has been referenced intermittently throughout this dissertation, it has not been the focus of systematic study. Such a study would also most likely need to be designed quite differently, for instance incorporating research into music psychology or use of audience questionnaires. Because my own compositional interests — while not discarding concerns of perception — for the most part lie in the manipulation of notes on the page using various developmental schemes or processes, this topic has not been given precedence in either my compositional or my literature research. It could however be an important further elaboration of the topic of density as a whole.

These points show that density is an issue that can still be explored further. This present dissertation hopes — through its clarification of concepts and terms as well as through examples of explorations of their practical application — to be a useful starting point both for further study as well as further use of density in composition.

[146] The study mentioned above is out of the scope of this dissertation. Possible starting points would include for example Bernhard Lang's "DW" cycle, so far numbering 31 pieces along with multiple derived works; Gilles Deleuze's famous 1968 essay *Difference and Repetition* (which is also referenced in the title of Lang's cycle, "DW" standing for "Differenz und Wiederholung", the German title of Deleuze's essay); and the work of Enno Poppe, whose music similarly uses minutely varied repetition of small motivic cells, often incorporating microtonal displacement.

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