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Instrumentalizing Imagination: The Interdependence of Technique and Imagination in the Compositional Process

A Dissertation submitted in partial satisfaction of the requirements
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in

Music Composition

by

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The Dissertation of Andrés Gutiérrez Martínez is approved, and it is acceptable in quality and form for publication on microfilm and electronically.

University of California San Diego

2022

DEDICATION

To my parents, in their unconditional support, and to my mentors and advisors who challenged, nurtured, and enticed my own curiosity.

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ABSTRACT OF THE DISSERTATION

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by

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Doctor of Philosophy in Music Composition

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Professor Roger Reynolds, Chair

The following work presents the use of electronic means of sound manipulation and generation, and more generally, the use of technology in my recent compositions. This dissertation attempts to frame creative practice through the interdependence of imagination and technique as two distinct operatives that shape my understanding of artistic production. Concerning technique, the tools employed in my creative practice are explained and subsequently exemplified in three compositions. The use of live electronic tools is then framed in relation to the different functions they assume (complementation/completion, projection, and initiation) in each of the compositions. This framing has been chosen to articulate the way in which technique and imagination relate to

each other in my creative process, and consequently, to conceptualize a creative intentionality regarding the use of tools in the scope of composition.

Orientation

Composition is for me the result of the positing of musical ideas in musical notation in which the experiential realization takes place in performance. The positing of ideas in the compositional process is based on elemental assumptions—both theoretical and acquired—pertaining to basic knowledge concerning the possibilities and limits of musical instruments, the adequate formal construction of a musical piece, or the deployment of a given process (electronic sound manipulation). The knowledge pertaining to the quality of sound of a particular instrument, the organization in time of musical ideas, and the way that an electronic manipulation of sound modifies a given instrument allows composers to take risks in the compositional process. By testing their basic assumptions in a yet unknown instantiation or combination, composers can gradually expand their creative horizon and their repertoire of tools and strategies. This elemental knowledge is a necessary foundation that help us create something which lies beyond our imagination's limit to fully represent in the mind. At the same time this "something" is made possible through the mind's ability to reconfigure the basic knowledge we possess in "imaginative" new ways.

Speculation plays an important role in the creative process. Defined as the act of taking something to be true without all the necessary evidence, speculation can take place in different areas of the compositional process. Technique can relate to a formal strategy, the temporal organization of a given musical "behavior" and its subsequent organization in time. Technique can also relate to an imagined sonority and its instrumentation by means of combination of different

sonorities taking into consideration the degree of timbral blend[1], segregation, spectral reinforcement (Touizrar & McAdams, 2019), to the way in which electronic sound manipulation contributes to achieve the desired function; or to a desired effect concerning the spatial movement of a given sound source. In economics, speculative activities involve *risk*. It is through the realization of the score in performance where the posited ideas are confirmed as valid, discarded for not meeting the expectations posited in the process of composition, or produce an unforeseen result, which brings about new possibilities "serendipitously" that positively impact one's creative development. I stress the speculative moment because of its importance in the continuous pushing of boundaries in the development of a personal creative practice. The expansion of the horizon of possibility concerns the way in which creative ideas and the toolset used to realize them are instrumentalized in the compositional process.

The experiential realization in performance plays an important role in my creative practice. In performance, the listener is confronted with the work as it exists "for the world" and no longer "in the mind of the composer", where it existed as a realized idea and was limited by the composers's ability to imagine its potential realization. I consider the experiential dimension of previously posited sonic ideas on paper in the form of musical notiation a central aspect in the further development of artistic practice and the actualization, or , the renewal of creative ambitions. The live performance of the work creates a context for the composer to reflect on the relationship between how the work was conceived in the mind and the work as it exists for the world. Regarding the continuous development of creative practice, each project contributes to the gradual disambiguation of the technical means used through an ongoing process of optimization of used tools and strategies, and repurposing of means and strategies that are operative in their practical

[1] This terminology stems from the work by Stephen McAdams and Moe Toiznar in the field of music perception and cognition regarding the perception of timbre of musical instruments.

realization. The advancement in creative practice is the result of a cyclical process made of a first imagined representation of sonic ideas, the development of adequate strategies for their realization, the fixating in notation, and lastly, the subsequent actualization in performance. The notion of *feedback* serves as a conceptual model for the above-described approach. In feedback systems, the most recent state of the system is contingent on the previous state. Furthermore, the development of creative practice with a strong self-referential anchoring could be understood through a "regressive model of self-consciousness" that takes into account the current condition, memory, and other modifying circumstances in generation of a subsequent "output". In his article "Towards a Conscious Art", Robert Pepperell presents an artistic model of self-consciousness using video feedback. Pepperell is interested in the representation of the self-conscious mind, which he approaches through a productive reinterpretation of the concept of infinite regression to put self-reference at the heart of his conception of phenomenal experience (2006). Having such a model as an orienting device, the compositional process corresponds to an initial thought and the experiential dimension to the reflective moment or "becoming aware" of that initial thought which subsequently shapes the compositional practice. The intertwined relationship between feedback and self-consciousness will appear again in a later section of this dissertation, when I explore this relation in an actualized form—my creative work that makes use of audio feedback as a sound source.

Having established a conceptual framework for my approach in creative practice, I would like to return to the basic assumptions mentioned earlier. The sum of knowledge and tools we possess concerning the means of expression that we will use make up the horizon of practical possibility in creation. In his book "Phenomenology of Perception", Merleau-Ponty suggests that the available vocabulary articulates the horizon of concepts that can be used in writing, speech, or

even though (2013). So too, the set of knowledge regarding orchestration, compositional strategies, electronic tools of sound modification, and notation make up the horizon of possibility in the compositional process. The term "technique" points to the sum of knowledge and tools to achieve a particular aim. It encompasses the scope of practical possibility within which composers posit musical ideas with an elemental confidence in their successful realization. Technique, however, is not an autonomous domain devoid of inherent constraints; Adorno considers technique as something that is culturally and historically defined, and thus, tied to a particular historical and geographical or sociocultural context (2002). Moreover, he considered the materials available to artists at a given time to be a sedimented manifestation of society's consciousness. Every artistic discipline created its own boundaries and then expanded them. The development of consciousness within individual artistic practices was seen as the manifestation of the progress of spirit (*Geist*) of a society. Furthermore, He claimed that it was essential that artist deal with the most progressive materials because this would imply that by doing so, the artist would be dealing with society itself (1978).

I draw from Adorno's writings to suggest that the historical consolidation of technique in music is the gradual solidification of procedural knowledge oriented by the artistic necessities, which in turn are guided by aesthetic values within an ideological framework at a given time, in a given place. Everything that lies beyond the horizon of technique is inaccessible or at least not readily available to the grasp of the creator and might even lie beyond his or her cultural horizon. I mentioned earlier the role of imagination in bringing into existence a configuration of ideas out of the manifold of possibilities provided in the compositional process[2]. *Imagination*, as used here,

[2] In his Book "Aesthetics as Phenomenology", Günter Figal frames Works of Art as phenomena which on the one hand, present a consolidated work made of intricate relations or "free variation of givens", and on the other, present themselves as appearances for others. The "free variation of givens" entails a particular configuration out of many possible in which what is given to us in the compositional process finds a concrete fixation.

conforms another horizon, one that is made by our individual ways of seeing the world, our experiences, inclinations, etc. One could think of imagination as a container shaped by an individual perspective of living in this world. It is a drive or an intentionality that affords creation and resorts to technique for its fulfillment. In this regard, things that lie beyond the imagination can be accessed through technique by means of its productive, enabling quality. In the compositional process, technique is instrumentalized in order to achieve a particular creative aim. Assuming the functionality of a certain tool, or the success of a given discursive strategy in a yet unknown or unexperienced context, aligns with what I have suggested about speculation in the compositional process. Imagination and technique are intermingled, both conditioning and enabling each other in the compositional process.

Returning to the cultural definition of technique, it is important to further clarify this with regard to the importance that western musical education gives to the transmission of culturally defined and historically developed tools in the study of composition. Composition is, in many contexts, still taught as a craft in the context of an apprenticeship in which many values are automatically transferred from the "master" to the "apprentice". In the process of transference, a clearly defined referential space is given which defines important aspects and conventions pertaining to idiosyncrasies of the creative practice such as the reliance on a musical score, the use of particular instruments and techniques. This delimits the horizon of possibility and articulates an implicit definition of music. During my formative years, I was deeply influenced by the central European music tradition including the post-war and post-serialist musical discourse that are strongly influenced by Adornian aesthetics. The paradigm of Adornian aesthetics was guided by a historical materialist understanding of the development of musical technique, as well as by the tenant of the autonomy of artistic discourse in the face of commodification and political

instrumentalization (Adorno, 1978) . In relation to the poetics of sound in music, Helmut Lachenmann's notion of *Musique Concrète Instrumentale* (1996) was very influential in the development of my own conceptualization of the function of sound in my music. Lachenmann establishes a direct link between Pierre Schaeffer's research concerning the typology of sounds in electronic music, and archetypical "behaviours" in instrumental music to present recurring "sound types". The incorporation of non-conventional sounds into the instrumental context in the second half of the twentieth century expanded the sonic possibilities afforded by acoustic music instruments and paved the way to the development of an aestheticization of noise in contemporary composed music. By the same token, Lachenmann's work provided a bridge which linked the advancements in the analysis of sound in electronic music to the field of instrumental music, taking into consideration salient perceptual features. Carrying along in this path, composers such as Gerard Grisey who, along other "Spectralist" composers, relied on computational analysis and psychoacoustics to explore timbre beyond pre-existing notions of harmony as a means of extracting organizational principles from sound spectra (Grisey, 2008). Informed by this historical tradition, my own approach is concerned with the extraction of musical material using sound analysis. Additionally, the incorporation of electronic means of sound processing in real-time by composers working at the Southwest German Radio Experimental Studio in the 1970's and 1980's[3], in particular the live-electronic music of Luigi Nono influenced my use of live-electronic processing, which strongly tied to instrumental sources. Furthermore, my engagement with electroacoustic music, exposed me to an entirely different context which revolved around live-

[3] In his book concerning the musical production of the Southwest German Radio (SWR) Experimental Studio, Hans-Peter Haller offers an elaborate account of the relationship between the development of certain technological tools used in the studio and the creative output of composers. Among these first tools of live-electronic sound manipulation was the pitch-shifter and the halophon, a spatialization device controlled manually. Both devices were amply used by Luigi Nono in his ensemble pieces with live-electronic processing.

electronic performance, electronic instrument design, interaction design, indeterminacy, and improvisation. The incorporation of technology in creative practice opened new expressive possibilities and exposed me to discursive approaches made possible by it. My most recent work is influenced by the pioneering work of Gordon Mumma in the field of cybernetics and self-regulated live-electronic music (Mumma, 2015), and Agustino Di Scipio whose work includes elements of interaction design using sound to control the behavior of a self-regulated system. Their work opened new avenues of exploration in the creation of interaction strategies of live-electronic music using sound as an interface to control sound (Di Scipio, 2003). Returning once more to the notion of technique as a horizon of practical possibility, I define technique in relation to the sum of knowledge acquired in the development of my creative practice, taking into consideration the different contexts and referential spaces mentioned above, which contribute to place my work with regard to existing practices.

Although technique is bound to a particular context (cultural, historical), it can be repurposed or extended to address other aims than those from which it was originally created. This is where imagination, the personal, and cultural background becomes important to my practice, as a horizon of possibility grounded in subjective experience. Notwithstanding the resonances with the above-mentioned contexts and their creative affordances, in recent years I have subjected the acquired tools and know-how to a critical evaluation regarding my own stance in relation to the different ideologies that drive musical discourse in the different contexts I have lived in in order to arrive at a more personal, critical grounding of creative practice. Distance allows for detachment and relativization. This has led to a gradual abandonment of culturally-historically defined, technocentric, positivist aesthetic postures as creative generators or referential spaces in order to approach musical creation—and a definition of aesthetics—from a perspective grounded on

subjective experience. My recent work is informed by phenomenology and perception as means of arriving at a definition of aesthetics which is grounded in the personal experience in contrast to preexisting ideological frameworks which condition the material possibilities and referential contexts of musical production. The afore-mentioned dialectic concerning imagination and technique was introduced as a model to present the distinct functions that technological means of sound manipulation have served concerning the creative aims in my recent compositions.

The expansion of the sonic possibilities of acoustic instruments is central in my use of electronic means of sound manipulation. I locate the use of technology in my music as a potentiator of an already existing poetic of sound, that is: the deployment of sound produced by music instruments in a closed referential space, which is held together by an internally defined logic. This logic further extends to the way in which the electronic means of sound production operate in each composition. I mentioned above the importance of the experiential dimension in the advancement of creative practice, in the optimization of different tools and strategies, and the actualization of creative aims. This is important for two reasons: on the one hand, and as mentioned above, the performance of the piece presents us with the reality of the composition as notated in the score. Through it, the existing gap between the intention of the composer (*poiesis*) and the perceived result (*aisthesis*) is articulated. This method informs subsequent creative endeavors and imposes corrections or adjustments to the techniques and strategies in the optimization process of their development. It also contributes to actualize creative aims and priorities, as illustrated in the compositional component of my dissertation. On the other hand, an important part of the use of technology in my music occurs in performance through live-electronic manipulation. This means that the electronic processes are instantiated in real-time by an electronic performer at the moment

of performance, and by the same token, it means that the existence of an important element of my creative practice takes place in performance.

This dissertation proposes three distinct approaches, which contribute to define the role of technology in each of the pieces presented: completion/complementation, projection, and initiation. For the first two pieces, the dialectical model between imagination and technique serves as a conceptual framework because of the nature of the creative process used in the creation of these pieces. For the last piece, a different model will be better suited: one taking into consideration the immediate reaction, embodiment of control, self-referentiality, and haptic sensibility. This categorical differentiation of the different roles of electronic sound processes in my music aims at illustrating the development of a personal poetics and the disambiguation of technique in the use of electronic means of sound processing.

Tools

This section presents the functionality of the electronic musical instruments used in my my music. In the introduction, I articulated the intermingled relationship between technique and imagination in the creative process. I also discussed the ways in which technique shapes the horizon of possibility and how each composition contributes to expand this horizon enabled by the available tools at one's disposal. Technological means of sound manipulation, as is the case with other tools and strategies that could be subsumed as technique, are a part of a value system that assigns them relevance due of the function they perform. As such they exist within a particular referential space, place, and time. Creators differently customize their tools based on the their level of engagement with—and understanding of—technological means of sound manipulation. The pieces described in this dissertation present distinct specifications and customizations—in terms of functionality and creative aims—of the technological means in my creative practice in recent years.

My engagement with computer music has expanded the tools at my disposal—in the technical sense—while at the same time, it has revealed new possibilities of creative engagement with sound that go beyond conventional practices of written composition. The use of technological means of sound manipulation in the presented works impacts the composition both structurally, and with regard to the content itself. In analogy to the gradual advancement in the practice of composition, so is too the gradual advancement in the practice and use of electronic tools of sound manipulation. When working with technologically mediated tools, one of the challenges faced is the search for different ways of using tools. This requires an elemental understanding of the

possibilities and limits of each electronic manipulation technique. Knowing how an electronic instrument will process sound also informs the choice of material in the compositional process that will be subject to manipulation.

In my music, I make use of electronic sound manipulation processes to extend the acoustic instruments' possibilities to enhance and complement the written musical part in performance. I employ electronic music instruments to complete and project the musical ideas intended in the score. This use of technology can be understood as subordinate to the primacy of the musical instruments. Electronic tools are subordinate in my work because I define them as dependent on the acoustic music instruments. The subordinate nature of electronic means of sound production in my work also relates to the role of human agency in the control of digital music instruments. In response to the techno-optimism and innovation culture that appears to be operative in many facets of contemporary life, the creative use of technology in my music is strongly contingent upon human agency. Notwithstanding the affordances of creative tools beyond the limits of human capacity, electronic means of sound manipulation and production take the form of extensive devices of human possibility.

Electronic Music Instrumentarium

In my compositions, instruments are assigned different roles based on specific technical properties. There are four areas of concern concerning the use of electronic sound manipulation in my music: sampling, real-time sound modification (pitch-shifting, filtering, modulation), spectral resynthesis, and sound spatialization. First, I will suggest how these processes depend on sound input to operate. Then, I will explain the functional elements of each as they are used in the compositions of my dissertation. After presenting how each piece differently makes use of these instruments, I will discuss how my use of electronic musical instruments relate to the dichotomy presented earlier between imagination and technique.

The compositions discussed in the following chapter make use of sampling, real-time sound modification, spectral resynthesis, and sound spatialization, albeit with the intention of achieving different results, in order to present the gradual consolidation of a live-electronic music instrumentarium comprised by a limited repertoire of digital instruments. An important distinction I make regarding the electronic instruments used in my music is the categorial differentiation between reactive and generative electronic instruments. This initial distinction is relevant because it specifies the roles I assign digital instruments with regard to their functioning. Further, their functionality conditions the ways in which they are instrumentalized in the creative process. I define reactive electronic instruments as those that depend on either a sound input or some information from an analyzed segment of a signal to produce sound. For example, an electronic instrument that changes the pitch of an incoming signal is reactive, whereas generative instruments, just as the name suggests, generate sound without the need of a sound input. On the other hand, a generative instrument is any kind of oscillator, which does not depend on any type of sonic input to produce an output, such a synthesizer such as a sine wave

As suggested by the four areas of concern mentioned above, reactive digital instruments are a central aspect of my work with live-electronic means of sound manipulation. This includes digital instruments made by oscillators which rely on data collected through analysis using the Short Time Fourrier Transform, also referred to as Fast Fourrier Transform: an analysis technique used to collect important information about an incoming signal such as the frequency and amplitude of a short segment of sound. The dependency on an external source makes this type of digital instrument reactive even though there is a generative component. Another combination of generative and reactive sound production takes place in feedback. Audio feedback happens when you place a microphone in proximity of a speaker. This is a hybrid of both because of the dependency on a sonic input, or a current state to produce a subsequent sonic result. I categorize audio feedback as generative due to the indeterminacy of the result when the system is altered.

Reactive Instruments

I differentiate between input-dependent reactive instruments, based on their affordances of real-time processing versus sampled-based processing. Real-time processes alter the source as it is coming in directly from an acoustic sound input. Sample-based procedures rely on a sampled portion of an incoming signal which, as the name suggests, records—or samples—a given portion of audio from an incoming signal into a buffer—a temporal memory container in which the audio information is stored. In the live-electronic compositions that make up my dissertation, real-time processes mainly concern the change of pitch of the incoming signal and the proliferation of a sound source through several techniques.

Sampled Based Processes

Sampler

As the name suggests, the sampler *samples* a portion of an incoming signal by writing the portion into a buffer and then reading the allocated information varying the duration of the selected portion and the speed at which the portion will be played back.

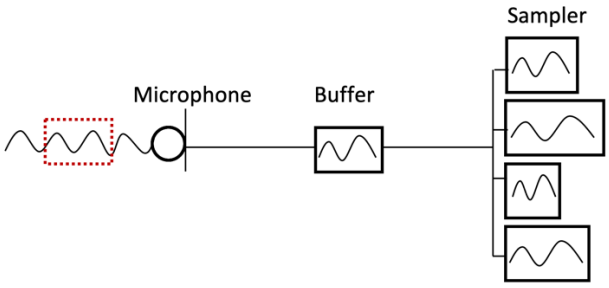


Figure 1 Diagram of a Sampler Unit

Figure 1 shows the basic diagram of a sampler unit. First, the portion of audio is recorded into a buffer through a microphone. Subsequently, the buffer is read by a variable number of playback devices—in this diagram there are four playback devices. Each playback device selects a portion of the buffer and the speed at which it will be played repeatedly at random. The former impacts the duration of the played-back segment, the latter its perceived pitch. The result is a multiplier of sound sources. The repetitions of different duration together help create a denser sonority.

Granular Sampler

The Granular Sampler is another digital instrument I employ which also reads information stored in a buffer. This instrument creates short audio segments or *grains*, as the name suggests, from a previously recorded section or from a sound file depending on several control parameters. The control parameters of this digital instruments impact the density of audio segments created at

a given rate, the duration and pitch of each grain, and the position in the buffer from which the grains are created.

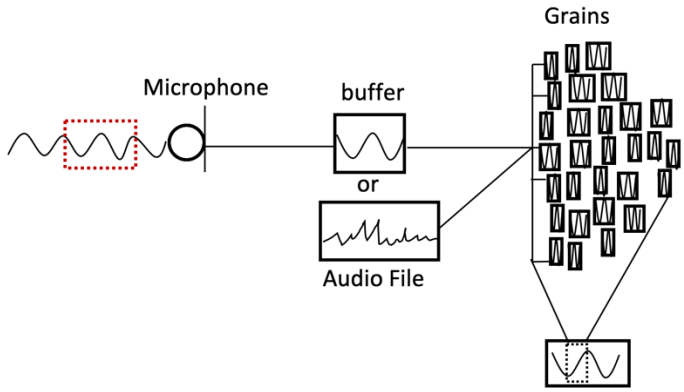


Figure 2 Diagram of a Granular Sampler Unit

Figure 2 presents the fundamental operation of the digital unit. The Granular Sampler reads audio information from a buffer either recorded from a microphone input or taken from a sound file and creates short audio segments taken at specified points in the buffer. Because the digital instrument allows for the control of the duration and rate, it is capable of creating dense sonorities made out of short segments of sounds. One particular use of this instrument is to create a sustained sonority by creating overlapping grains and slowly reading the buffer from beginning to end. This extends the duration of the recorded sound artificially without modifying the original sound source. Granular samplers can also be used to create time-stretched versions of a recorded sample. By creating many short sample grains while slowly advancing the reading position in the buffer, it is possible to change the duration of a recorded sample. However, due to the nature of this process, percussive sounds with sharp transients become smeared. The functionality of this instrument conditions the sounds I choose to "feed" into the isntrument. This is an example of the implications that the selection of tools has in the development of musical material.

Input Based Processes

Granular Delay

An input-based variation of the granular sampler is the granular delay unit, which makes short grains from an incoming signal. The control parameters of the granular delay are density (number of grains created at a given moment), duration, playback rate, delay time and pitch variation per grain. The possibilities of this instrument are similar to those of the granular sampler with regard to density and pitch variation. However, the dependency on input inevitably ties the output to the incoming signal, allowing for almost immediate reaction. Manipulating the delay time and playback rate randomly is a strategy I use to create complex textural proliferations of a single real-time sound source.

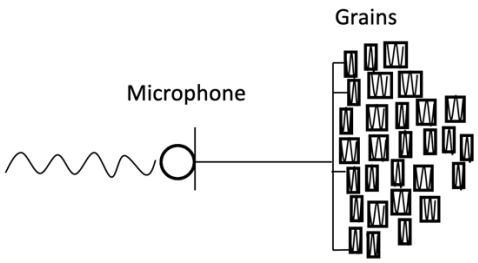


Figure 3 Diagram of Granular Delay

Tone-Altering Instruments

Pitch Shifter

Pitch shifting is a sound process that alters the pitch of an incoming signal, such as the sound of a violin. By altering the rate of the pitch shifter, it is possible to change the pitch of the incoming sound to make it sound higher or lower than the original source. When the sound of the pitch shifter and the original sound source are played together, this not only creates a doubling of

the original sound source, but it adds an additional layer contributing to creation of sonic density. The process can be used as a fixed transposer or to dynamically produce pitch inflections or melodic alterations.

Figure 4 Diagram of the Pitch Shifter Unit.[4]

The three instruments presented below are additional pitch-altering instruments which I employ in my music that belong to the same family of pitch shifters.

Variable Delay Units

Delay units are used to delay a signal by a given amount of time, however, it is possible to employ delay units to alter the pitch of an incoming signal. The dynamic change of delay time within a narrow range—between a tenth of a second and a quarter of a second—alters the pitch by either increasing it when the delay time becomes shorter, or by decreasing it when the delay time becomes longer. Using a sinusoid as a modulator of the delay time between two set values creates a periodic fluctuation of pitch. Variable delays are used to model the Doppler Effect, whereby the changing delay time represents the sound source getting closer or moving away from the listener.

[4] The discontinuous lines show the shifted pitch either upwards or downwards.

FFT-Based Bin Shifter

The bin shifter applies the Fast Fourrier Transform (FFT) to the incoming sigal to obtain the frequencies contained in each of the frequency bins, which are subdivisions or bands of the audible spectrum. By modulating the shift parameter by non-integer values, the resulting sound is a combination of amplitude modulation with frequency shift. Shifting the incoming signal by higher or lower integer values than one will shift the frequency content of the sound by the size of each frequency band multiplied by the integer value of the shift parameter.

Ring Modulation with Pitch Detection

Ring Modulation alters the sound by multiplying a sinusoid at a retrieved frequency taken from the analysis of the incoming sound. The ring modulation adds additional side bands —summation and residual tones— to the incoming sound, modifying the timbre of the incoming sound source.

Sound Analysis and Resynthesis

Spectral Synthesizer

The Spectral Synthesizer combines sound generation with audio analysis. This instrument does not modify the sound of an incoming signal like the reactive instruments presented above. The spectral sustain generated by the Spectral Synthesizer is conformed by sixteen sine wave oscillators used to read a wavetable. The frequencies of the sixteen oscillators are taken from an analyzed segment of an incoming signal using FFT and the Phase Vocoder technique for pitch estimation.

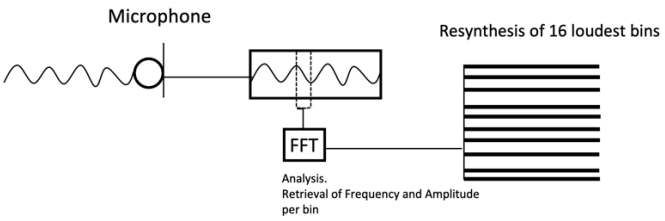


Figure 5 Diagram of the Spectral Resynthesis Synthesizer

The FFT analysis provides the frequency and the amplitude components found in each of the frequency bands of the spectrum. The analysis takes a short segment of audio from a continuous temporal signal and yields a static representation of the frequency components contained in that audio segment. The duration of the analyzed segment is approximately a tenth of a second. The FFT analysis takes a given moment of time, like a slice of an instant, and makes its audible components explicit in a representation of frequencies from low to high. The Spectral Synthesizer makes use of the sixteen loudest frequency peeks of the frequency spectrum. When using this instrument on a sound source, the synthesizer generates the salient frequencies contained in the spectrum of the incoming signal. This allows for a synthetic reinforcement of sounds without necessarily revealing the electronic quality of the generated sound.

Spatial Projection of Sound

Spatialization of sound is an important element in my use of electronic means of sound manipulation in real time. The digital instruments employed in my music each actively manipulates an incoming sound source in different ways. The output of these instruments is routed to a spatializating instrument based on Vector Based Amplitude Panning (VBAP), which takes the sound and places it at a position within a circumference. Given the number of loudspeakers (stereo, quadrophony, octophony, etc.), the speaker positions are defined in equidistant angle positions in

a circumference, which defines the audible space. The Spatializer places the sounds at set points within the circumference using automation and explicit angular positions as a result of a random generation of values. For a more intricate dispersion of sound sources in space, each instrument contains its own spatializer. Although sound specialization is not a sound modifying process, it is instrumental in creating an immersive experience by placing the listener in the center of the listening space around which speakers are placed.

The Representation of Electronic Processes in the Score

In my pieces, the electronic layer is notated as an additional voice in the score. The programed sequences are represented in the form of numerical cues. If not explicitly notated in the score, the electronic performer has a description of the processes involved in each cue such that they can operate the digital instrument while following the score. The sequence of events of some cues are entirely automated. These pre-programmed actions include: turning instruments on/off, fading volumes, and manipulating values. Other cues require the active control of the performer with different degrees of freedom. In order to access the controls of the digital instrument, the electronic performer assigns the control parameters of the electronic instruments to the knobs, buttons, and faders of an external MIDI controller.

Electronic Sound Manipulation as Subordinate?

The use of synthesized sounds in my music was something that I disregarded for a long time. Since I began exploring sound manipulation in real-time in the context of improvisations with live musicians, I focused exclusively on the manipulation of acoustic musical instruments. I was interested in expanding the sonic possibilities of music instruments without compromising

their acoustic character. I sought to manipulate the instrumental sounds electronically as a way to interact and engage with musicians in a performance setting. Thus, live-electronic processing of sound became a way for me to insert myself as a performer in my compositions. Not only were the sounds of the instruments expanded through electronic means; the processed sounds also became active interacting agents in the performance situation. This carried over to the use of live-electronic processes in my composed music. I have already brought into consideration the subordinate, reactive nature of electronic sound modification, which depends on an input signal. This distinction is in no way minimazes the role of electronic manipulation in my creative practice, but to clarify a mode of engagement with technology in my music. My motivation to make this differentiation will become evident when I discuss another mode of engagement with technology that involves generative processes. I will elaborate on this matter in the final chapter.

Instrumentalizing Imagination

Complementation

Grain for Mixed Ensemble and Live-Electronics

This section presents the use of electronic means of sound modification for the purpose of complementing the instrumental texture. *Grain* for mixed ensemble and live-electronics focuses on the creation and exploration of a sonic space made of different types of sonic materials[5] defined in the compositional process. The articulation of sonic moments in this piece follows an underlying *directionality* given by the gradual movement within the defined sonic space of the piece, an extended *Klangfarbenmelodie*[6], which includes pitch-less sounds and instrumental extended techniques. Another form of phrasing takes place through the introduction of focal impulses. The resonance of the focal impulses is orchestrated by the musical instruments and the resonance *dissolves* into pitch-less sounds. The live-electronic layer of *Grain*—which complements the existing instruments and contributes to the construction of an electroacoustic texture—allows for the creation of additional sound density. Figure 6 presents a common representation of my pre-compositional process. In the process of generating the sonic material, I exhaust all the possibilities between different instrumental actions on the basis of timbral similarity that I can conceive of. This allows me to create sonorities with an underlying similarity, and at the same time to consider the directionality of the changes in timbre as a means of creating gradual changes in the unfolding sonic continuum. In this representation, the diagram indicates instrumental actions, which connect

[5] This approach to material generation and organization is strongly influenced by Lachenmann's notion of "Klangfamilien" or "Sound Families", which he developed in response to Pierre Schaeffer's categorization of "Sound Objects" according to different perceptual qualities. However, in Lachenmann's approach, the sound families are organized following serial principles in the compositional process and not organized "linearly" as a means of creating gradual transitions from one type of sonority to another.

[6] The term was coined by Arnold Schönberg to denote the timbral profile of a multi-instrumental melodic formation.

with other actions of similar nature. The sketch depicted in Figure 6 presents different instrumental actions that share a granular *feel*: all actions are made of repetitive elemental actions (e.g. bouncing of the bow repetitively, scratching of the string, sliding of a card on the piano keyboard, etc.). Some of the paths shown by the arrows lead to more than one sonic possibility whereas others are more limited in their connectivity with the preceding and the following instrumental actions. Endpoints can also be starting points. The diagram attempts to represent different sonic qualities within the category "granular actions" represented below, and the possible ways of transitioning from one action to another.

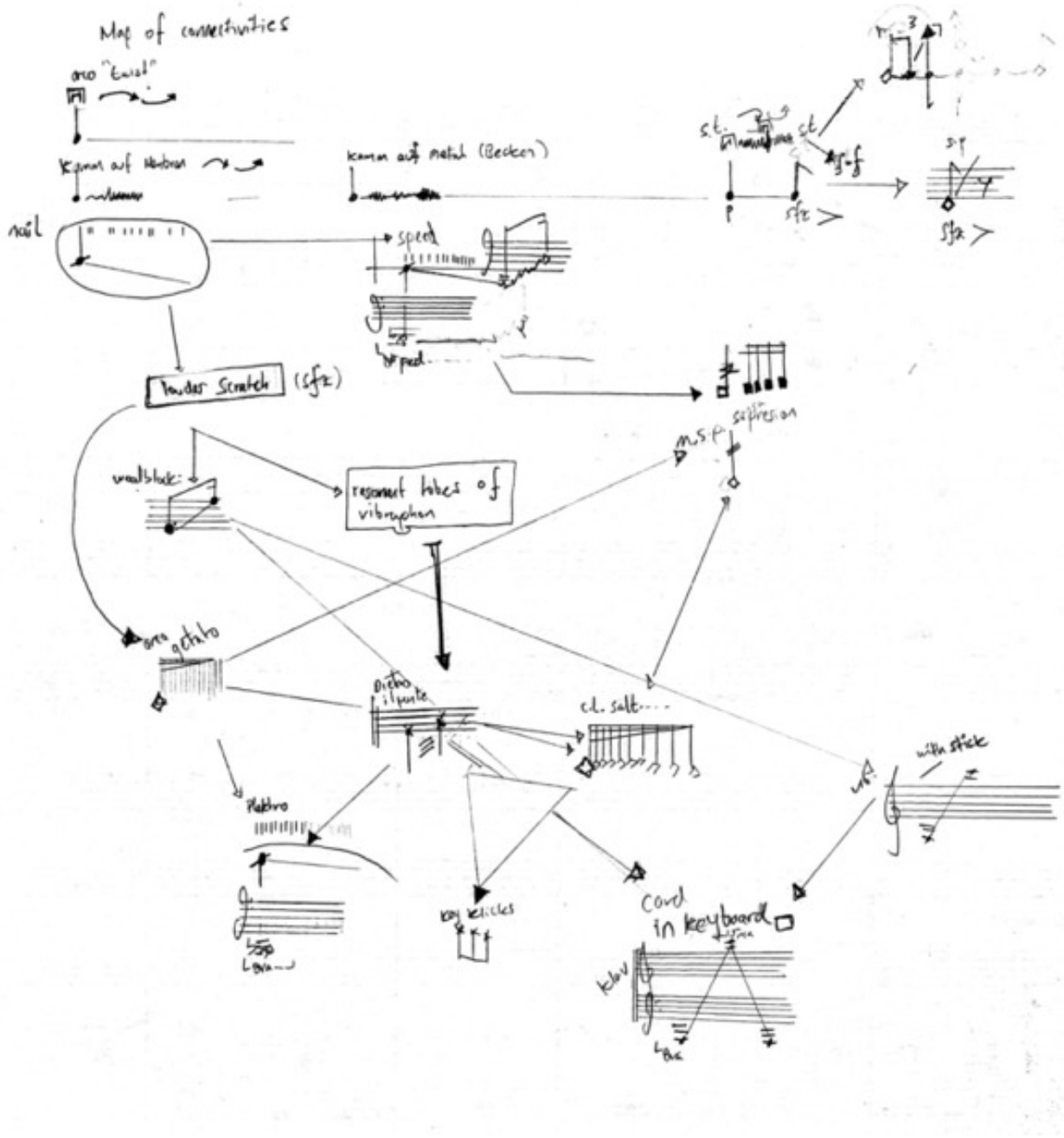


Figure 6 Sketch of the Material “Connectivity" in *Grain* for Mixed Ensemble and Live-Electronics

The Electronic Layer

In my first conception of *Grain*, I conceived of the sound mass as a dense cloud of sounds that changes in color, shape and *feel*, as time unfolds. I was interested in creating a gradually

changing texture in which the salient perceptual features that are in play (e.g. articulation, timbre, and pitch to noise ratio) are gradually morphed to achieve an organic unfolding of the conceived sound texture. In order to achieve this convincingly, more density of sounds was needed due to the fact that I was only working with eight live instrumentalists. The use of electronic sound processing had two distinct functions in the composition: on the one hand, the live electronic layer was operative in creating the needed density to create the kind of textures I was aiming for. On the other hand, it played an important role in the gradual transformations taking place in the piece: as a sonic bridge between different types of sounds played by the acoustic instruments. These two functions can be framed under the category of completion. The creation of density and the use of sampled sounds as a means to connect different types of sound materials completes the piece as suggested in the instrumental score. The following section elaborates on central features of the composition that were made possible by using technological assistance. Each of the features will be illustrated with concrete examples from the score.

Density

The electronic processes contribute to the creation of density in the following ways:

Through the proliferation of sounds: in most cases, one or more instrumental sounds are processed.

a) In the opening bars the sound of the strings is manipulated in three distinct ways: The strings are recorded for 7 seconds. The recorded passage is placed in a buffer that is played back at slightly different rates and durations by four different samplers. After 12 seconds,

the sound of the strings is treated granularly by means of a real-time granular delay processor, which further proliferates the sonic material.

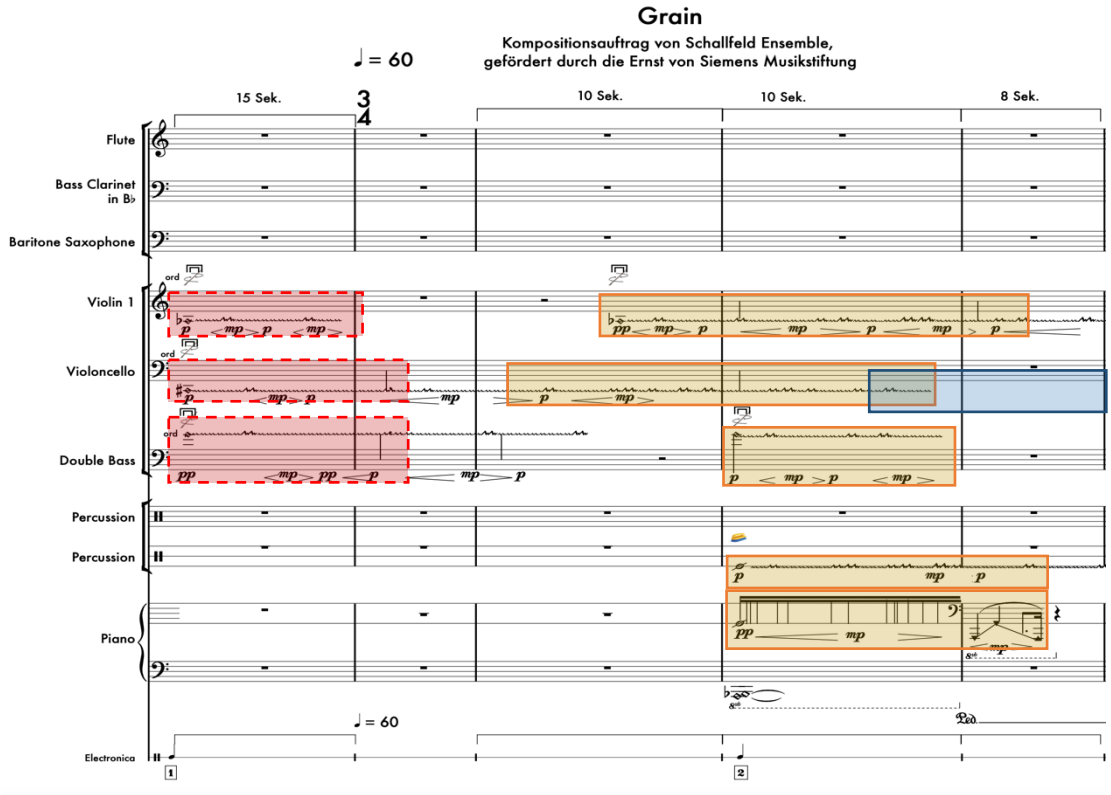


Figure 7 Opening section of Grain for Mixed Ensemble and Live-Electronics[7]

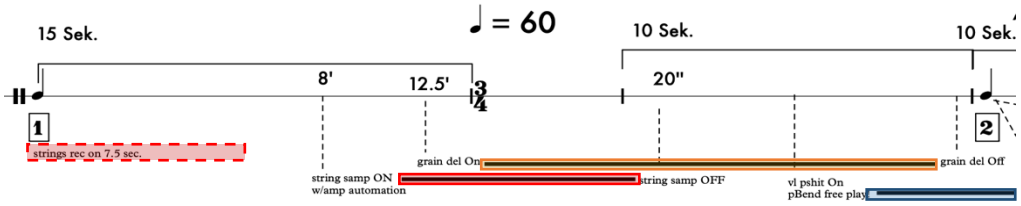


Figure 8 Detail of the Electronic Layer of the Opening Section of *Grain* for Mixed Ensemble and Live-Electronics.

Figures 7 and 8 depict the active processes taking place in the opening section of the piece (audio excerpt: gutierrez_01_Grain_example1.wav). The instruments marked in red are recorded and subsequently played by the sampler. All the electronic processes in this section contribute to

[7] Instruments in the score from top to bottom: flute, bass clarinet, baritone saxophone, violin, violoncello, double bass, percussion (2 staffs), piano, electronics.

proliferate the texture produced by the string instruments. Given the noise-like sonority of the bow scratching the strings, the different electronic processes contribute to create a denser sonority without altering the sonic quality of the acoustic sound sources. The instruments in the red boxes with intermittent lines are recorded into a buffer and played back by the sampler after 8 seconds. The yellow boxes with orange contour lines comprise the sounds that are sent to the granular delay starting at 12.5 seconds. Lasty, the blue box with dark blue contour indicates the instrument that is being processed by the pitch-shifter starting after 24 seconds. Towards the end of the first sequenced scene, we see the indication "Vl pshift On pBend free play" in connection with the pitch-bend parameter of the active pitch-shifting process on the violin, marked in blue. This is an indication for the electronic performer to freely—but responsibly—manipulate the control parameter of the digital instrument in this section. The freedom of their manipulation corresponds to the degree of pitch-shift: the change of the resulting pitch of the sound of the violin.

Another instance of density occurs in bar 25. Figure 9 depicts the acoustic instruments that are being processed by the different electronic instruments in the first two repetitions of the repeated passage (audio excerpt: gutierrez_02_Grain_example2.wav). The first two bars depict the electronic processes in scene 8. The string instruments in the red box with dash lines are recorded into a buffer, the blue box marks the use of the same process in the violin as well as the percussion. In scene 9 (the second instance of the two-bar passage), the recorded strings from the previous scene are now played back by a sampler marked in red. The blue boxes with yellow contour lines depict the use of the pitch-shifter in the wind instruments. Lastly, figure 10 shows a detail view of the electronic layer for the passage depicted in figure 9.

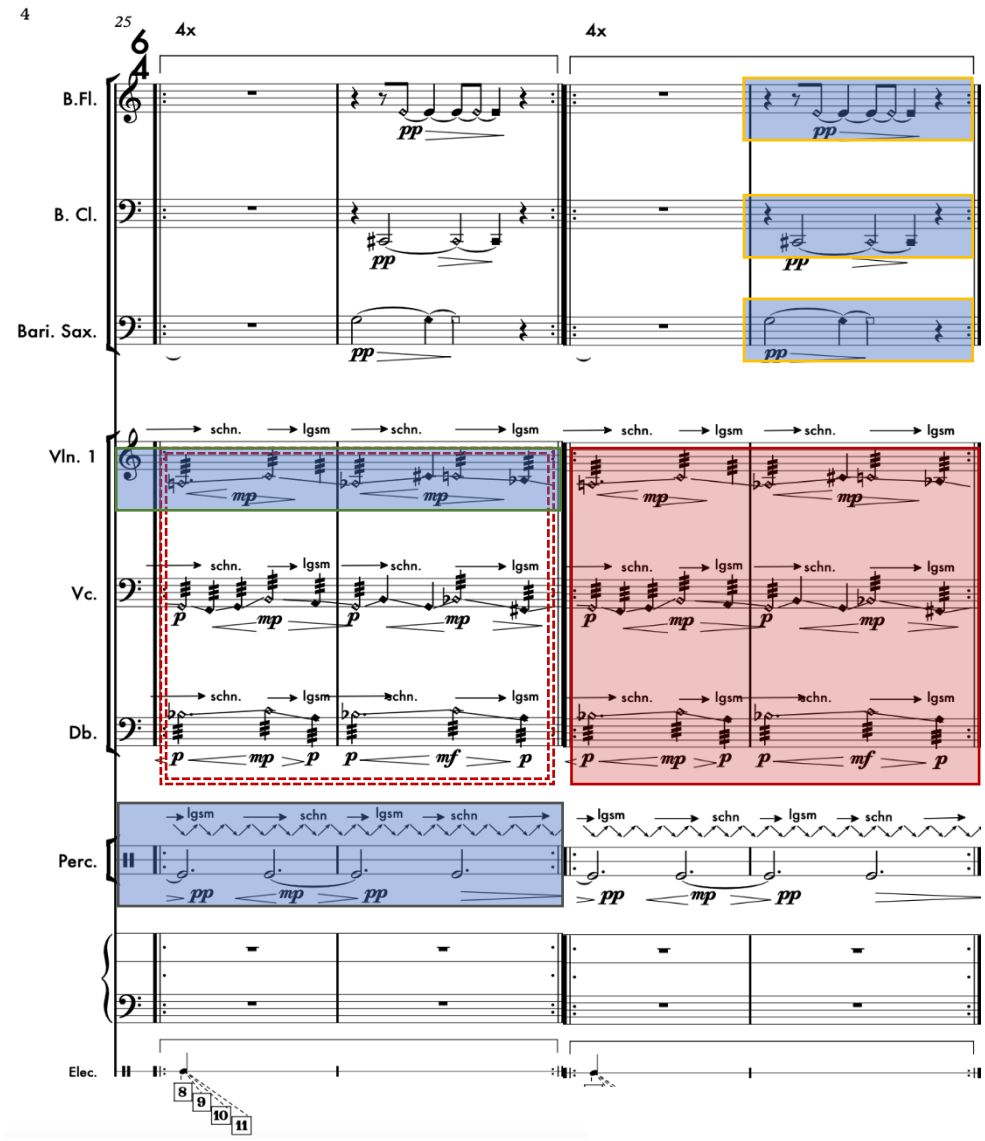


Figure 9 First Repetitive Section in Grain for Mixed Ensemble and Live-Electronics[8]

[8] Instruments in the score from top to bottom: flute, bass clarinet, baritone saxophone, violin, violoncello, double bass, percussion, piano, electronics.

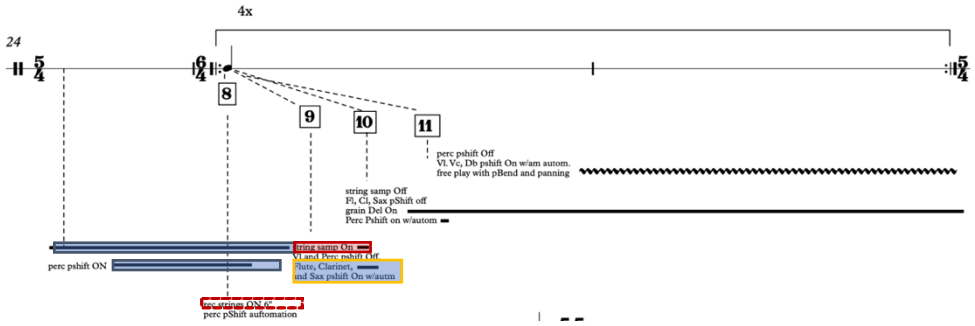


Figure 10 Detail of the Electronic Processing for Each of the Repetitions of the Passage[9]

Spectral Projection

This process operates exclusively on the piano input. As explained above, spectral resynthesis is used to create a sustained chord of variable duration using the sixteen most prominent peeks of an FFT analysis of the incoming signal. This process is only operative on the piano, because of the spectral richness of muted strings, particularly those produced by the lowest notes of the piano. This is a means to artificially amplify a particular sound phenomenon to create an audible spectral trace. The resynthesis and projection of sounds arising from within the ensemble allows for the electronic layer to be directly tied to the ensemble. For example, in Figure 11 the preceding phrase concludes with a fingernail or pick slide—a gliding action played on the string of the instrument—on the lowest A and B-flat strings of the piano followed by a muted single attack. The complex harmonic sound of the muted strings is sustained. The artificially extended resonance of the piano marks the beginning of the next phrase. Something similar happens at the instrumentalist level involving harmonic projection: the strings and woodwinds play notes, which pertain to muted sounds of the same low piano notes. However, the written

[9] Scene 8: "rec strings ON, perc pShift automation); Scene 9: string samp On, Vl and Perc pShift Off, Flute, Clarinet and Sax pShift On w/autom; Scene 10: string samp Off, Fl, Cl, Sax pShift off, grain Del On, Perc pShift on w/autom; Scene 11: perc pShift Off, Vl, Vc, Db pShift On w/autom free play with pBend and panning.

notes in the score might not exactly correspond to the actual spectrum of the piano notes at a given performance due to the slight variations in the contact position of the muted strings and the piano. This is an example of an extrapolated compositional instrumental technique made possible by electronic means of sound analysis/resynthesis.

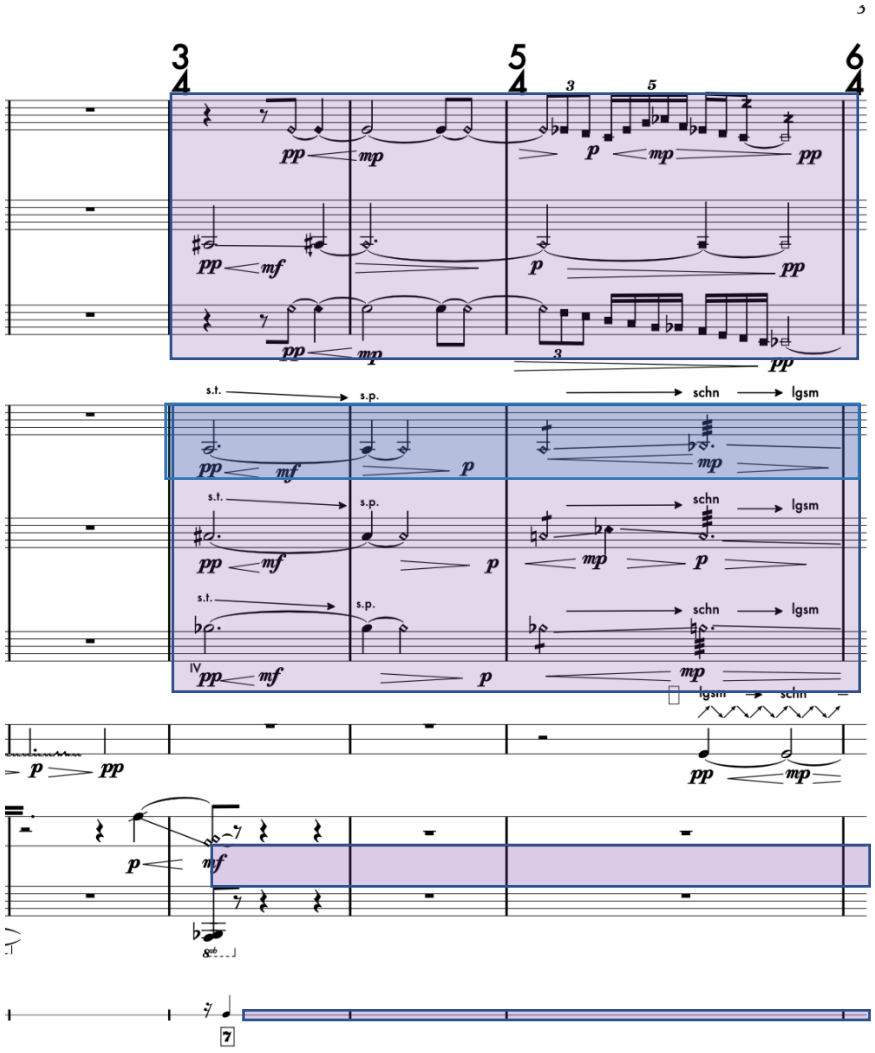


Figure 11 Detail of Passage in *Grain* for Mixed Ensemble and LIve-Electronics[10] [11]

[10] Passage in *Grain* in which both, the electronics and instruments, extend the sonority of the muted piano string.

[11] Instruments in the score from top to bottom: flute, bass clarinet, baritone saxophone, violin, violoncello, double bass, percussion, piano, electronics.

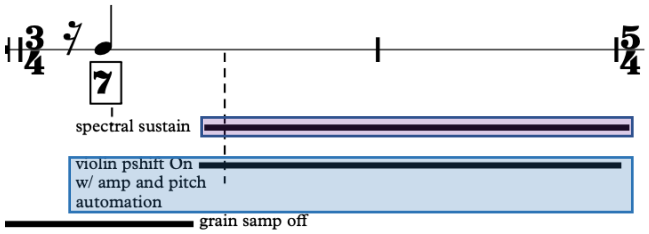


Figure 12 Detail of Electronic Sequence of the Same Passage as the Figure Above[12]

The purple boxes in Figure 11 depict the composed artificial resonance of the piano, which is also electronically resynthesized, as marked under scene 7, in both figures 11 and 12 (audio excerpt: gutierrez_03_Grain_example3_1.wav). The blue box on the violin system pertains to the pitch-shift instrument activated in scene 7. Similar moments include beginning of bars 32, 89, 102, and 128. In these contexts, the spectral sustain marks the culmination of the preceding phrase (audio excerpt: gutierrez_04_Grain_example3_2.wav).

Metamorphizing Repetition

The motivation behind this strategy was to create a perceptually gradual transition from the acoustic ensemble sound to a more complex electroacoustic texture. In this section, the ensemble plays a sequence in an ostinato-like manner while different electronic processes are used in each section, modifying the original source in a slightly different manner with each repetition of the passage. This strategy was applied in both repetition sections (bars 25-26, depicted in Figure 9, and bars 63-68, depicted in Figure 13). For each repetition, different processes are activated. The intention to combine a cyclical passage with a progressive mode of sound manipulation pertains

[12] Scene 7: spectral sustain, violin pShift On w/amp and pitch automation.

to the sonic representation of a gradual distancing between the sounds produced by the ensemble and the sounds coming from the speakers.

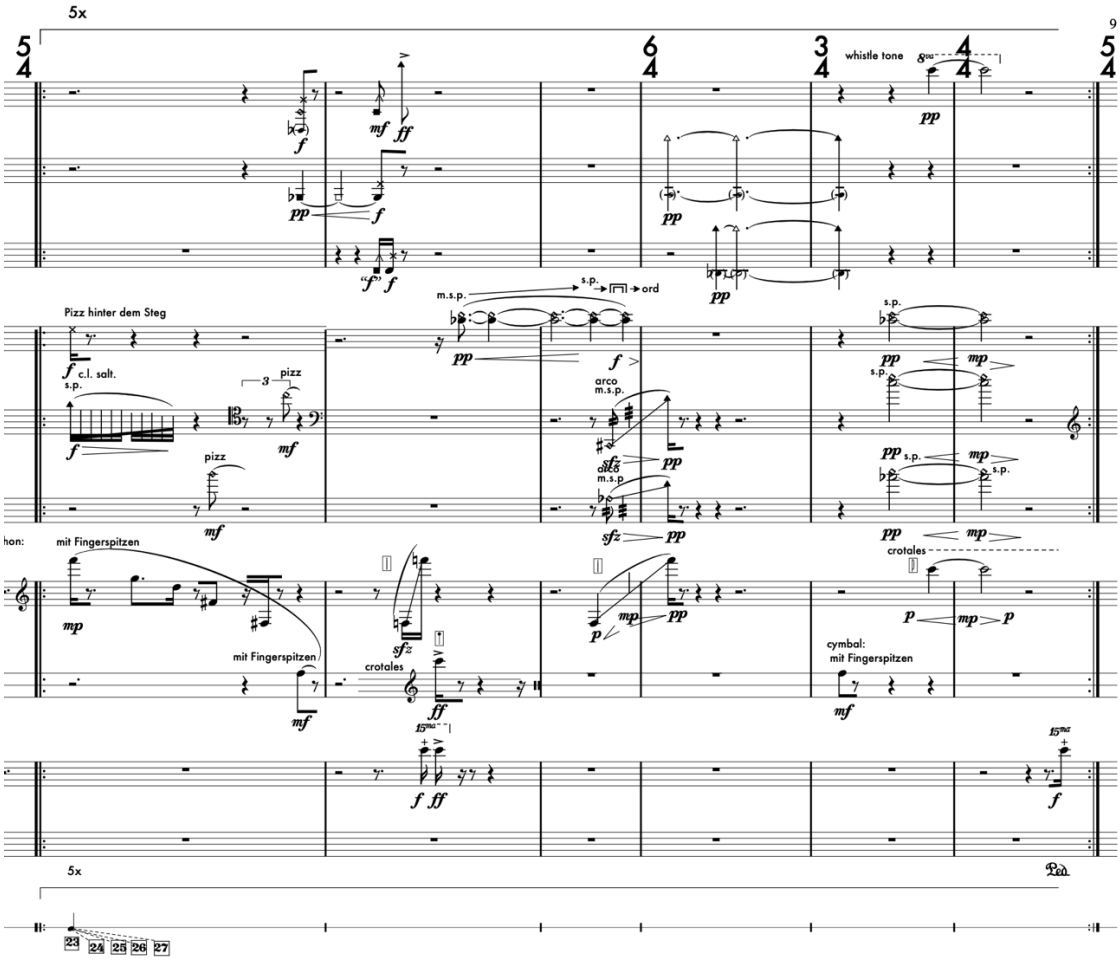


Figure 13 Detail of Repetitive Passage no. 2 in *Grain* for Mixed Ensemble and Live-Electronics[13]

[13] Instruments in the score from top to bottom: flute, bass clarinet, baritone saxophone, violin, violoncello, double bass, percussion (2 staffs), piano, electronics.

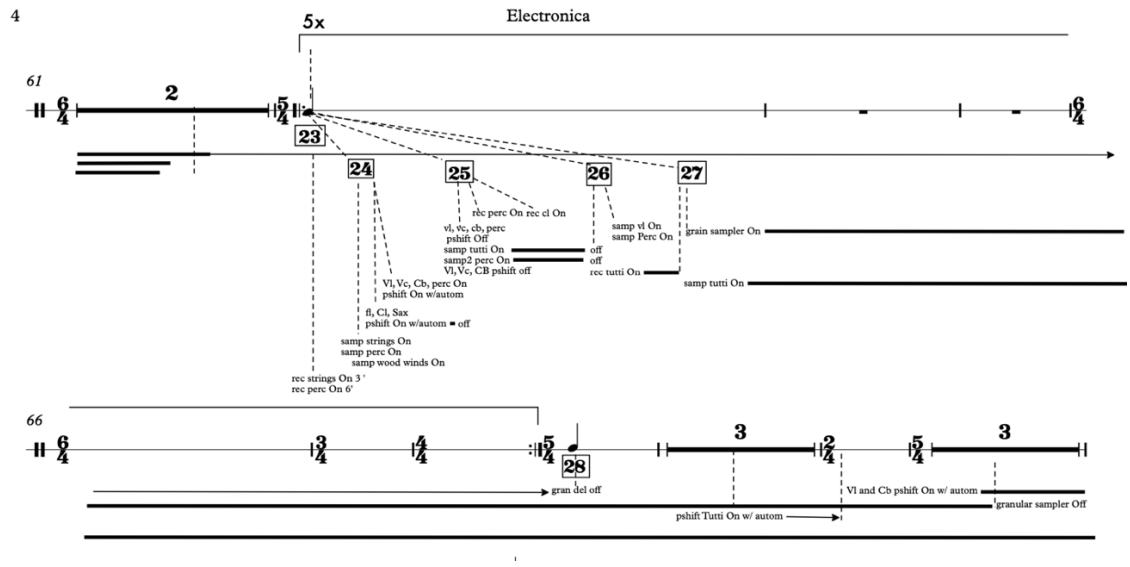


Figure 14 Electronic Sequence of Second Repetitive Passage in *Grain* for Mixed Ensemble and Live-electronics[14]

Figure 14 shows the detail of the electronic sequence for each of the repetitions of the 6-bar passage depicted in figure 13 (audio excerpt: gutierrez_05_Grain_example4.wav).

Spatialization

In *Grain*, spatialization is employed as a way of extending the sounding space to place the listener in the center of the sonic action. Each instrument is routed to a spatializing unit, which randomly places the sounds in the space. There is no underlying compositional strategy with regard to the spatial placement of sounds throughout the piece other than the intention of placing the listener "inside" the sonic texture.

[14] Scene 23: Rec strings On 3''. rec perc On 6''; Scene 24 Samp strings on. samp perc on. samp woodwinds On. Fl, Cl, Sax pshift On w/autom off. Vl, Vc, Db, Perc On pShift w/autom; Scene 25: rec perc On. rec cl On. Vl, vc, db, perc pShift Off. Samp tutti On. samp2 perc On. Vl, vc, db pshift off. Scene 26: Samp vl on. samp Perc On. rec tutti on. Scene 27: grain sampler On. samp tutti On.

Performer Agency One-Way Interaction

A central aspect in the use of live-electronic processes in my music is the role given to the electronic performer. *Grain* allows for some decision-making from the perspective of the electronic performer concerning the balance, the spatialization of certain manipulations, and the musical content. The latter is particularly true for the closing section of the piece: starting at bar 129, the electronic part allows for a more flexible manipulation of the instrumental sounds by the electronic music performer in relation to previous sections where many processes are automated. This flexibility is achieved through the non-prescriptive use of the sound modification processes available to allow for an individual engagement with some or all the elements of a particular passage, according to the performer's musical sensibility. The underlying idea is to treat the instrumental ensemble as a sound source, which is then sampled or processed "freely". Based on the idea of "shaping" a musical texture, I wanted to allow the performer to shape the performance without too much pre-sequenced processes in order to stress the liveliness of the electronic manipulation in real-time focusing on the real-time interactions between the electronic performer and the ensemble.

In the referenced recording of the piece, I decided to sample the ensemble at different moments, focusing on pointillistic passages, and use the results to interact with the ensemble in sections in which similar actions were taking place. My aim was to produce more dense gestural moments, which seem to prompt a reaction from the instruments or appear to be a consequence of gestural passages of the ensemble (audio excerpt: gutierrez_06_Grain_example5.wav).

Projection

Schnur for Violin, Cello, Double Bass and Live-Electronics

The experiences gathered in *Grain* informed greatly my understanding of the possibilities and limits of the tools used in my creative practice: the inherent *affordance* of the electronic processes used, the optimal mode of functionality of said tools, the development of an intuition concerning the expected sonic result in relation to the choice of source sonic material and the chosen sound processing tools. In *Schnur*, the live-electronic processing focuses on three distinct processes in order to maximize their use. This limitation imposed on the electronic part mirrors the limited sonic material of the instrumental part to concentrate the attention on gradual changes. The use of electronic tools in *Schnur* is presented through the category of "projection".

Schnur is informed by several concepts pertaining to perception concerning to the quality of sound in the experience of music. Beyond the categorization of affect based on tonality wherein affect is related to the different modes —major and minor—, my attention was drawn to the perceptual valence of sonic material. I became interested in the inherent feel and the energetic projection of sound in relation to its characteristic intensity. The awareness of the affective dimension of sound—in relation to Deleuze's notion of percept/affect (Deleuze & Guatari, 164)—led me to a critical evaluation regarding the perceptual feel of the sonic material employed in my music. After having written many pieces that make use of extended techniques, pointillistic treatment of sonic events, and sudden gesturality as a means of creating musical units of meaning using harsh sonorities, my attention turned to a different sonic quality of material as a means to explore sonic character from another perspective. This piece is greatly influenced by Gernot Böhme's writings on aesthetic theory, which take the subjective standpoint as point of departure as a means of elaborating a theory grounded on the subject-object relationship (2013). Böhme is a

German Philosopher whose writings on aesthetics show a strong inclination towards perception and phenomenology. He develops the concept of *Atmosphere* to highlight the relationship between the outward-projecting qualities of objects, the space wherein they are contained, and our apprehension of them. The concept of atmosphere as an affectively charged "point of contact", that is, a place of encounter in which the characteristic intensity of an emanating source, its contained space of diffusion, and the perceiving subject meet, drew my attention because it provided a conceptual framework to think about the perceptual quality of sonic material and its spatial propagation as qualitatively valent in the experience of the listener.

The piece unfolds gradually, from a breath-like sonority to soft pitched tones. As the sounds emanate from the acoustic instruments they are projected around the listener. The notion of outward projection taken from Böhme regarding the attribute of the appearance of objects, lent itself to a direct translation into sound spatialization. The spatialized sound projection contributes to fill—and articulate—the space engulfing the listener. The electronic manipulation is considered in the compositional process as belonging together with the live sound source. An example of the intricate relationship between the actions of the instruments and the electronic processes is the qualitative overlap between the sonic material played by the strings and the different electronic processes. The string instruments play pitch-altering actions such as pitch inflection-like gestures that are mirrored by a series of electronic manipulations that modify the pitch of the incoming sound. These manipulations were introduced in the previous chapter when I elaborated on the pitch-altering sound processes I use.

The Electronic Instrument

The concept of *atmosphere* as defined by Böhme led me to conceive of the role of the electronic layer in a different manner than that presented in the previous section. Rather than conceiving the electronic layer as a complementing voice that contributes to the creation of the electroacoustic texture, the processes used in *Schnur* operate as amplifiers of the written musical behaviors, that is, they contribute to emphasize the musical actions of the acoustic instruments. The interrelation between the type of modifications taking place and the sounds that will be modified is an important consideration, as it binds the electronic processes to the musical material. In *Schnur*, the electronic layer has three distinct functions: the first one concerns the use of different sound processes on the incoming signal. Each of these digital processes can be understood as a variation of a similar principle: the modification of the perceived pitch in a way that reflects—*projects*—the actions played by the acoustic instruments.

There are many instances in *Schnur* where pitch-shifting processes are used. Some of these digital processes act passively as amplifiers/spatializers when the pitch-bend control parameter is not active. An example of this process takes place the beginning of the piece.

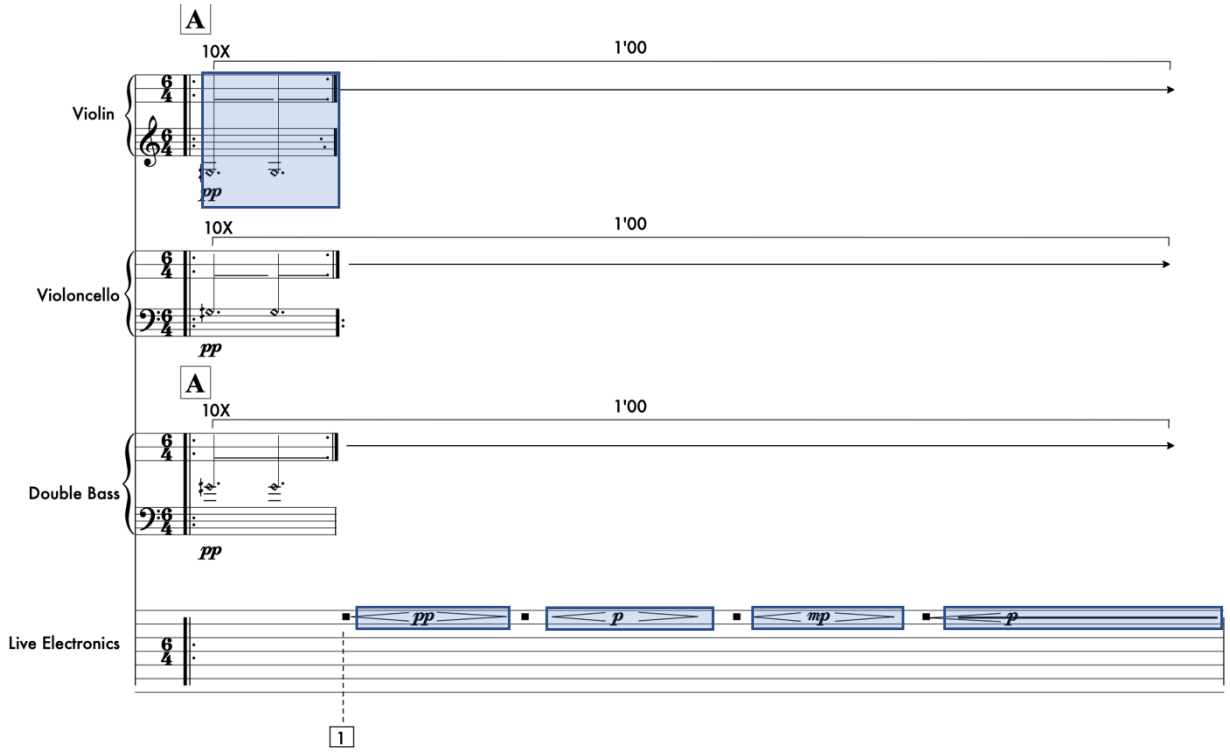


Figure 15 Opening section of *Schnur* for Violin, Violoncello, Double Bass and Live-Electronics[15]

In the opening section of the piece depicted in Figure 15, the violin is amplified and spatialized while the acoustic instruments play a repetitive, sustained, breath-like sonority (audio excerpt: gutierrez_07_Schnur_example1.wav). The loudness of the swells in the electronic part is controlled by the performer. The number of swells is not prescriptive—as notated in the score—but rather suggests the pacing of the swells for the duration of the section. This passage presents a steady breath-like rhythm as a periodic manifestation from which the piece gradually unfolds. As the piece continues, "swelling"—a gradual increase and decrease in loudness or energy—becomes an important mean of introducing new material. Just as swelling takes place impacting the loudness of the amplified/pitch-shifted sound of the violin, it also occurs in the instruments as a means of gradually introducing pitched sounds and more timbrally complex sounds.

[15] Instruments in the score from top to bottom: violin, violoncello, double bass, electronics.

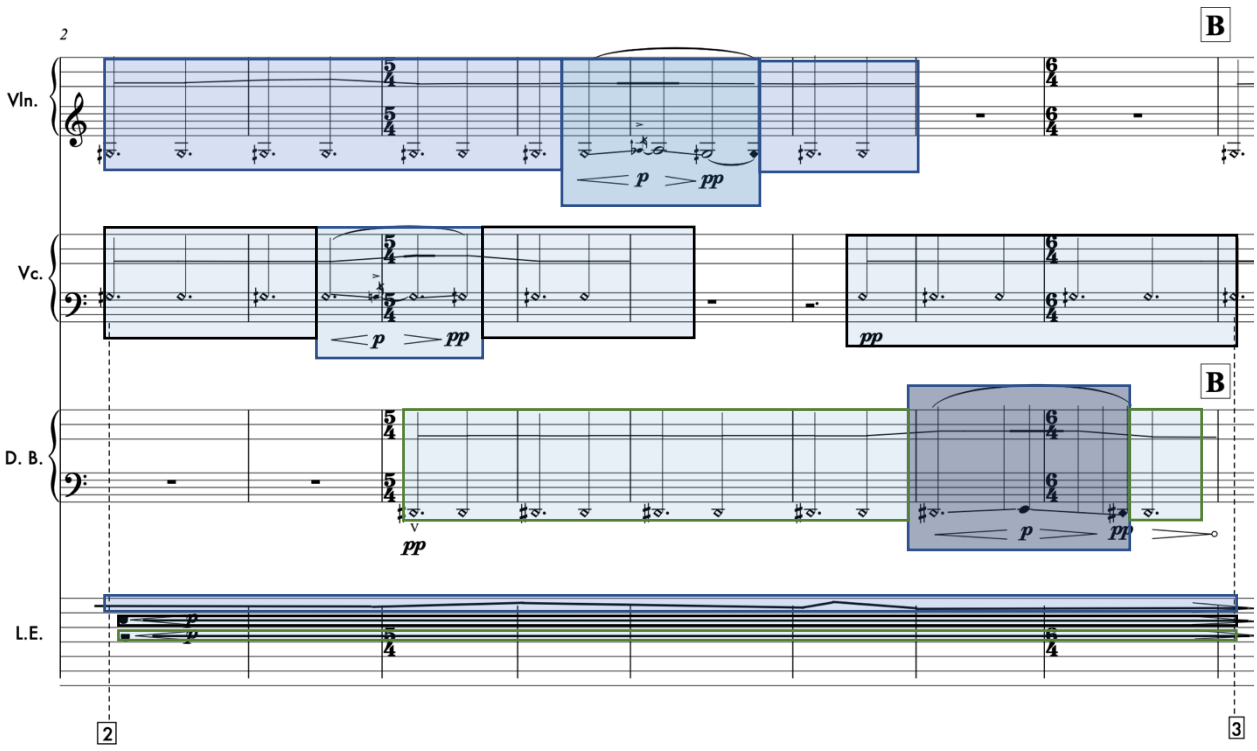


Figure 16 Second page of *Schnur* for Violin, Violoncello, Double Bass, and Live Electronics[16]

The highlighted actions of the instruments in Figure 16 present the instrumental swells manifest as the piece unfolds (audio excerpt: gutierrez_08_Schnur_example2.wav). In this section, a glissando—a linear alteration of pitch—accompanies the increase of loudness. Each action stands out as an articulated gesture from the otherwise uniform and seemingly ambiguous background. Tying things back to Böhme's definition of atmosphere, the noise like sonority has a "veil-like" function in relation to which clearly defined sonic gestures become gradually audible and fade again into the background. The electronic layer starting from the scene 2 introduces two new pitch-shifting processes assigned to the cello and the double bass. All three acoustic instruments are amplified and slightly processed asynchronously. The electronic performer continues to swell the amplitude of the three active processes in order to highlight the actions taking place in the

[16] Instruments in the score from top to bottom: violin, violoncello, double bass, electronics.

ensemble. At the beginning of scene 3, the three active electronic processes fade out and each string instrument is assigned a different pitch-shifting process. In subsequent sections, the swell gestures become more intense produced through added pressure to the bow on the strings. The increased bow pressure introduces a distortion-like sonority. This leads to the second function of the electronic processing: the use of sustained sonorities as a means of creating a "harmonic" background or to artificially extend the resonance of the instruments. Having a sustained harmonic layer in different sections of the piece creates an interesting depth, a static background on top of which the dynamic actions of the instruments are contrasted.

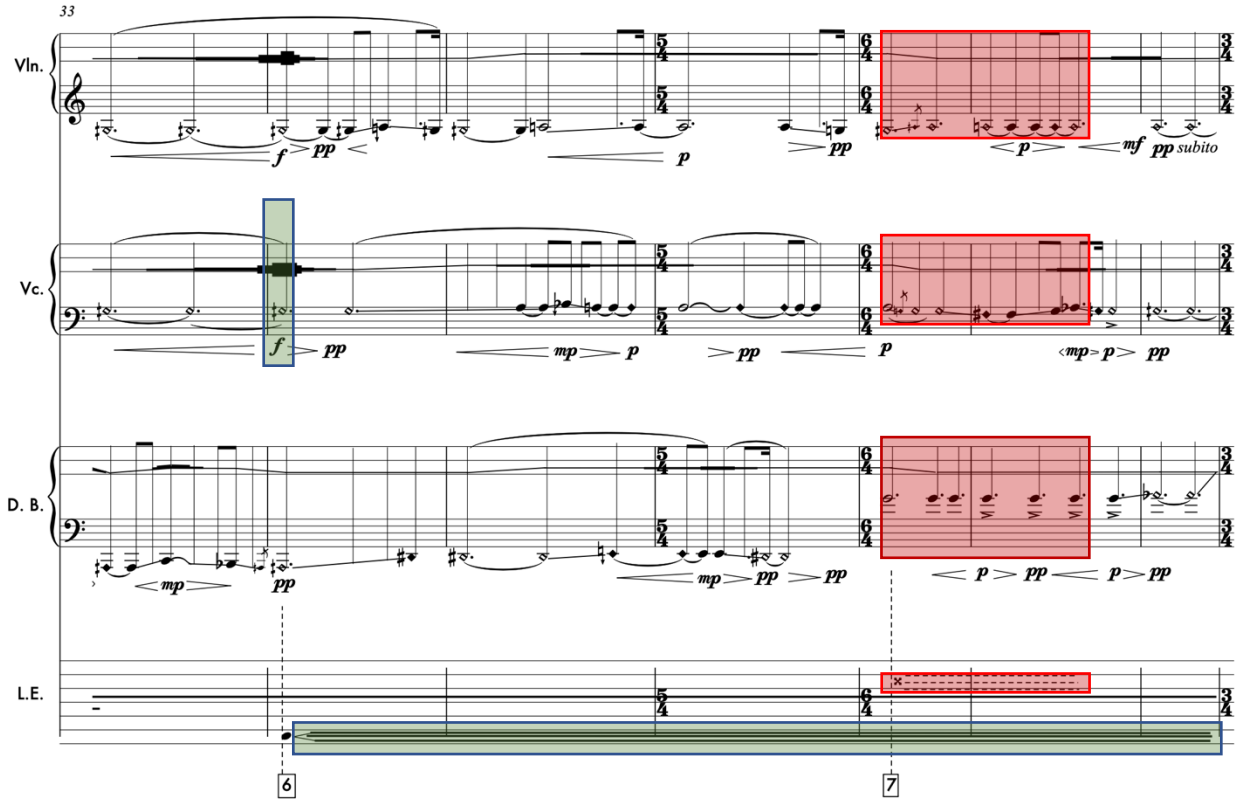


Figure 17 Bars 33 to 38 from *Schnur* for Violin, Violoncello, Double Bass, Live Electronics[17]

[17] Instruments in the score from top to bottom: violin, violoncello, double bass, electronics.

Figure 17 shows a section in *Schnur* where the swells in the violin and violoncello appear again but with an extension of their timbral range (audio excerpt: gutierrez_09_Schnur_example3). The three-line system above each of the note staffs represents the bow position and bow pressure on the strings. The actions at the end of bar 33 mark the beginning of scene 6. The Spectral Synthesizer generates the sixteen loudest partials of the captured sound of the cello. The resulting chord reproduces the spectral harmonics of the bowed string of the cello at the beginning of bar 34. Given the richness of the sound produced by the bowed string with added pressure, the resulting sound is a spectral chord that highlights the salient partials of the instrumental action through the entire register. The spectral chord assumes the function of "harmonic" background highlighting the instrumental actions as standing out against this background. Following along the score, in scene 7 the three instruments are recorded into a buffer that will be used in a granular sampler in the following section.

Figure 17 presents one of the ways in which the Spectral Synthesizer is used. When the instrument is active while the instrumentalists are playing, the Spectral Synthesizer acts as a static harmonic reinforcer on top of which the dynamic actions of the instrumentalist are highlighted. Because the chord is created from individual frequencies already contained in the instrumental sounds, the synthesized chords blend well with the acoustic instruments. I mentioned earlier that this instrument can also be used to artificially extend the resonances from acoustic instruments even after these have finished playing. Such is the case of the use of both the Spectral Synthesizer and the Granular Sampler in the next example. Given the complex sounds of the sum of the three bowed instruments played together, the Spectral Synthesizer generates different peaks every time. This is due to the highly complex spectra of bowed strings with extreme pressure. Statistically, our ears can make up an averaged distorted sound, however, the analysis tool is able to "discriminate"

the salient peaks for each of the actions at the time of the analysis. The resulting resynthesized sound contains salient peaks for each of the bowed actions, this is why, although the sound of each is perceptually different, they all relate to the analyzed sound.

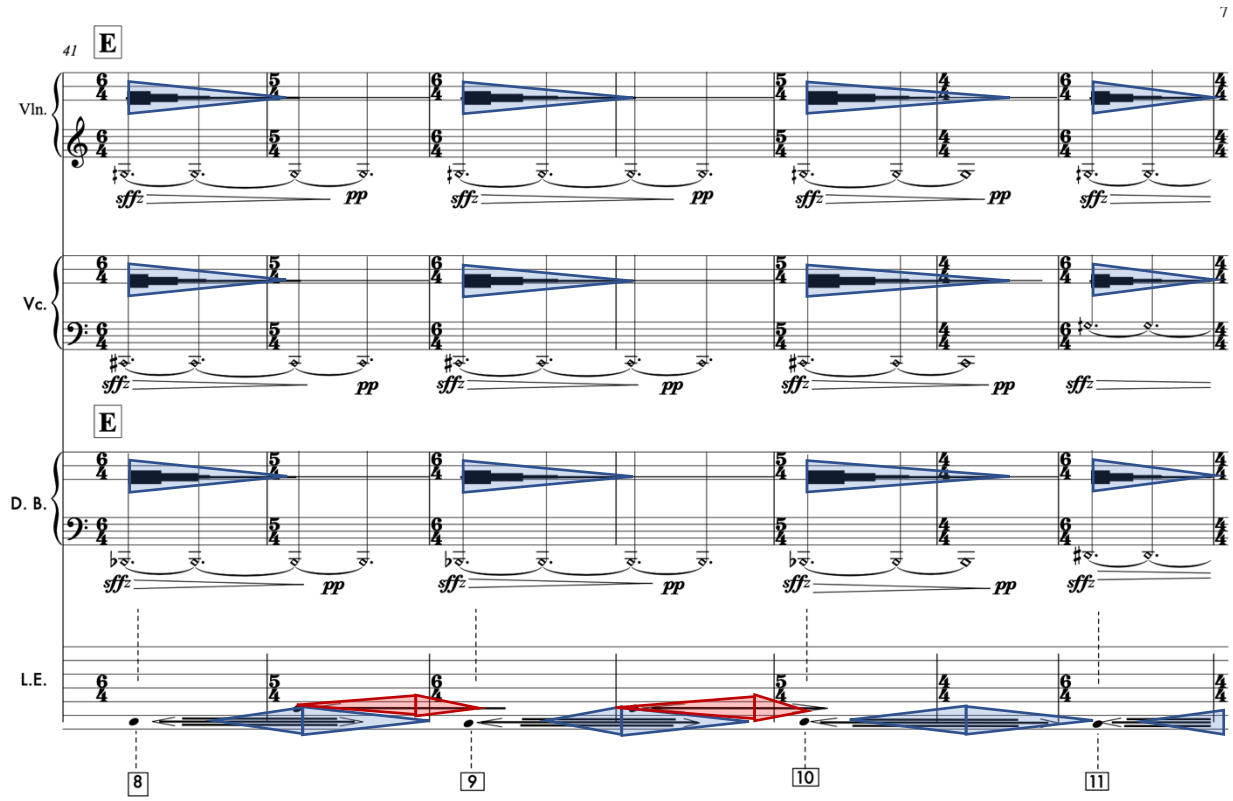


Figure 18 Bars 33 to 38 from *Schnur* for Violin, Violoncello, Double Bass, Live Electronics[18][19]

In this section shown in Figure 18, the spectral resynthesis takes the sum of the three string instruments to produce the spectral chords (audio excerpt: gutierrez_10_schnur_example4.wav). The Spectral Synthesizer fades in just as the string instruments are fading out as a means of artificially extending the sonority of the acoustic instruments. Additionally, in scenes 8 and 9, the Granular Sampler is used to fade in and out the sounds recorded in the previous section—depicted

[18] This passage presents the use of spectral resynthesis to create a spectral trace of acoustic instruments.

[19] Instruments in the score from top to bottom: violin, violoncello, double bass, electronics.

in Figure 17—as a further extension of the electroacoustic phrase. The notion of projection introduced earlier can be adequately applied to this way of employing the electronic processes. As if the spectral resonance introduced by the resynthesis emanated from the acoustic instruments outwards into the listening space.

Lastly, the third function, which is implicit in all the above-mentioned processes, concerns the spatial projection of the acoustic sounds played by the instruments. This function corresponds directly to the concept of the outward projecting qualities of objects as presented earlier by Böhme's definition of *Atmosphere*. The spatialization of the different electronic processes follows a random path around the listener space using a random process modelled after simple Brownian motion. My intention was to let the sounds move independently and allow for the statistical possibility of emergent behavior and spatial correspondences between the instrumental sound source and its spatialized projection. The speed of the spatialization is slow so that the movement of the sound sources around the listening space can be perceived as naturalistic in relation to the speed at which physical objects move in space. In *Schnur*, I intended for a more defined role of the placement of sounds. Using an algorithm modelled after simple Brownian motion as a means of controlling the directionality and position of the spatialized sound, I wanted to create continuous movement while also allowing for some independence in its local behavior. The basic functioning of Brownian motion algorithm is as follows: a random number generator chooses between three possible values, which correspond to the following states: [-1, 0, +1]; if the generator's output is -1, the current position of the spatializer is moved counterclockwise by a set angle value (in the spatialization method employed, the position of the spatialized sound source is given in angles); if the result is 0, the previous position remains unchanged; and if the value is +1, the same angle

value is added (clockwise) to the current position of the spatializer. In this way, the trajectory of the spatialized sound source is never discontinuous or unidirectional.

Performer Agency

In *Schnur*, as was the case in *Grain*, the role of the electronic performer is very important. The performer is responsible for following the score and triggering the sequences taking place throughout the piece at given moments. In each sequence, the performer is responsible for controlling the levels, and degrees of modulation of the active processes. This requires that the performer is actively listening and interacting with the instrumental performers. In a similar fashion to the *Grain*, there is an entirely open ad-lib section towards the end of the piece, where the performer can choose the electronic processes and the degree of modulation applied. In this section, the instruments play a passage repetitively with each instrument having different repetition lengths so that the ensemble gradually desynchronizes. The electronic performer can apply the different pitch-shifting processes in a free manner; however, their presentation must never be sudden. Cross-fading different instruments is an easy way to mask entrances and decays.

Conclusion

Having a conceptual framework allowed me to approach the articulation of a sonic continuum from a different point of departure. Rather than conceiving the development of a sonic discourse through gestural articulation and employing electronic processing as a means of "completing" to the sonic transitions, *Schnur* focuses on gradual transformations of sound in a slowly unfolding manner. Consequently, this shift in approach made me reconsider space as a relevant perceptual dimension in the experience of music. This shift provided new ways to think

about the articulation of the physical space in an active, controlled, manner, instead of as a mere effect with no structural function. In composing this piece and reflecting on the way in which electronic processes are used, I began to consider the strong connection to orchestration in the use of live-electronic processing. Orchestration, in a broad sense, is the task of assigning actions to specific instrumental combinations in an orchestral composition. Adding to the "doublings" of voices of the different pitch-shifting instruments, the Granular Sampler, and the Spectral Synthesizer, the spatialization of each of these instruments provides a fullness that three acoustic instruments are not capable of producing on their own. The proliferation of doublings with slight changes in timbre can be understood as a timbral expansion through coloration. In this sense, the electronic performer becomes a "live-orchestrator" that actively shapes the overall experience of the composition. This allows for the potential of different interpretations depending on the performers involved.

The previous two examples exemplify the way in which electronic means of sound manipulation are instantiated taking into consideration the roles or functions they are assigned in the compositional process. For these two pieces, the dialectical relationship between technique and imagination serves as model to frame the way in which creative ideas and means of realization interact in the creative process. This model has its limitations when the creative idea and the tools to realize them are no longer clearly separate. The following example attempts at a different framing which takes into consideration the constitutive elements of an entirely different approach than that presented above for the purpose of articulating the way in which creative decisions are made.

Initiation

Generative Electronic Music

In the section where the electronic tools operative in my compositions were presented, the subordinate function of the electronic manipulations was established: in the previous two examples, the use of electronic means was presented always in relation to one or more acoustic instruments: in both examples, the digital instruments' operation is dependent on the instruments' input. However, this is not to say that their *role* —in the realization of the piece—is subordinate. As was presented in the previous two pieces, the electronic instruments are responsible for complementing the sonic phrases and are essential to the experience of the composition. The framing of these processes as subordinate was an important step to better articulate the use of the modification processes in relation to the acoustic instruments they manipulate. This framing served to introduce the way in which electronic sound manipulation contributes to the realization of an imagined sonic idea that has its origin in the instrumental texture. In this section, a contrasting approach that focuses on the use of technology in the context of sound generation as source material will be described.

My access to generative electronic instruments was granted through experimentation with feedback systems the basic configuration of which requires a closed loop between a source's output and its input. My first serious exposure to feedback took place experimenting with no-input mixers: this is the designation given to audio mixers that are used as sound generators by "mis-using" the device by connecting its inputs to its outputs. The framing of this way of employing the mixer as a "mis-use" relates to repurposing in relation to its original function. The mixer in its conventional use, is a signal router that acts as an intermediary between one or more sound sources and a loudspeaker system and/or a recording device. Connecting the device to itself, although

foreseeable as a possibility, does not correspond to the conventional use of the device. Analog feedback, as it takes place in analog mixers, can produce highly complex sonic behavior by creating different signal paths that modulate each other. Feedback also occurs in physical space—for example, in a room. It can take place when a microphone is placed in proximity of a loudspeaker. Through recurrent amplification, the microphone-speaker system reinforces the resonating frequencies of the room producing often-times loud and high-pitched sounds corresponding to the resonant modes of the space where the feedback occurs. The resulting sound of feedback can be somewhat controlled; however, feedback systems are usually unstable making them difficult to manipulate reliably. Feedback is, in most contexts, considered undesirable, however, in controlled circumstances, the sonic result can generate interesting patterns and rich sonorities. Starting in the late fifties, feedback was explored creatively by several US American experimental composers such as Gordon Mumma, David Tudor, Alvin Lucier, and Steve Reich who created pieces and performance situations in which feedback was employed as a means of generating and controlling sound[20].

My interest in feedback led me to experiment with contact speakers and contact microphones—devices that attach to surfaces and rely on vibration of solid matter rather than air particles to propagate sound—as a means of creating feedback situations while also taking advantage of the resonant properties of different percussion instruments[21]. In subsequent sections of this text, the term *surface feedback* will be used to refer to the creative use of feedback in

[20] Of particular interest are the pieces Horn and Hornpipe by Gordon Mumma in which the electronic sound generation is contingent upon the resonant qualities of a space. Mumma devised a self-generating cybernetic circuit that generated sound in reaction to audio information of both, the direct sound of the horn and the resonant sounds of the room picked up by microphones. This is one of the earliest examples of self-generating live-electronic interaction.

[21] Transducers have also been used by experimental composers as a means of amplifying sound signals and using resonant material as propagation. In this context, the piece Rainforest by David Tudor is of relevance for its use of transducers in an installation/performance setting.

resonant surfaces by means of transducers and contact microphones. In the first exploration process, I experimented using different resonant surfaces such as metal plates, tam-tams, cymbals, snare drums, timpani and bass drums and created several performance opportunities in which I feature such instruments [*Auscultation (Metal)* – Audiovisual Performance for Large Tam-Tam and Video (2019), *Auscultation (Skin)* for Bass Drum and Live-Electronics 2020, *Tertium Datum* for Three Percussionists (2020), *Duo for Percussionists* (2021), and *Auscultation for Solo Performer* and Live-electronics (2021)].

Duo for Percussionists, Surface Feedback and Live-Electronic Performer

Many challenges were faced in the compositional process of the piece mainly due to the high instability of surface feedback: there are many variables that determine how the system reacts at a given moment, some of which are known—such as amplitude, microphone/speaker position—and others, which are unknown, and might impact the system. They include such factors as room size, position of the system, humidity, surface tension, and instrument material. This makes the re-instantiation of a particular behavior difficult, if not impossible. A central aspect of composition concerns the fixating of sounds, or more broadly any type of actions in time. When working with unstable sound sources, the action of fixating in the score must take into consideration this instability and allow for flexibility with regard to the resulting sound in a given instantiation. *Duo for Percussionists* is the result of attentive exploration of the possible behavior of surface feedback on bass drums heads. The piece itself is an exploration and a first attempt at fixating in notation musical actions which deal with unstable behavior with some degree of control. Concerning the model regarding the relationship between technique and imagination, this piece offers a different approach entirely. The role of imagination here will be replaced by sensation and immediate

response. Both concepts become central aspects in the control and manipulation of the affordances granted by the technical means employed. The process of exploration prior to the composition of the piece articulates the space of action, its possibilities and limitations.

In *Duo for Percussionists*, a fixed percussion setting is mirrored with slight variations: each percussionist performs on a percussion set consisting of a bass drum, a resonant metal instrument such as a tam-tam and a metal plate, a set of crotales, plus other variable resonant instruments such as almglocken and suspended cymbals. Figure 19 shows a basic diagram of the instruments of the piece. As it will be explained further below, the mirroring of the percussion setup is an important component, both sonically and visually. In the second movement of *Duo for Percussionists*, the performers interact sonically with surface feedback systems, which are controlled in part by the electronic performer and in part by the manipulations of the percussionists. On the one hand, the percussionists can directly engage with the feedback system by manipulating the surface where the feedback system is mounted. On the other, the percussionists complement the sounds produced by the feedback system with sounds produced by other percussion instruments. The electronic performer controls the amplitude, balance, and equalization of both systems. The additional control of these parameters impacts the behavior of the system: the electronic performer also interacts with the system by changing the amplitude and equalization of each microphone-speaker pair. The piece makes use of the timbral commonalities both, between the two percussion setups, the sounds produced by the feedback system, and the sounds produced by the percussionists to create complex sonorities

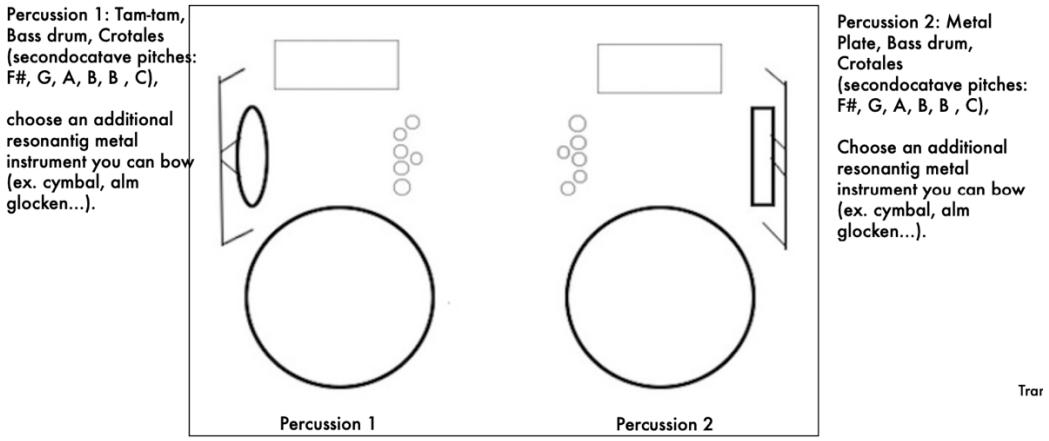


Figure 19 Instrument Setup of Duo for Percussionists.

In *Duo for Percussionists*, each, percussion setup has a feedback system, which consists of two microphone-speaker pairs (one pair consisting of a contact speaker and contact microphone, one pair consisting of a cardioid microphone and a contact speaker). The feedback system is mostly set up on the surface of the bass drum with the exception of the 1st movement in which the feedback system is set on the resonant metal surfaces. The surface feedback system consists of two different contact speakers: a low-frequency buzzer, and a treble transducer. Each transducer has a microphone assigned to it: The low-frequency buzzer is connected to a contact microphone (AKG411), which picks up the vibration of the percussion instrument's surface, rather than the sound waves travelling in space; the treble transducer is connected to a cardioid microphone placed about one foot above the drumhead of the bass drum. Each microphone-speaker pair produces a particular sonority—one pair relies on surface vibration while the other on feedback paths between a cardioid microphone and a contact speaker. When used together, interesting modulations and interactions take place, making the sound more complex and oftentimes unstable.

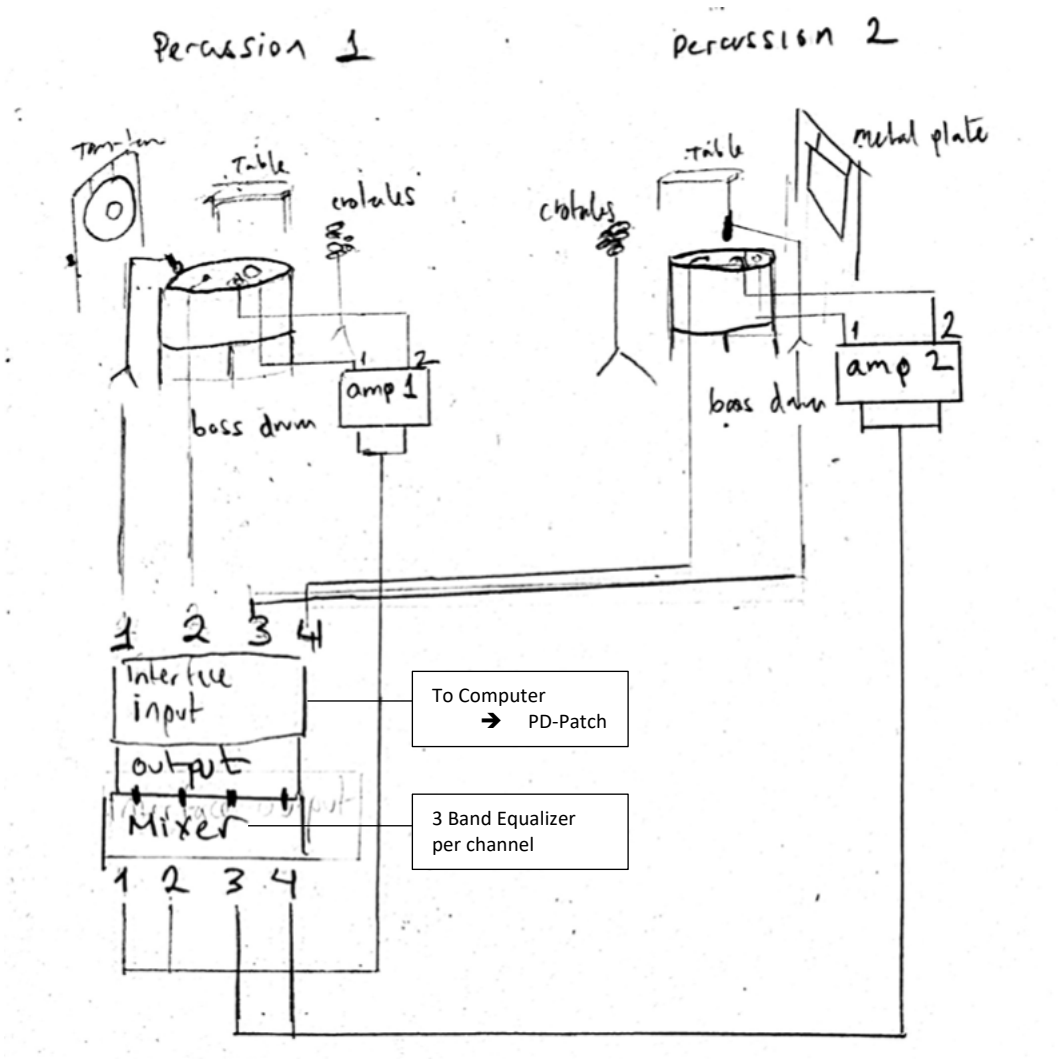


Figure 20 Diagram of Surface Feedback System

Doppelgängers and Analogous Sonorities

Working with surface feedback afforded the generation of sound by means of the excitation of resonant instruments using electronic means. The resulting sound is always contingent upon the resonant properties of the instrument to which the feedback system is mounted. *Duo for Percussionists* makes extensive use of this sonic overlap between the percussion instruments' conventional sounds and those sounds produced by the surface feedback system. A key difference between these sounds concerns their duration and malleability. These two aspects are used

extensively in *Duo for Percussionists*. "Doubling", in terms of sounds but also in terms of instrumental setup is one of the central aspects of this composition.

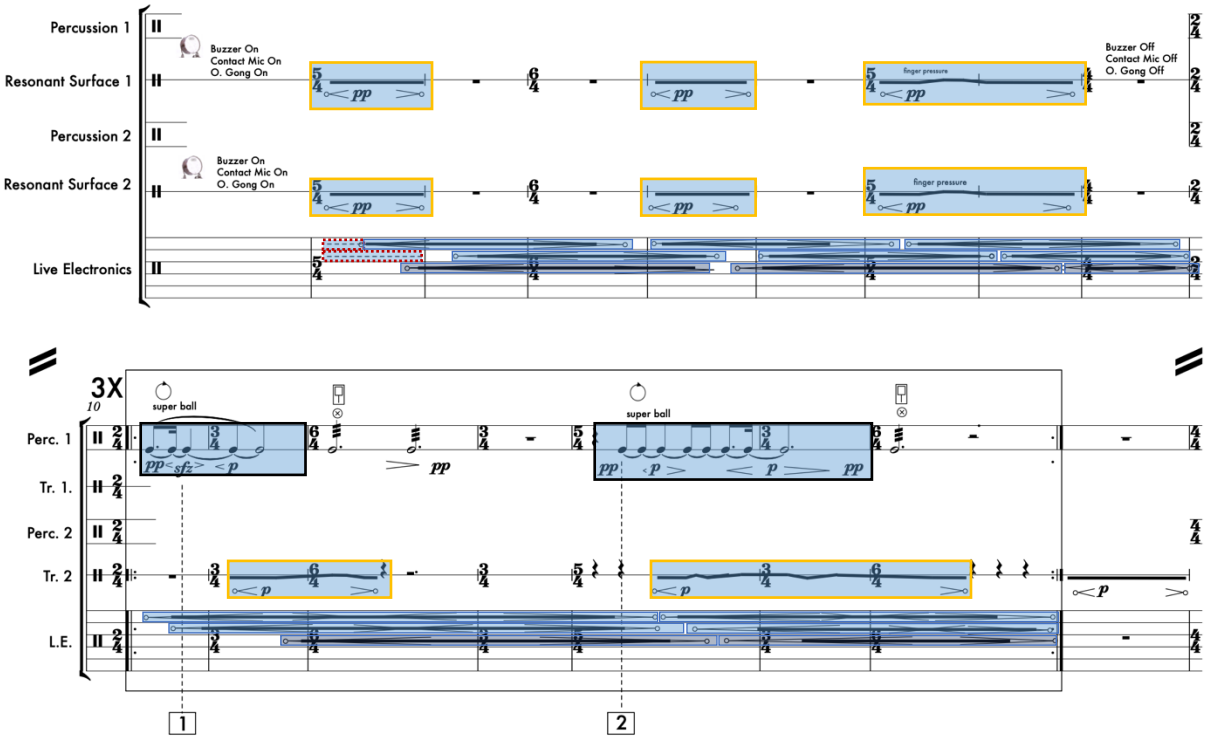


Figure 21 Beginning of *Duo for Percussionists*[22]

The beginning of the second movement—depicted in Figure 21—presents an example of how doublings take place: in the upper system, the electronic performer activates the feedback system on both bass drums with a swell-like envelope (audio excerpt: gutierrez_11_Duo-for-Percussionists_example1.wav). The first two instances take place without any intervention by the instrumental performers. The feedback systems are activated by the electronic performer using a mixer with independent channels for each of the speakers. In the third instantiation, the percussionists interact with the system by applying pressure to the drumhead to change the surface

[22] Instruments in the score from top to bottom: percussion 1, transducer 1, percussion 2, transducer 2, live electronics.

tension resulting in pitch inflections in the produced sound. In the second system, one of the performers excites their bass drum with a superball—a rubber ball that excites the drumhead by means of friction—while the second bass drum is activated through feedback. The second performer interacts with the feedback system resulting in a similar but not identical sonority to that produced by the first performer with the super ball.

The live-electronic manipulation—notated in the lowest stave of each system—contributes to extending the sonority of the bass drums. In this first section, the electronic layer acts like a sonic bridge between the sounds generated by the percussion instruments. Using samplers and spectral sustain, the sounds are extended and projected through the multichannel spatialization. The live-electronic layer generates complementing sounds and contributes to create a background-foreground relationship adding depth and sonic density to the percussion setup. This is another exemplification of live-electronics as orchestration in which the electronic layer reinforces and projects the sounds produced by percussion instruments with and without surface feedback.

In terms of structure, the piece presents alternate sections where the performers actively interact with surface feedback system, and sections in which the other percussion instruments are played while the surface feedback is controlled by the electronic performer. The sonic exploration shifts gradually from the low register sonorities of the initial bass drum swells to a much richer sonic space once the metal percussion instruments are incorporated. In subsequent sections of the *Duo for Percussionists*, the doublings incorporate high register percussion instruments which match the richer sounds produced by the feedback system with additional changes to the equalization, controlled by the electronic performer. Variability in the occurrence of events takes place through the introduction of repetitive blocks in the sections in which the percussionists play other percussion instruments. In these sections, the duration of individual actions is varied so that

the timing of each reoccurrence becomes indeterminate in relation to other actions happening. This contributes to a steady yet aperiodic flow of sonic events.

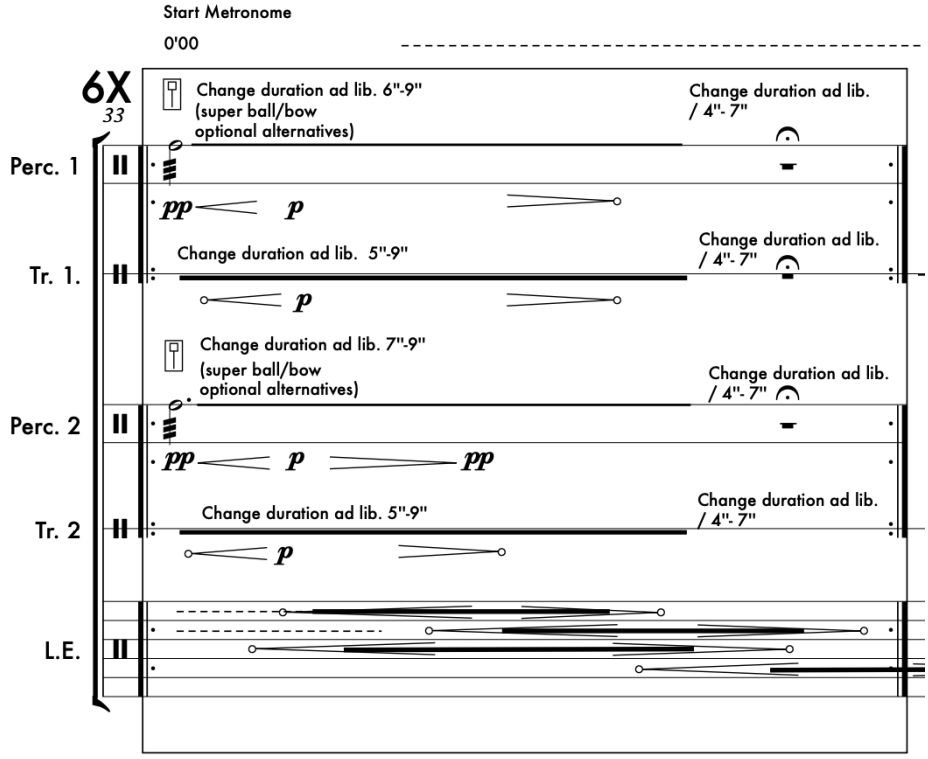


Figure 22 Repetition Boxes in *Duo for Percussionists*[23]

Figure 22 shows a passage in *Duo for Percussionists* where each of the 4 individual voices of the composition perform temporally flexible and independent actions in a repetitive manner (audio excerpt: gutierrez_12_Duo-for-Percussionists_example2.wav). Even though the actions are aligned in the score, their execution is flexible concerning their individual duration. As mentioned above, this allows for a constantly unfolding sonic discourse, the interweaving entrances and decays produces a constantly unfolding of sound which is additionally supported by the live-electronic layer. This is another instance of a compositional strategy gained from the electronic procedures used, namely, the variable sampler presented earlier.

[23] Instruments in the score from top to bottom: percussion 1, transducer 1, percussion 2, transducer 2, live electronics.

Lastly, the final section of the second movement of *Duo for Percussionists* extends the flexibility of performed actions to grant the performers some agency regarding to the actions they perform to complement the sounds of the surface feedback system. In this section, the percussionists can choose from the different instruments at their disposal. This section is an instrumentalization of a similar procedure that takes place in the electronic layer of the previous pieces in which the electronic performer is granted some flexibility in shaping the overall texture.

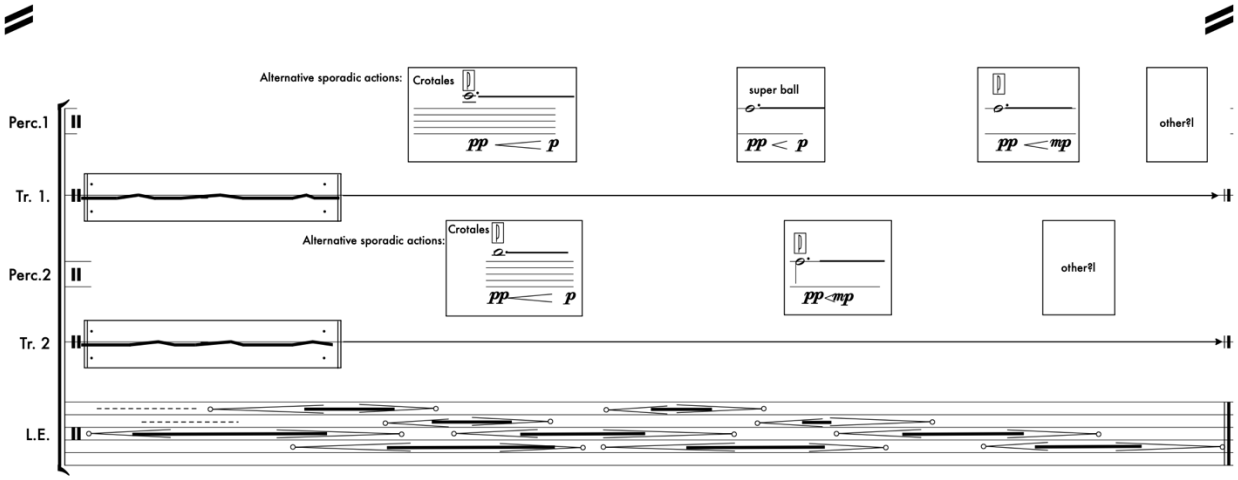


Figure 23 Closing Section of the Second Movement of *Duo for Percussionists*[24]

Figure 23 depicts the above-mentioned section (audio excerpt: gutierrez_13_Duo-for-Percussionists_example3.wav). The different actions represented in the boxes do not present a fix chronological succession of sonic actions but rather present a pool of potential of engagement for the performers. The electronic performer operating the surface feedback instrument interacts with the surface feedback in a free manner altering the equalization, loudness, and overall balance between the two speakers of each feedback module. The live-electronic layer further contributes to project the sounds of the percussion instruments to complement the sonority and create a multi-channel, immersive sonority.

[24] Instruments in the score from top to bottom: percussion 1, transducer 1, percussion 2, transducer 2, live electronics.

Embodiment

Experimenting with surface feedback offered a new approach to the generation of electronic sound and expressive control in combination with the resonant properties of percussion instruments. Even though the mode of sound production is electronic, the resulting sound has a strong connection to the acoustic instruments to which the surface feedback system is connected. Although starting from a different point of departure, this kind of sound generation aligns with my overall use of electronic processes (be it for manipulation or generation purposes), which is centered around acoustic instruments. Just like the tools of live-electronic sound manipulation expand the acoustic instruments' possibilities in my music, surface feedback incorporates resonant qualities of the percussion instruments thus expanding their sonic potential. Surface feedback not only opened up the possibilities of generative electronic music in my own creative practice, it articulated an entirely new domain of exploration pertaining to touch and hapticity as a means of dealing with embodiment in electronic music. Most computer music instruments are controlled through external controllers consisting of knobs, faders, and buttons—a paradigm that goes back to the days of analog synthesizers and has become a standard in the performance practice of computer music. There exists a wide range of external controllers, and although a case can be made for the use of such control devices as performative instruments in their own right, the reduction of control of such mechanisms often-times effaces direct connection between the control parameters of the digital instrument and the resulting sound. This renders controllers interchangeable with little fundamental relationship to the parameters being controlled. Working with surface feedback, the performers must use their hands to engage with the system in order to shape and somewhat control the produced sounds. The idiosyncratic embodiment of sound control in electronic music allows for a direct connection between action and result and enables multi-sensorial relationships

between the felt and the heard as a means of developing a "relationship" to the electro-acoustic instrument. This places the body as an active agent in the process of sound production —as is the case of acoustic musical instruments— and enables, thus, an embodied control and articulation of sound. Moreover, approaching sound propagation from another medium, opens a field of exploration that involves experimentation with different objects (metal, wood, drumheads) and their resonant qualities, as well as multi-sensorial perception as a means of sensing sound. Lastly, the reliance on touch as a means to control sound, and the way in which the performer is required to immediately respond and adjust, warrant a different framing of the use of electronic means of sound in my music.

Whereas the work by Mumma and Di Scipio take cybernetics and system theory correspondingly as points of departure to create self-regulating "environments" in which the performer plays a marginal yet important role in generating or regulating the interactions happening between the generated sound and the resonant qualities of the performance space. In surface feedback, touch and active control become central in the behavior of the system. By actively changing the conditions of the feedback system, the performer is strongly tied to the generative system. Their actions have direct implications in the resulting sound. In surface feedback human agency is fundamental in the control of the electroacoustic instrument. Touch, and sound are interrelated

Conclusion

In the opening chapter of the essay, the term feedback was used to frame the development of my creative process through time because of the way in which completed compositional projects impact and inform the subsequent development of my creative practice. In the last chapter, feedback was reintroduced as a concrete a strategy generate sound in real time. Feedback has been employed as a means of creatively approaching a model of consciousness because of the way in which the "recursive" or "regressive" nature of self-consciousness: an initial thought impulse or action followed by the awareness of said thought or action, followed by the awareness of the awareness, etc. (Pepperell, 2008). This framing of feedback contributes to elucidate both the way in which the current state of my creative practice informs its subsequent development, and, in the context of surface feedback, the way in which haptic response and listening are intertwined to shape the behavior of the system in real-time.

The purpose of a verbal articulation and framing of intentionality serves the development of an awareness concerning the instrumentalization of ideas and procedural strategies in cultural production. Furthermore, it contributes to the illumination and articulation of previously "uncharted" relationships for the sake of a better understanding of one's own "way" of approaching creative practice. This paper presented three distinct approaches to the use of technologically assisted sound generation and projection strategies and attempted at a framing of the different uses presented in relation to particular "functions" (complementation/completion, projection, initiation) assigned to technology in the creative process. The dialectical opposition of imagination/technique served to articulate the way in which creative ideas are brough about through technique as a means to arrive at an understanding of the interdependence of technique and imagination through the creative aims in artistic production; the analogy between self-consciousness and feedback

contributed to frame a more immediate, embodied approach to the use electronic means of sound generation. Lastly, the conceptual frameworks presented contribute to provide an understanding —at a procedural level— of the way in which ideas are brought about and instantiated in the compositional process mediated by the technical *know-how* and artistic intentionality. The pieces presented as part of this essay represent a gradual progression in the development of an individual creative approach concerning the use of live-electronic means of sound processing and production. The collection of pieces serves to exemplify both, the gradual disambiguation of tools employed, and an actualization of creative aims.

APPENDIX

Grain

Für gemischtes Ensemble und Live-Elektronik
For Mixed Ensemble and Live Electronics

Andrés Gutiérrez Martínez
(2018)

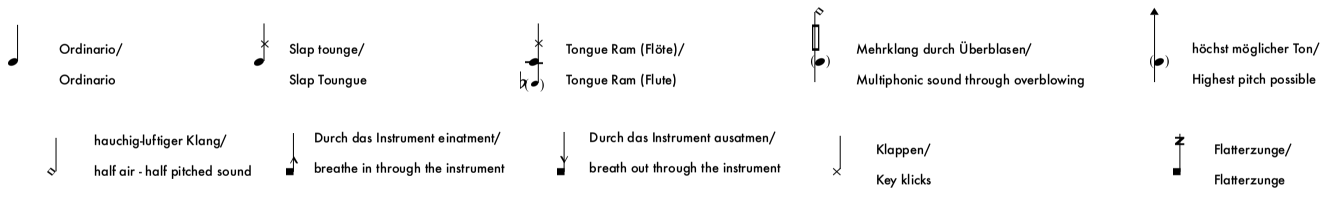
Grain (2018)

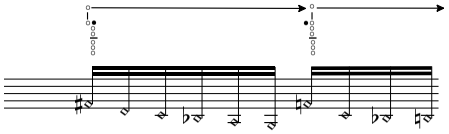
Für gemischtes Ensemble und Live-Elektronik/ For mix Ensemble and live electronics
Andrés Gutierrez Martínez (1984)

Kompositionsauftrag von Schallfeld Ensemble,
finanziert durch die Ernst von Siemens Musikstiftung

Legende/
Performance Instructions

Bläser/Wind instruments





Notation eines mikrotolaen Laufs in der Bassklarinette:
Die Klappe soll wärend der ganzen Dauer der Phrase offen gelassen.
Die Phrase ist durch die Pfeile bestimmt.

Microtonal scale in the Bass clarinet

Notation der Multiphongriffe/

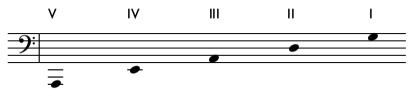
Notation for multiphonic fingerings

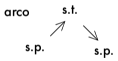
Streicher/ Strings

Die Saite dämpfen so dass es kein bestimmter Ton erlkingt/

Mute the string completely avoiding it to resonate properly

Stimmung des Kontrabass / Tuning of the Double Bass (5 strings)





Den Bogen entlang Der Saiten gleiten/

Slide the bow up and down the strings.

Viel Bogendruck/

Apply bow pressure

Den Bogen auf der Saite reiben/

"Scratch tone" - Slightly rotate the bow
while applying pressure
in order to produce scratch sounds

leggero / legg.

Wenig Bogendruck/

little pressure in the bow

gradueller Übergang/

gradual Transition arrow

s.t. - sul tasto
ord - ordinario
s.p. - sul ponticello
m.s.p. molto sul ponticello

Schalgzeug/Percussion

Schlagzeugliste/
Percussion Set

Schnarrtrommel - (snare)/ Snare drum
Becken/ cymbal
1 Crotalesscheibe (Höchtes C, oder höchst möglich)/
1 Crotales disk (highest C)
Vibraphon/ Vibraphone
Wookblocks/ Woodblocks
Triangle/Triangle

Drumstick/
Drum stick

Bogen/ Bow

Weiche Schlägel/ Soft mallet

Mittel-harte Schlägel/
Medium-hard mallet

Harte Schlägel/
hard mallet

Superball

Bürste/Brush

Schwam(weicher Klang)
/Sponge (Soft sound)

Kreisbewegung.
"Ohne" Artikulation/

Circular movement "without" articulation

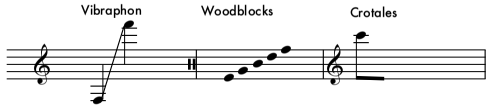
"hin und her"-artige Bewegung der Hand/

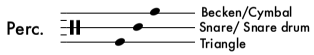
"Angular" movement producing a clear articulation.

Die Bürste auf dem Trommelfell (snare) reiben/

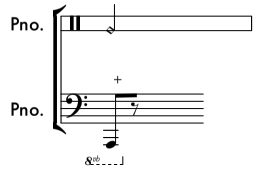
Rub the brush on the snare's membrane

Das Becken mit der Schlägelspitze kratzen/
Scratch the cymbal with the tip of the drum stick



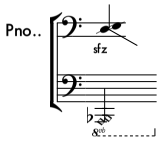


Klavier/
Piano



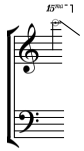
Notation der linken und rechten Hand des/der Pianist/Pianistin.
Das obere System zeigt die relative Position des Fingers auf der Saite, die gedämft wird.
Im unteren System werden die Noten geschrieben, die auf der Tastatur gespielt werden.
Das "Dämpfenzeichen" "+" wird auch verwendet, um zu zeigen, dass die Saite gedämpft werden soll egal wo der Finger die Dämpfung macht./

Notation for the left and right hand of the pianist.
The upper system shows the relative postiion of the finger on the muted string. The upper limit represents the furthest position from the pianist
and the lower limit the closest to him/her and to the hammers.
The lower system shows which notes are being activated or played.
The mute sighn + is also used to show that the desired note should be muted intependent of the muting position.



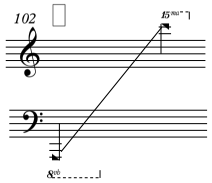
Den Finger entlang der Saite gleiten/

Slide the finger tip, nail or guitar pick on the given string(s)



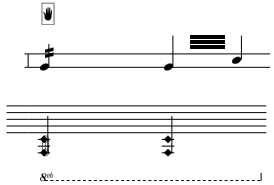
"Arpeggio auf den Saiten"
Den Finger auf der Harfe des Klaviers gleiten. Die Verwendung eines Plektrums ist auch möglich.

Arpeggio on the strings.
Slide the finger on the harp of the piano.
The use of a guitar pick or a card is also possible



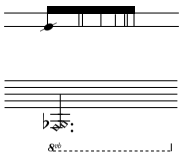
Glissando auf der Tastatur mit einer Karte aus Plastik/

Glissando on the keyboard with a plastic card



Die Saiten mit der offenen Hand schlagen/

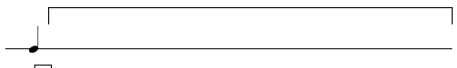
Hit the strings with the open hand



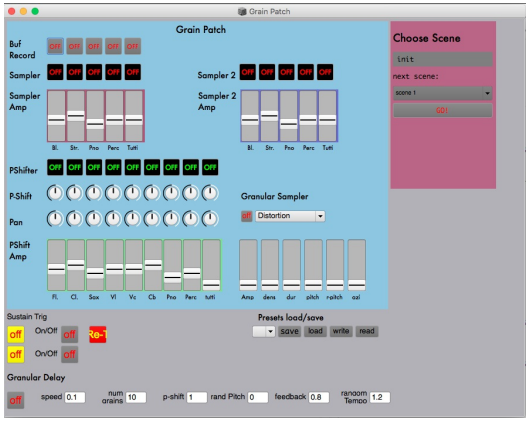
Die Fingerspitze oder das Plektrum langsam durch die Saiten gleiten, so dass jede vertikale Linie eine "Attacke" wird. Der notierte Rhythmus ist nicht fix. Der/Die Pianist/in ist frei bezüglich eines fixen Rhytmus/

Slide the finger tips slowly on the string.
Each vertical line marks a short "attack"
The rhythim is approximate. The perfomer is free to interpret the notation.

Liveelektronik
Live - electronics



1



1 Szenenummer / Scene number

Für die Stellen, in denen der Einsatz des Klangregisseurs/Elektronische Musik Performer gewünscht ist, soll ein Midi Kontroller verwendet werden (Korg Nano, Behrginger BCF 2000), um gesturalle Bewegungen realisieren zu können.

Das elektronische Instrument besteht aus 6 unterschiedlichen Module,
die durch den Sequenzer programmiert sind. Der Interpret des elektronischen Instruments kann in manchen Stellen frei improvisierend, um die gesturale Zusammenspiele zwischen den Instrumente zu antizipieren oder imitieren, bzw. zu komplementieren.

Die einzelne Module sind in Familien organisiert:
Samplers 1 & 2 bestehen jeweils aus 4 einzelne Spuren, deren eizelne Länge und Wiedergabegeschwindigkeit zufällig generiert wird.
Die Instrumentalgruppen sind in Gruppen organisiert:
Gruppe 1: Bläser (Flöte, Bassklarinette, Bariton Sax)
Gruppe 2 : Streicher
Gruppe 3: Schlagzeug
Gruppe 4: Klavier

Die einzelne Signale der Instrumente werden zu einem Pitchshifter Modul geschickt und individuell verarbeitet, bis auf den 9ten Regler, der alle zusammen verarbeitet.
Der Granular Delay nimmt kurze Sequenzen vom Live Input und verarbeitet sie mittels granulare Verfahren.
Der Granular Sampler vearbeitet bereits gespeichertes Material mittels granulare Verfahren.
Der Sustain-Trig Modul ist ein FFT-bassiertes "Freeze"-das die 16 lauteste Teiltöne des Eingangssignal synthetisiert und spatialisiert.

/////

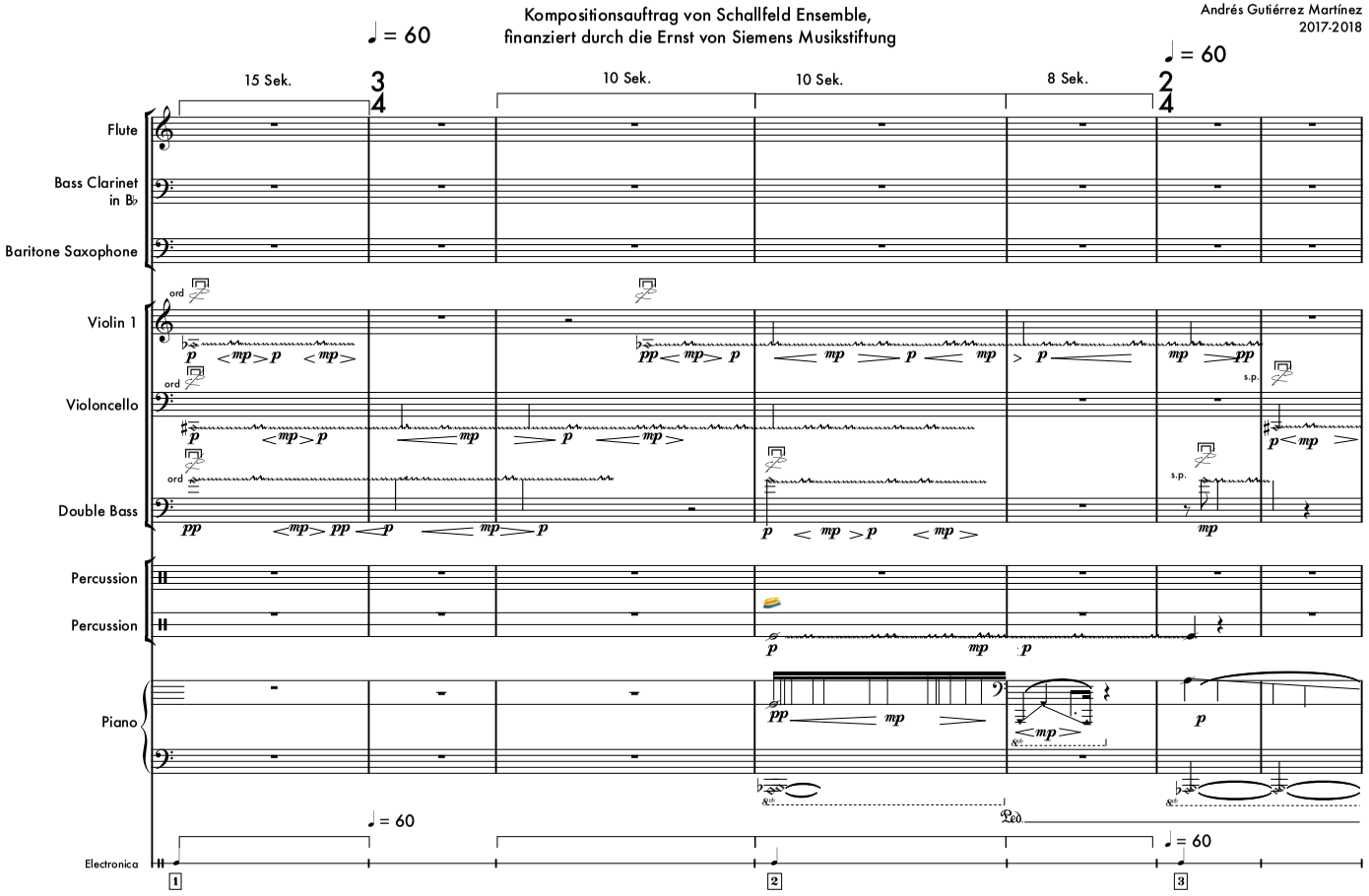
The electronic patch consists of 6 different modules whose use is programmed through the sequencer.
The input for the instruments is either separted in instrumental families, processed individually or as a sum of all the inputs.
Samplers 1 and 2 consist of 4 slighlty variated copies of the same recorded buffer. Each of the copied tracks is slightly different in length and pitch.
For the samplers each sampler is separated as following
Grupe 1: Winds (Flute, Bass Clarinet, Baritone Saxophone)
Grupe 2: Strings
Grupe 3: Percussion
Grupe 4: Piano

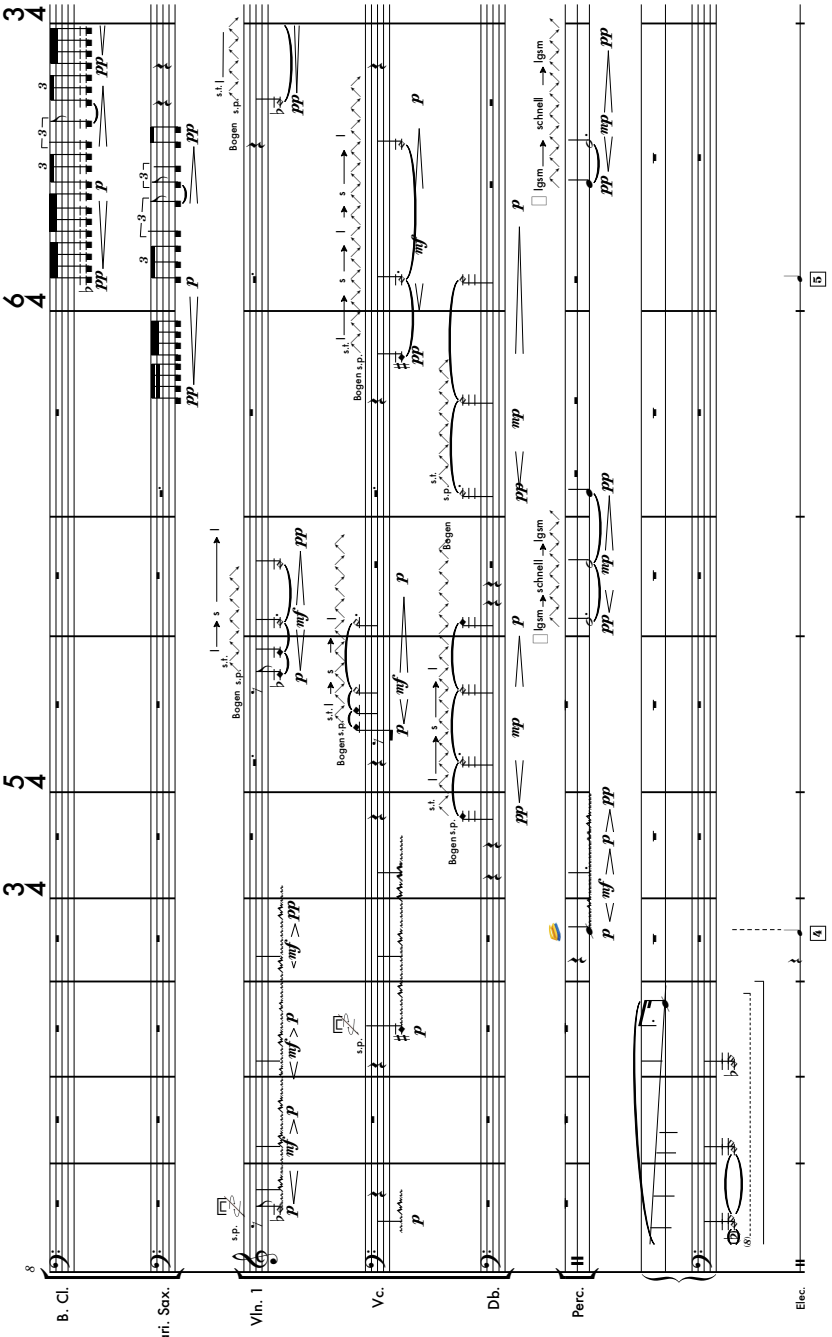
The Pitch Shifter process each input individually except the last knob and fader, which controls the sum of all the inputs together.
The Granular Delay takes short segments from live input and processes them granularly
The Granular Sampler takes short segments from previously loaded buffers and processes them granularly.
The Sustain-Trig Module is an FFT-based freeze instrument, which takes the 16 loudest partials of a given signal and sustains them and spatializes them.

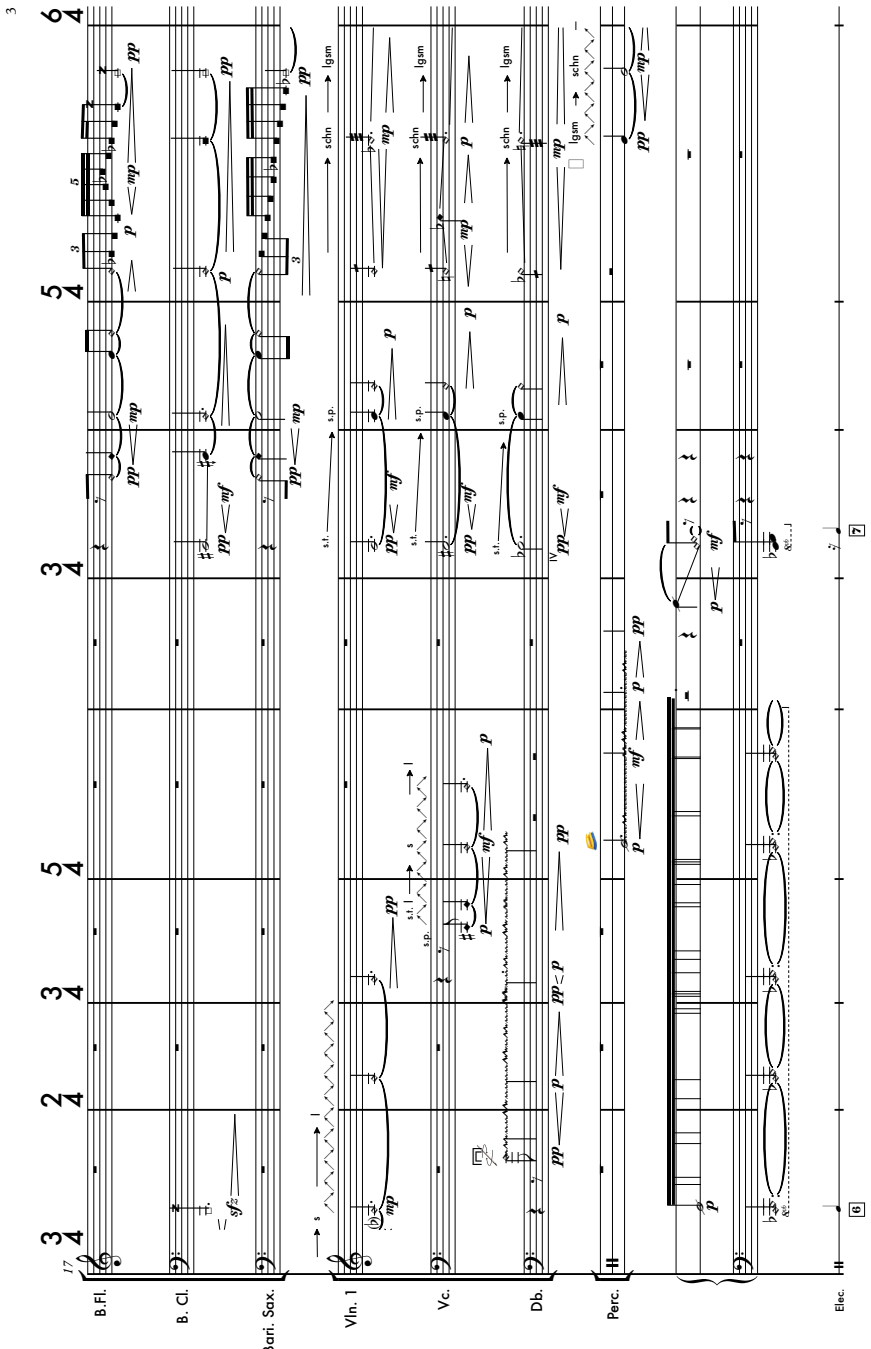
Grain

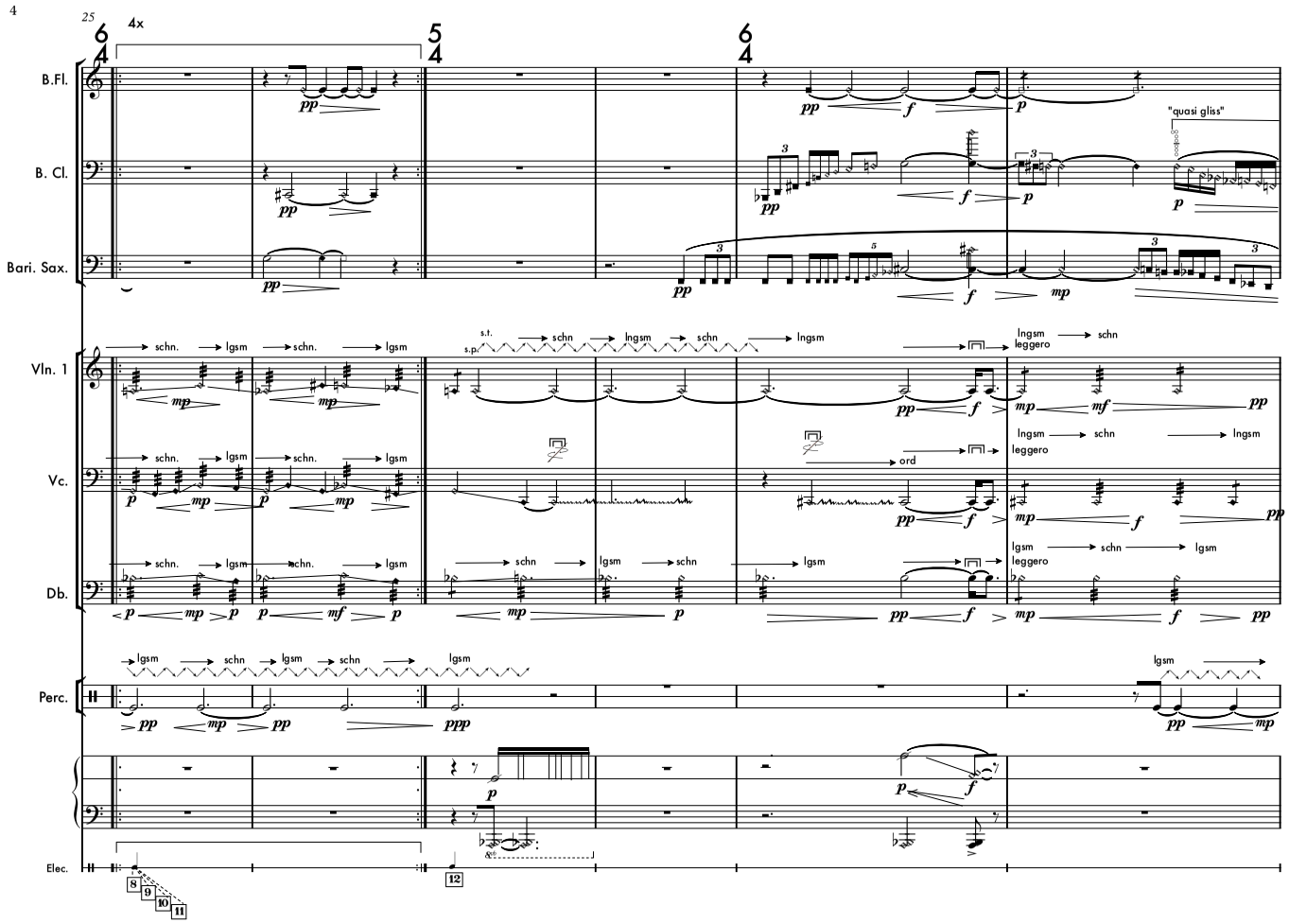
Kompositionsauftrag von Schallfeld Ensemble,
finanziert durch die Ernst von Siemens Musikstiftung

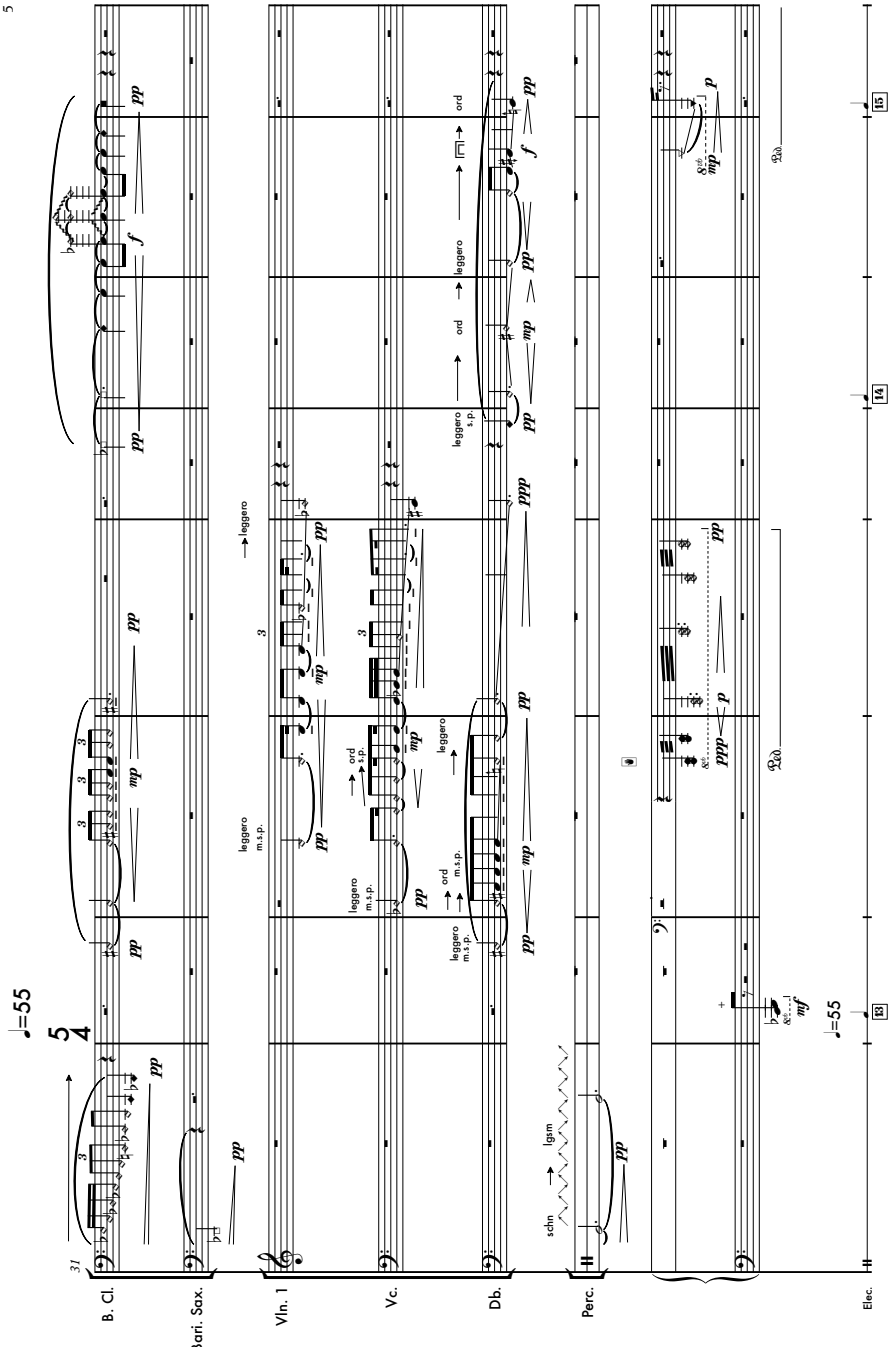
Andrés Gutiérrez Martínez
2017-2018

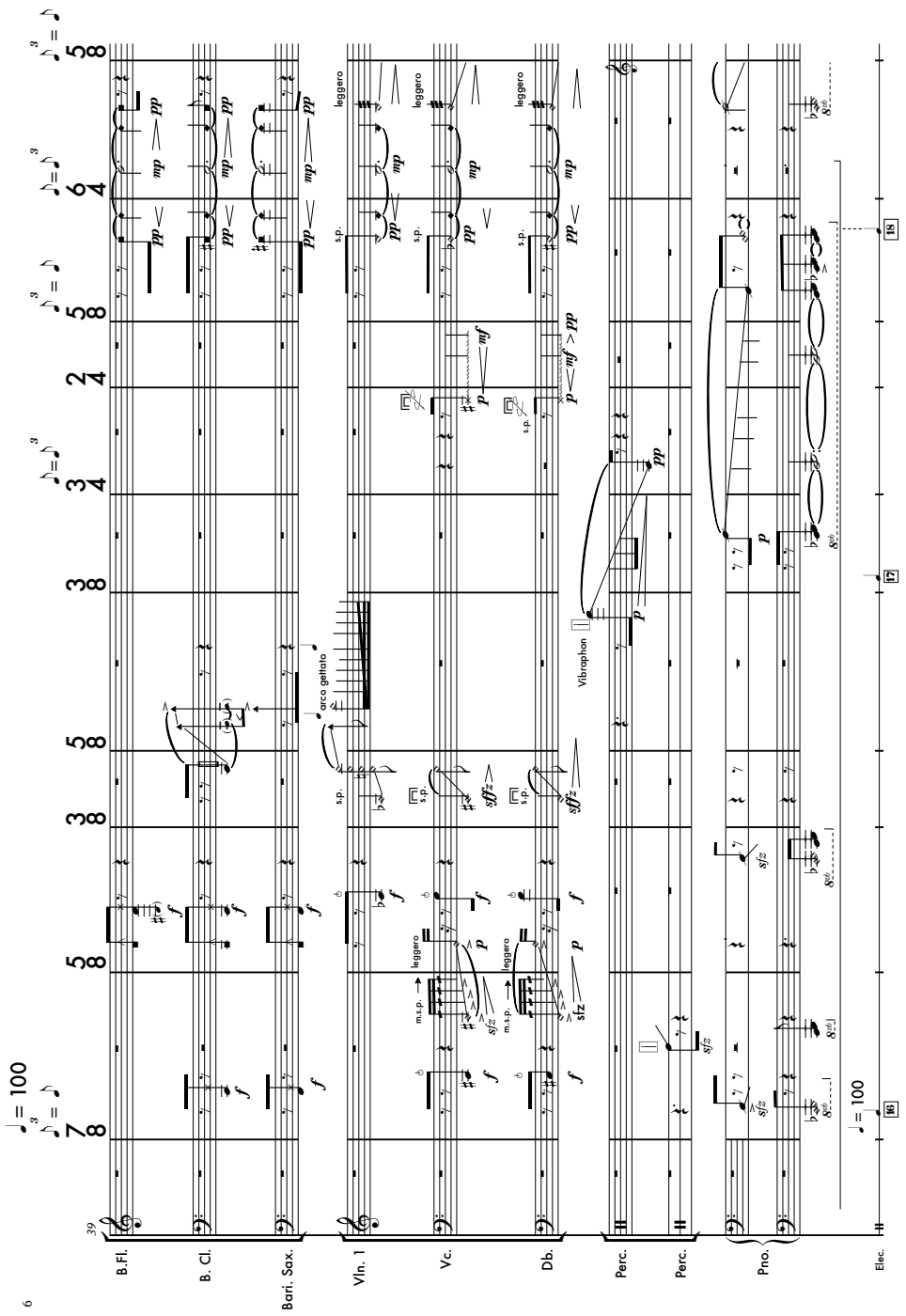


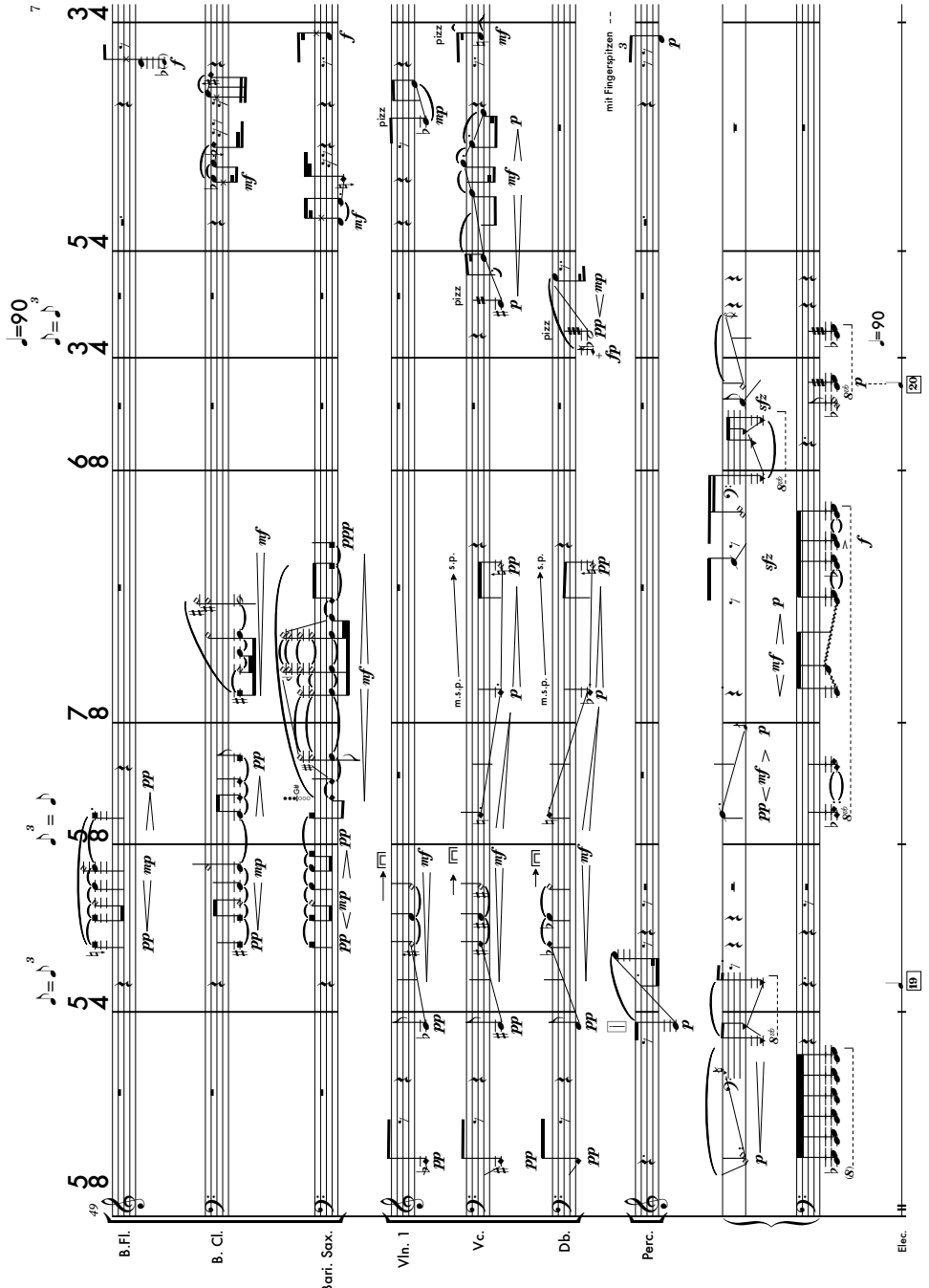

B. Cl.
Bari. Sax.
Vln. 1
Vc.
Db.
Perc.
Elec.
Bogen
s.p.
s.t.
lgsm
schnell

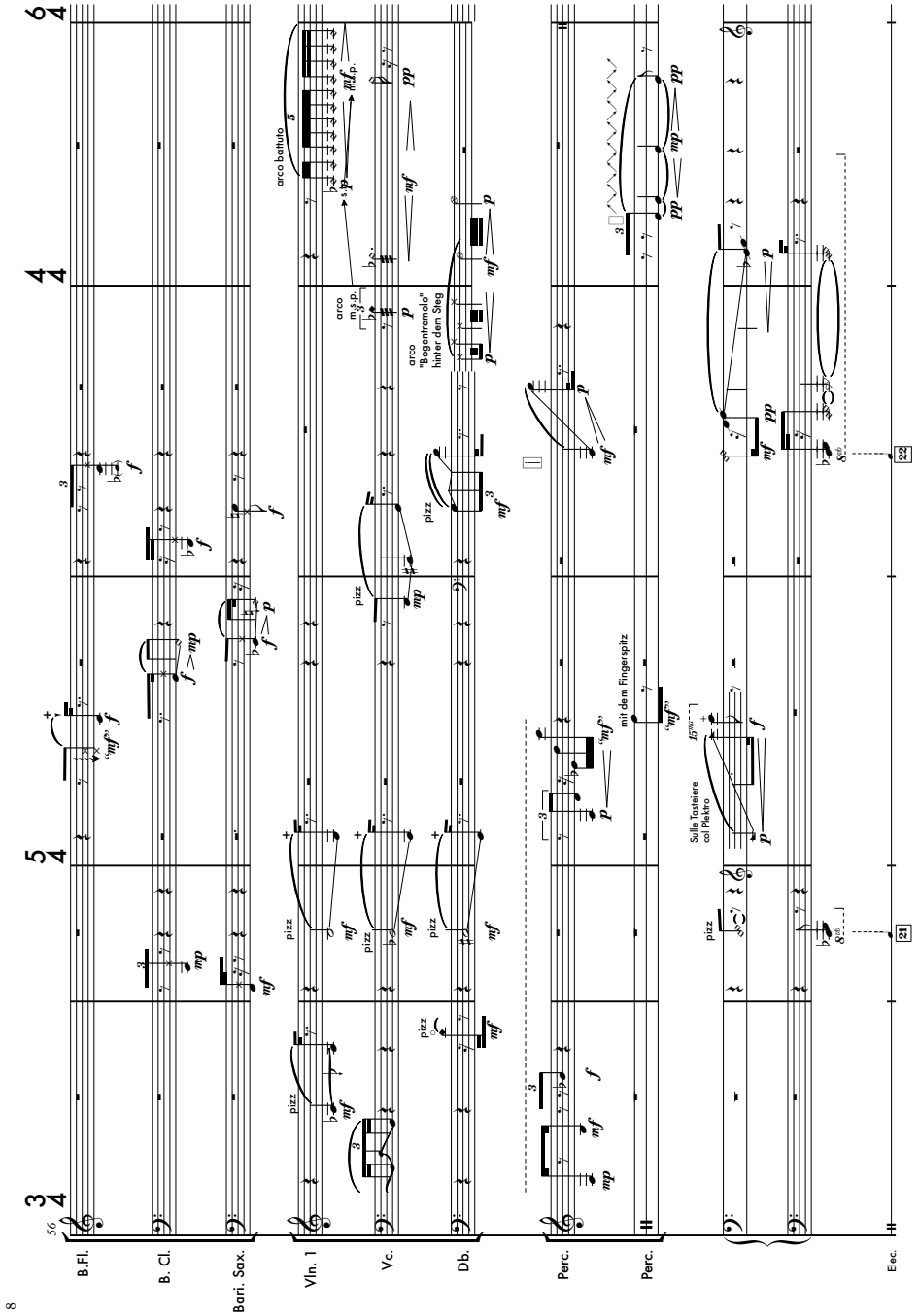

B.Fl.
B. Cl.
Bari. Sax.
Vln. 1
Vc.
Db.
Perc.
Elec.

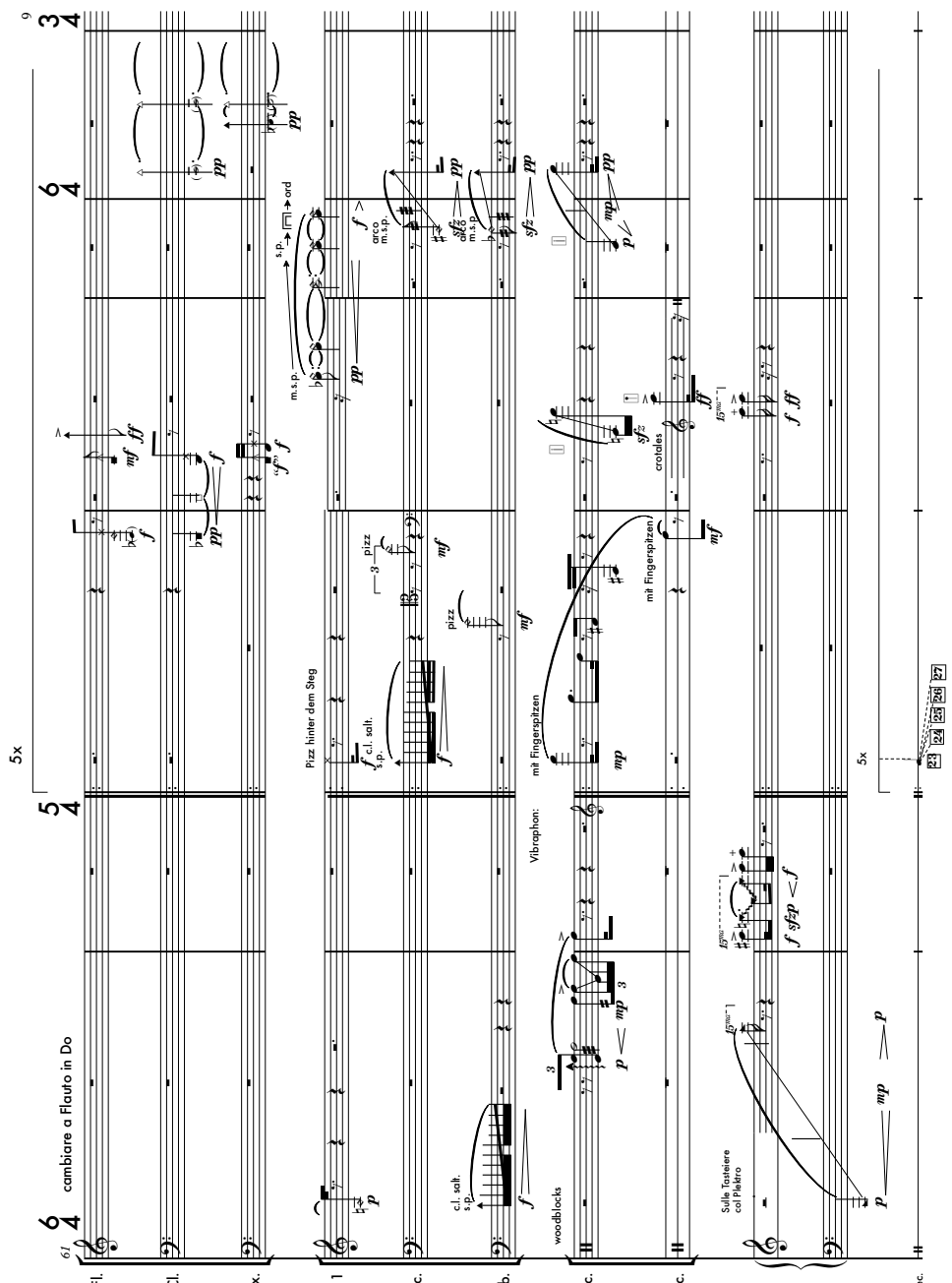

25
4x
B.Fl.
B. Cl.
Bari. Sax.
Vln. 1
Vc.
Db.
Perc.
Elec.
"quasi gliss"
schn.
lgsm
s.t.
s.p.
ord
leggero
lngsm
8
9
10
11
12

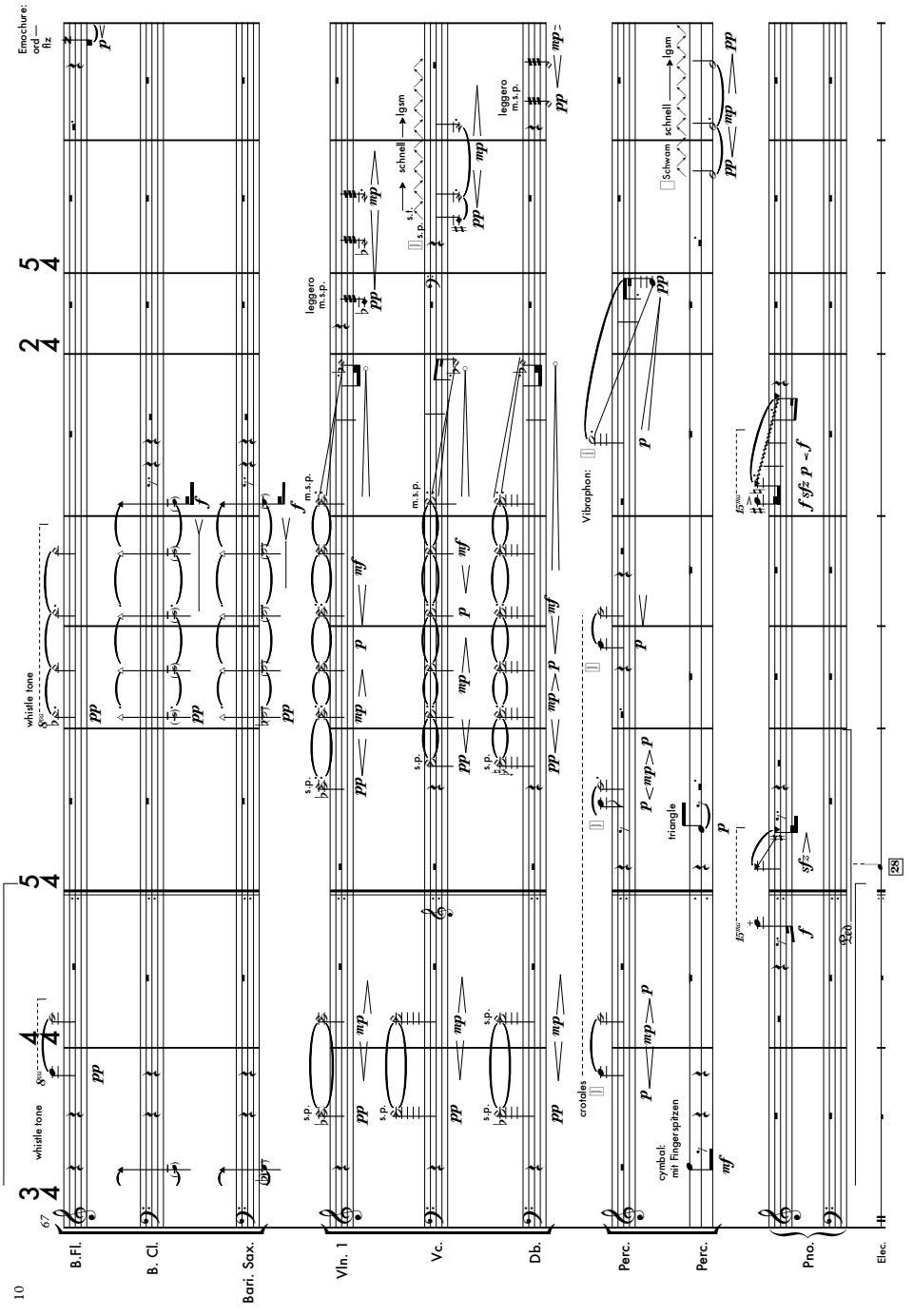

B. Cl.
Bari. Sax.
Vln. 1
Vc.
Db.
Perc.
Elec.
♩=55
leggero m.s.p.
ord s.p.
leggero s. p.
ord
schn
lgsm

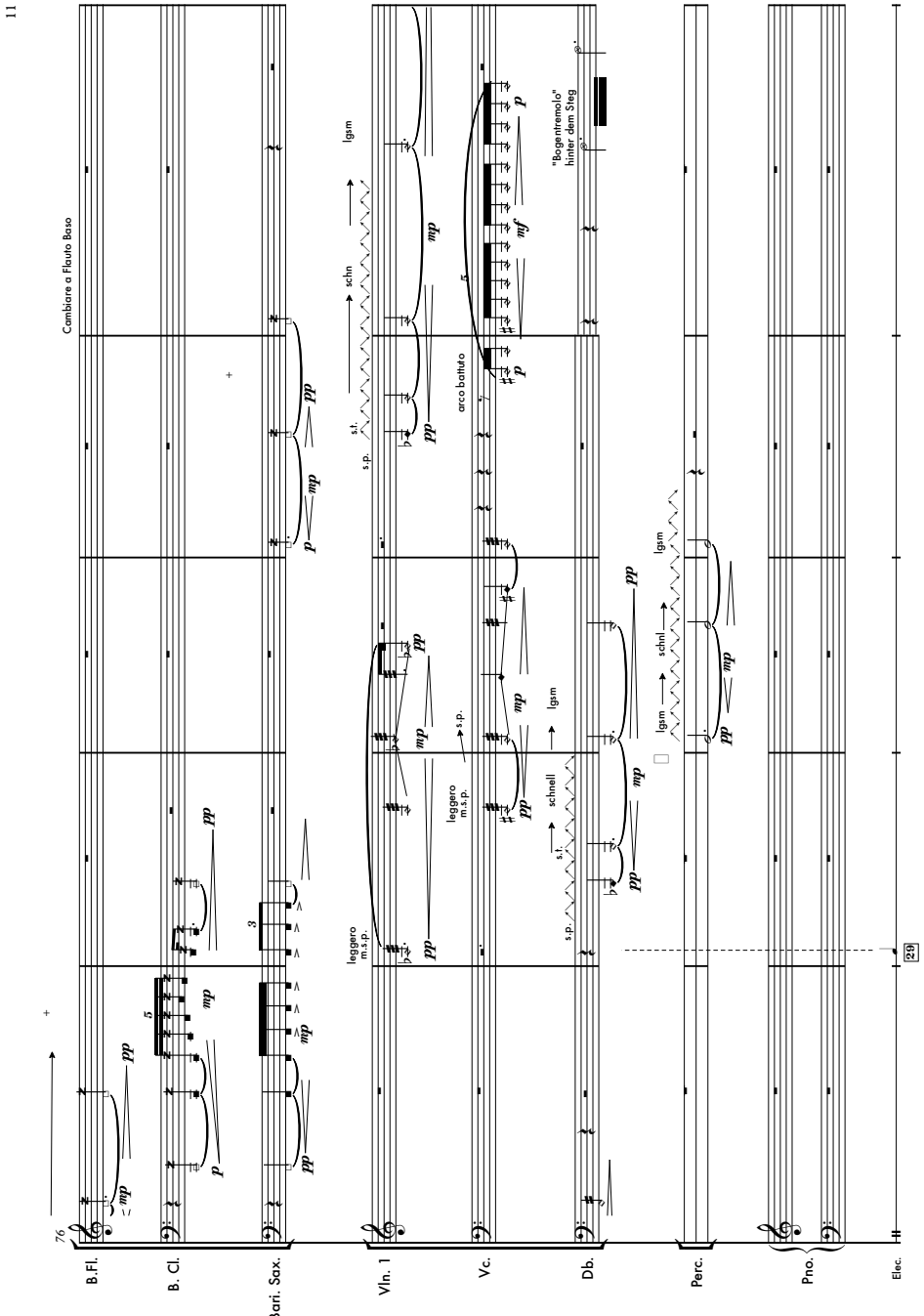

B.Fl.
B. Cl.
Bari. Sax.
Vln. 1
Vc.
Db.
Perc.
Perc.
Pno.
Elec.
Vibraphon
arco gettato
leggero
s.p.
m.s.p.
m.s.p.

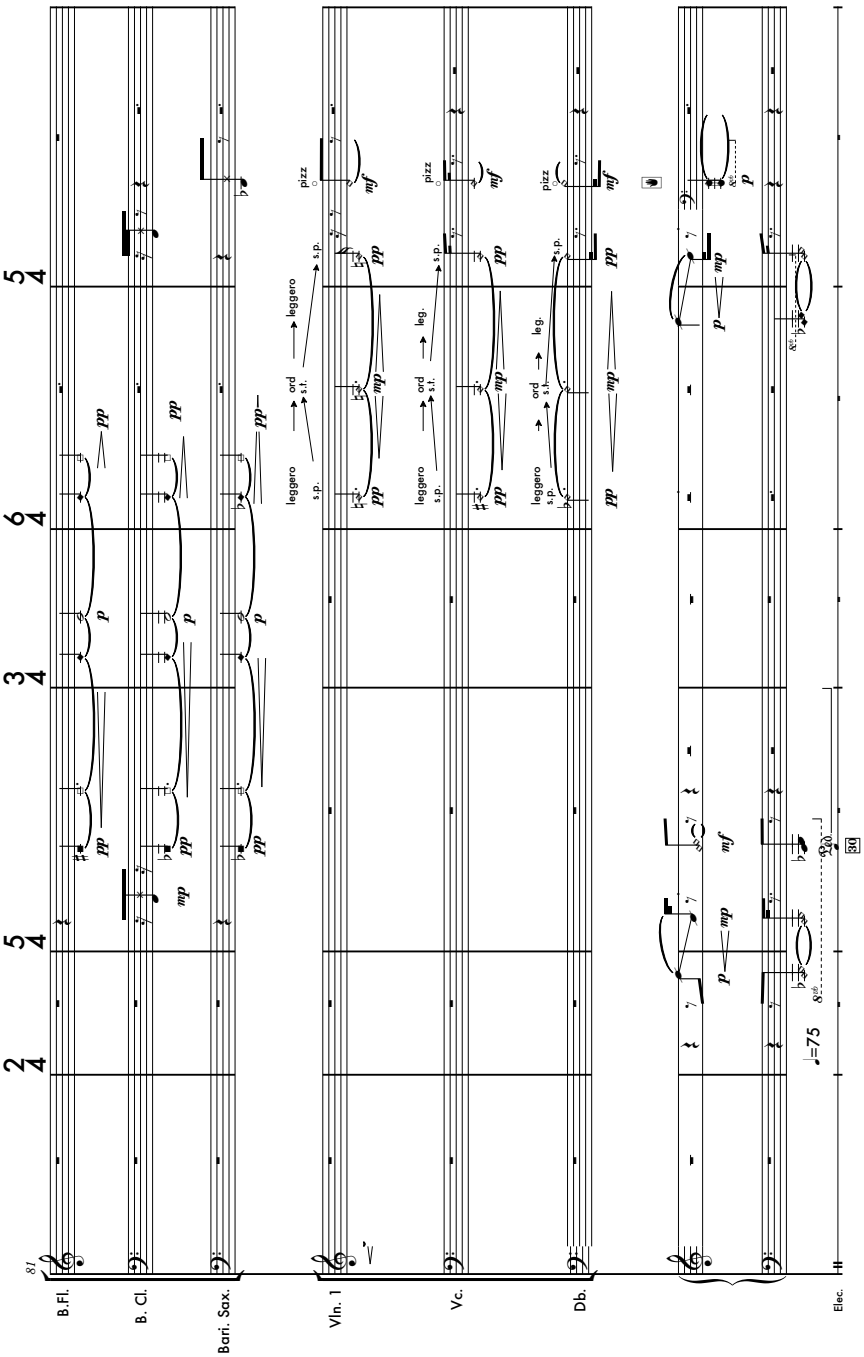

B.Fl.
B. Cl.
Bari. Sax.
Vln. 1
Vc.
Db.
Perc.
Elec.
mit Fingerspitzen
pizz
m.s.p.
s.p.

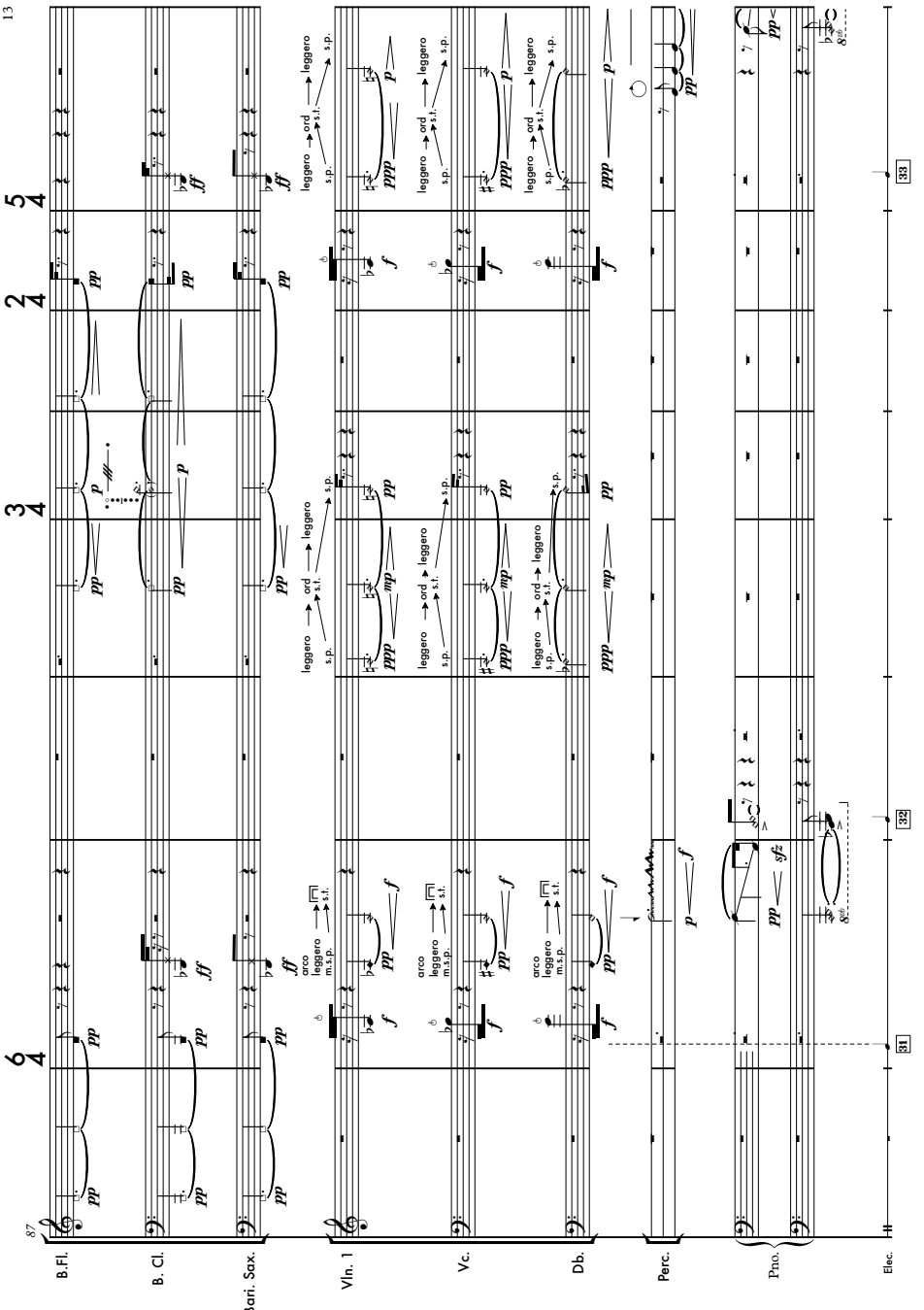

56
B.Fl.
B. Cl.
Bari. Sax.
Vln. 1
Vc.
Db.
Perc.
Perc.
Elec.
arco battuto
arco
m.s.p.
arco
"Bogentremolo"
hinter dem Steg
pizz
Sulla Tasteiere
col Plektro
mit dem Fingerspitz
8va
15ma
21
22

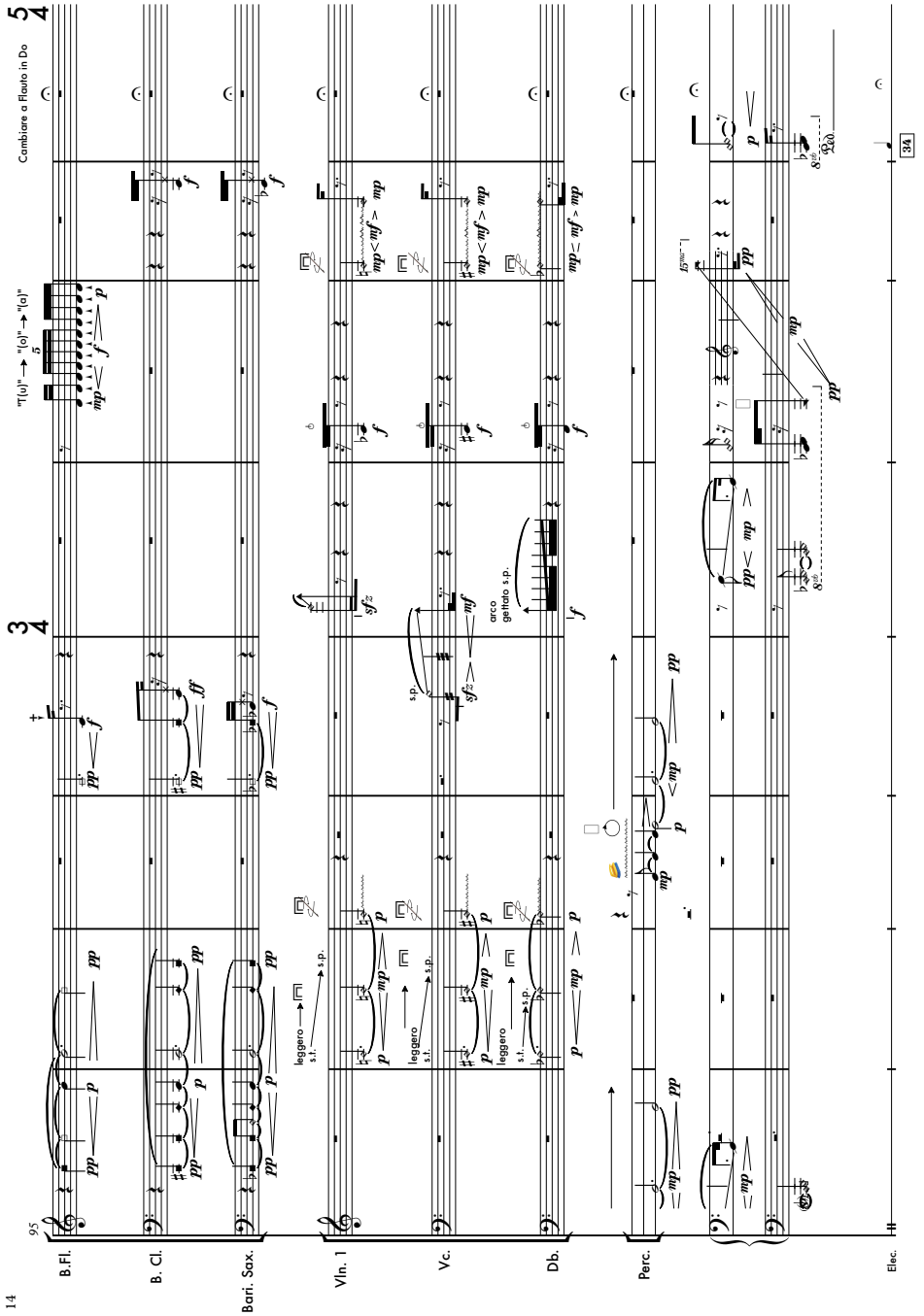

B.Fl.
B. Cl.
Bari. Sax.
Vln. 1
Vc.
Db.
Perc.
Perc.
Elec.
5x
cambiare a Flauto in Do
Pizz. hinter dem Steg
Vibraphon:
mit Fingerspitzen
woodblocks
Sulla Tastiera
col Plektro
crotales
5x

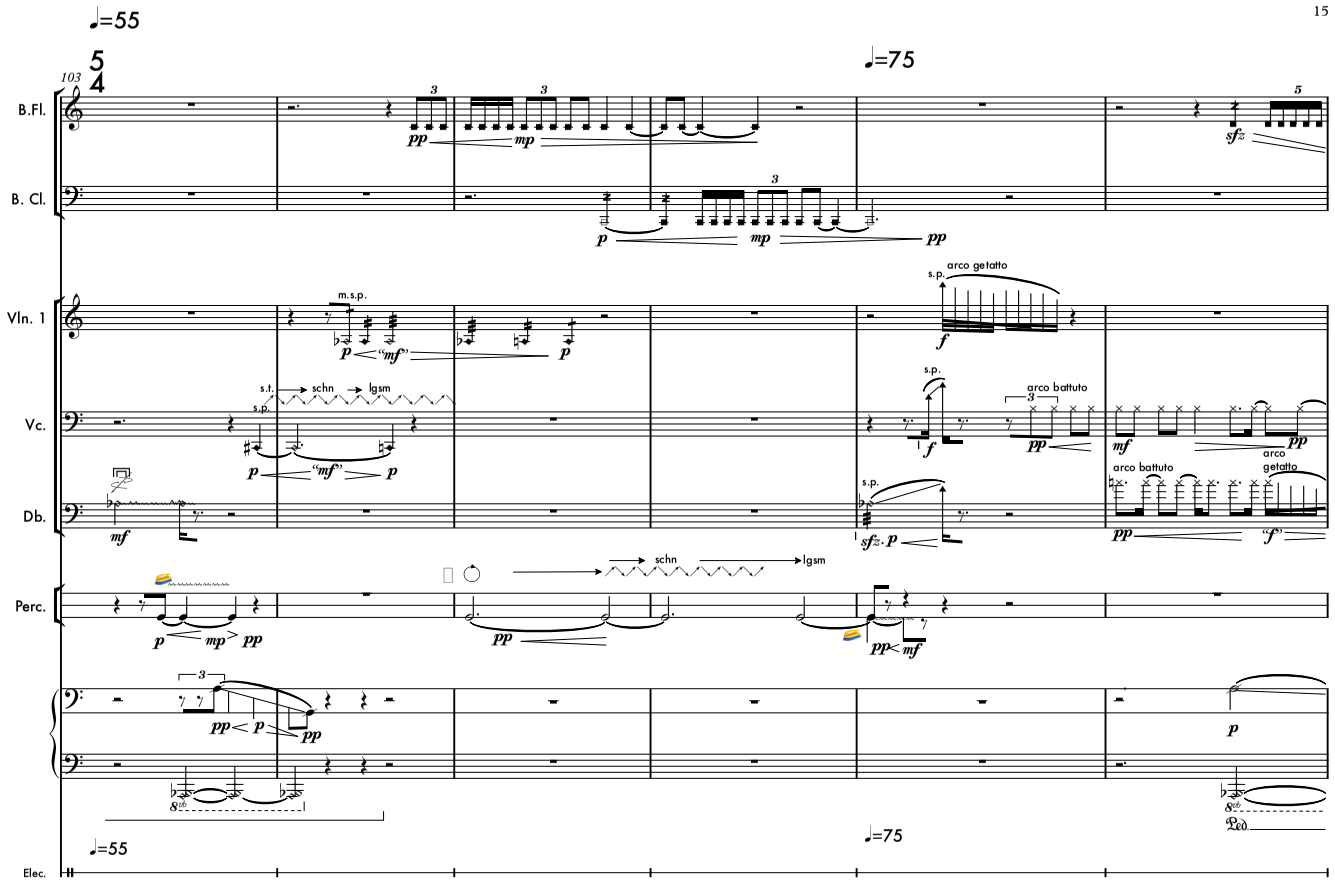

B.Fl.
B. Cl.
Bari. Sax.
Vln. 1
Vc.
Db.
Perc.
Perc.
Pno.
Elec.
whistle tone
Emochure: ord — flz
leggero m.s.p.
m.s.p.
s.p.
schnell
lgsm
Schwam
Vibraphon:
crotales
cymbal: mit Fingerspitzen
triangle
28

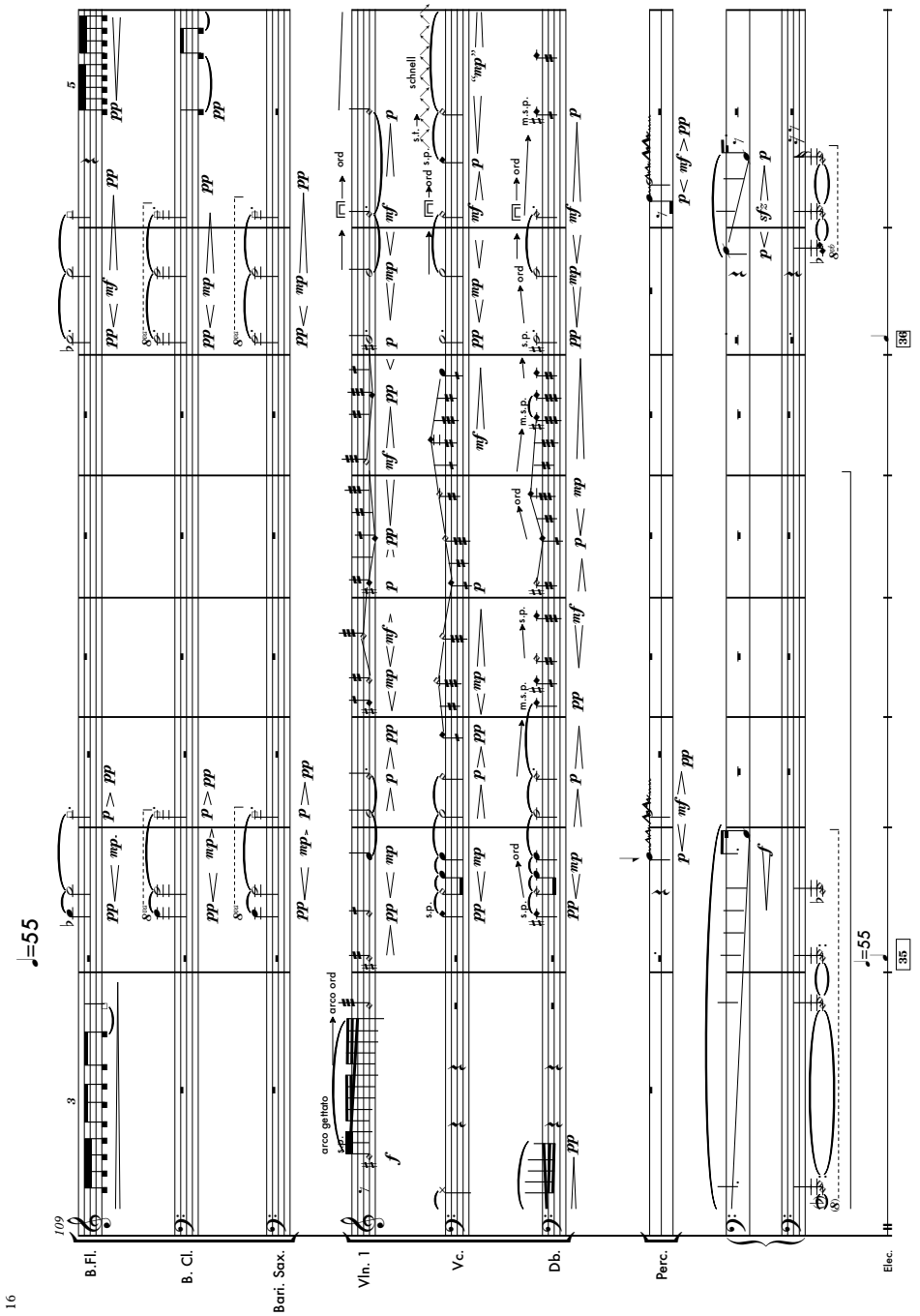

11
76
Cambiare a Flauto Baso
B.Fl.
B. Cl.
Bari. Sax.
Vln. 1
Vc.
Db.
Perc.
Pno.
Elec.
leggero m.s.p.
s.p.
s.t.
schn
lgsm
arco battuto
"Bogentremolo" hinter dem Steg
schnell
schnl
28

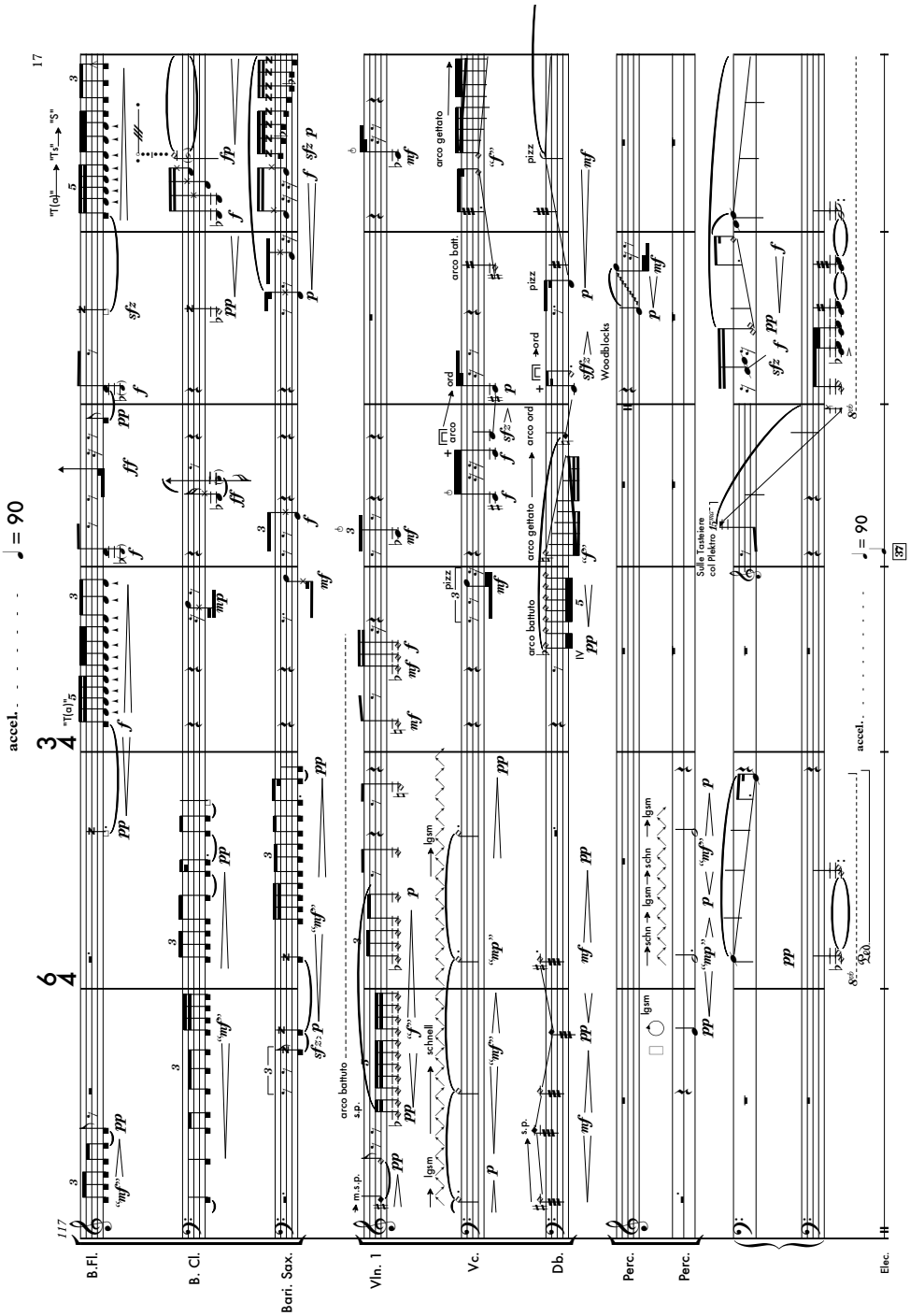

12
♩=75
B.Fl.
B. Cl.
Bari. Sax.
Vln. 1
Vc.
Db.
Elec.
leggero
s.p.
ord
s.t.
pizz
leg.
mf
mp
p
pp
♩=75

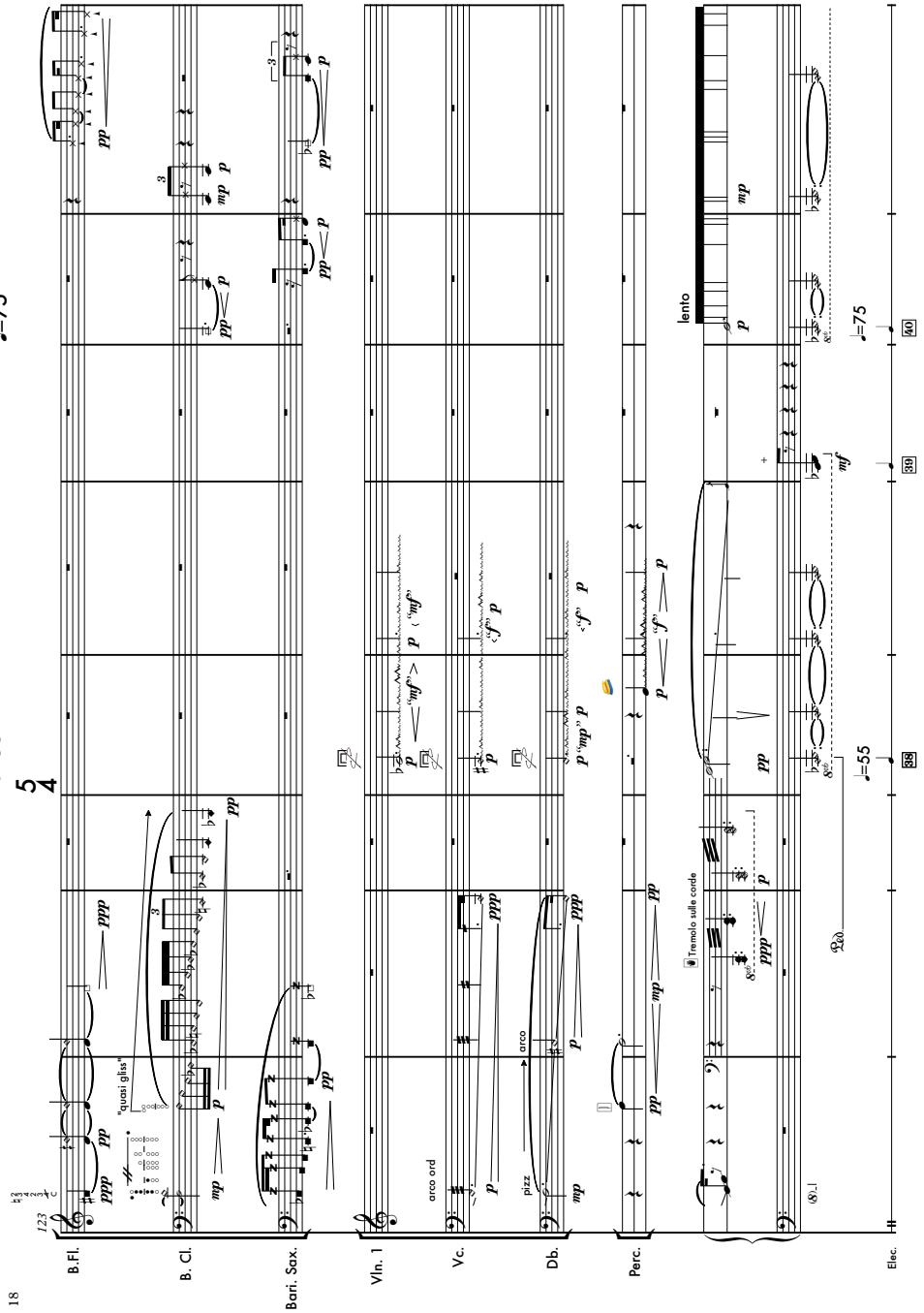

13
87
B.Fl.
B. Cl.
Bari. Sax.
Vln. 1
Vc.
Db.
Perc.
Pno.
Elec.
31
32
33

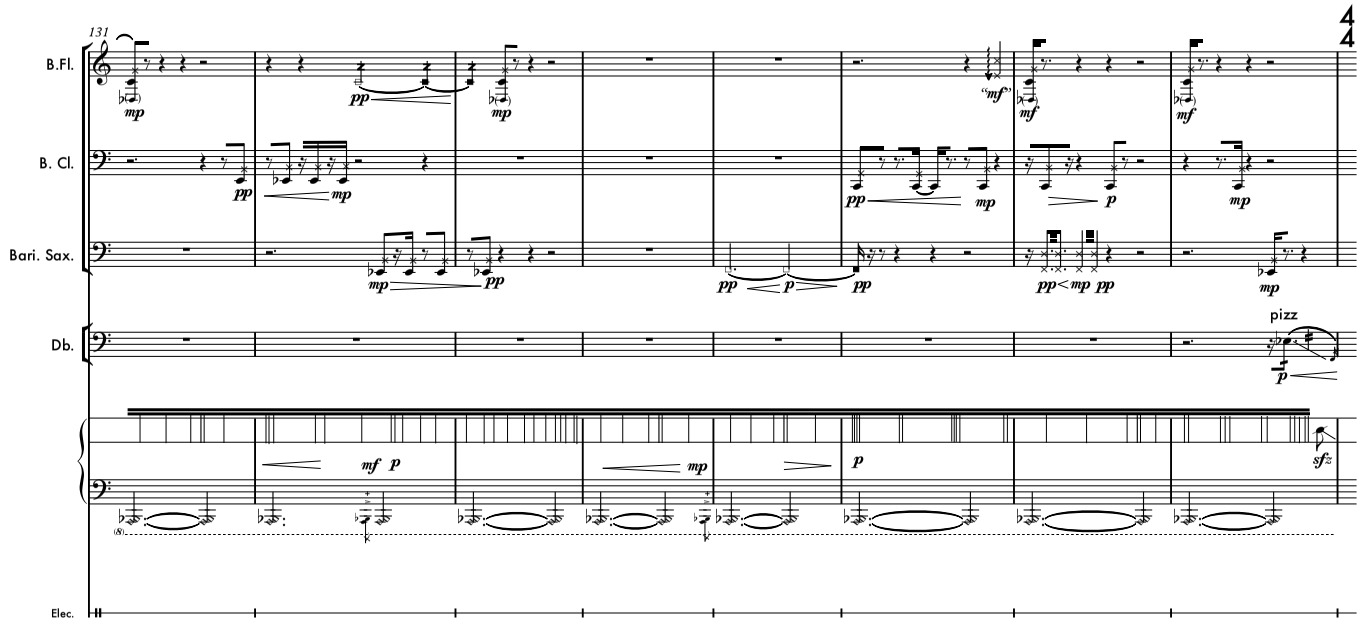

Cambiare a Flauto in Do
"T(o)" → "(o)" → "(o)"
B.Fl.
B. Cl.
Bari. Sax.
Vln. 1
Vc.
Db.
Perc.
Elec.
leggero
s.t.
s.p.
arco
gettato s.p.
34

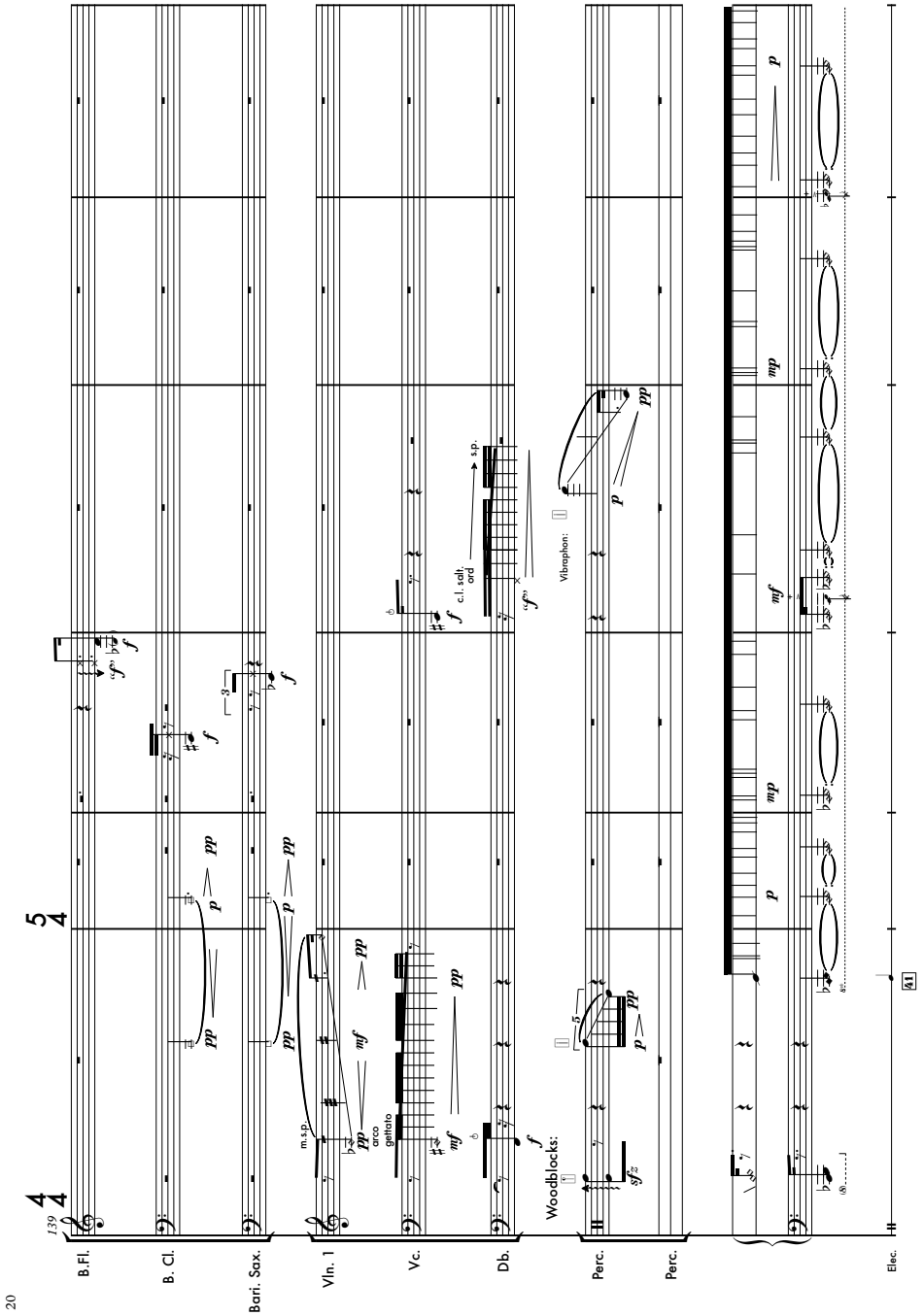

♩=55
5/4
103
♩=75
B.Fl.
B. Cl.
Vln. 1
Vc.
Db.
Perc.
Elec.
m.s.p.
s.t.
schn
lgsm
s.p.
arco getatto
arco battuto
arco
getatto
♩=55
♩=75

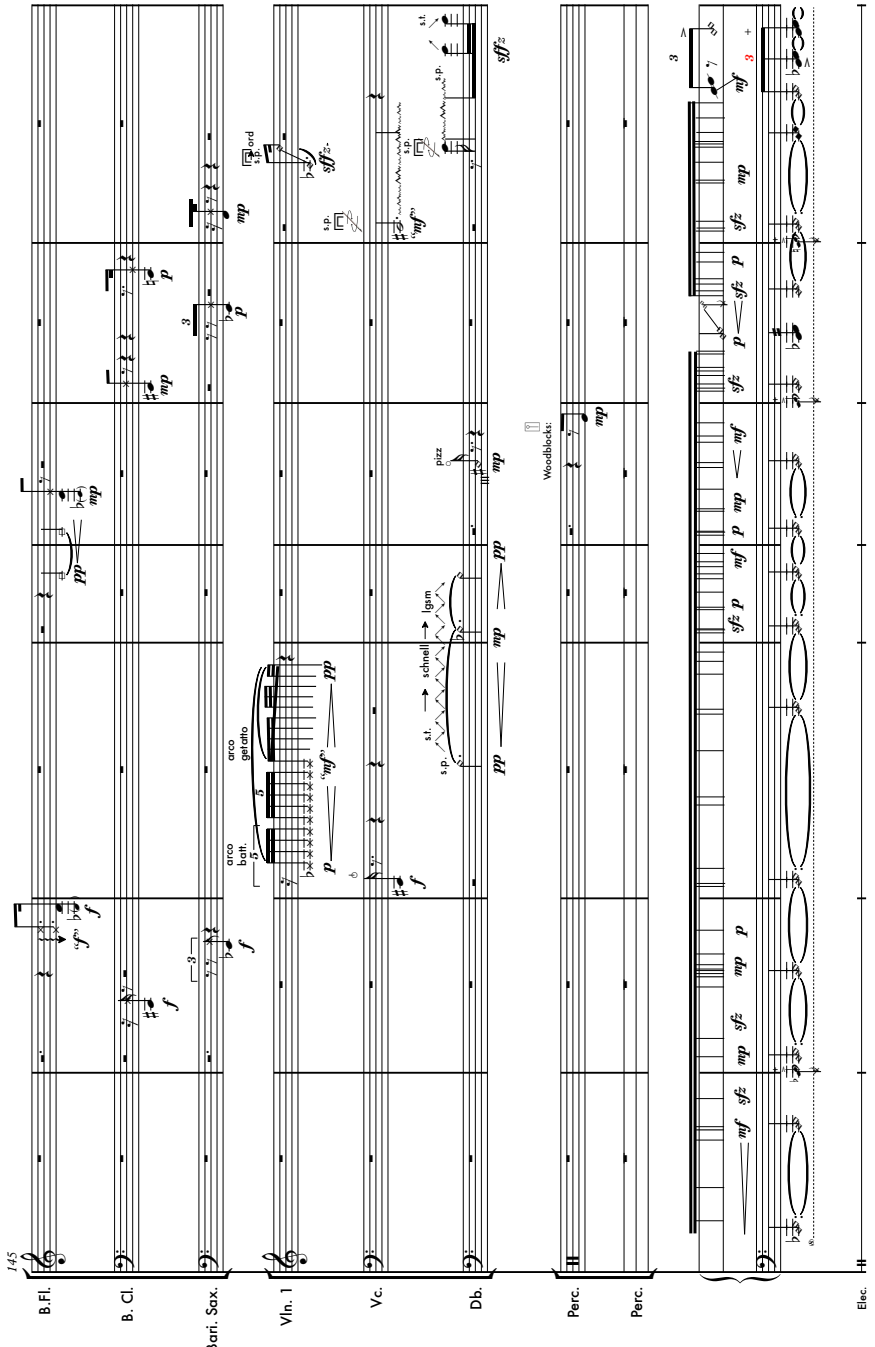

♩=55
B.Fl.
B. Cl.
Bari. Sax.
Vln. 1
Vc.
Db.
Perc.
Elec.
arco gettato
arco ord
schnell
s.p.
m.s.p.
ord
35
36

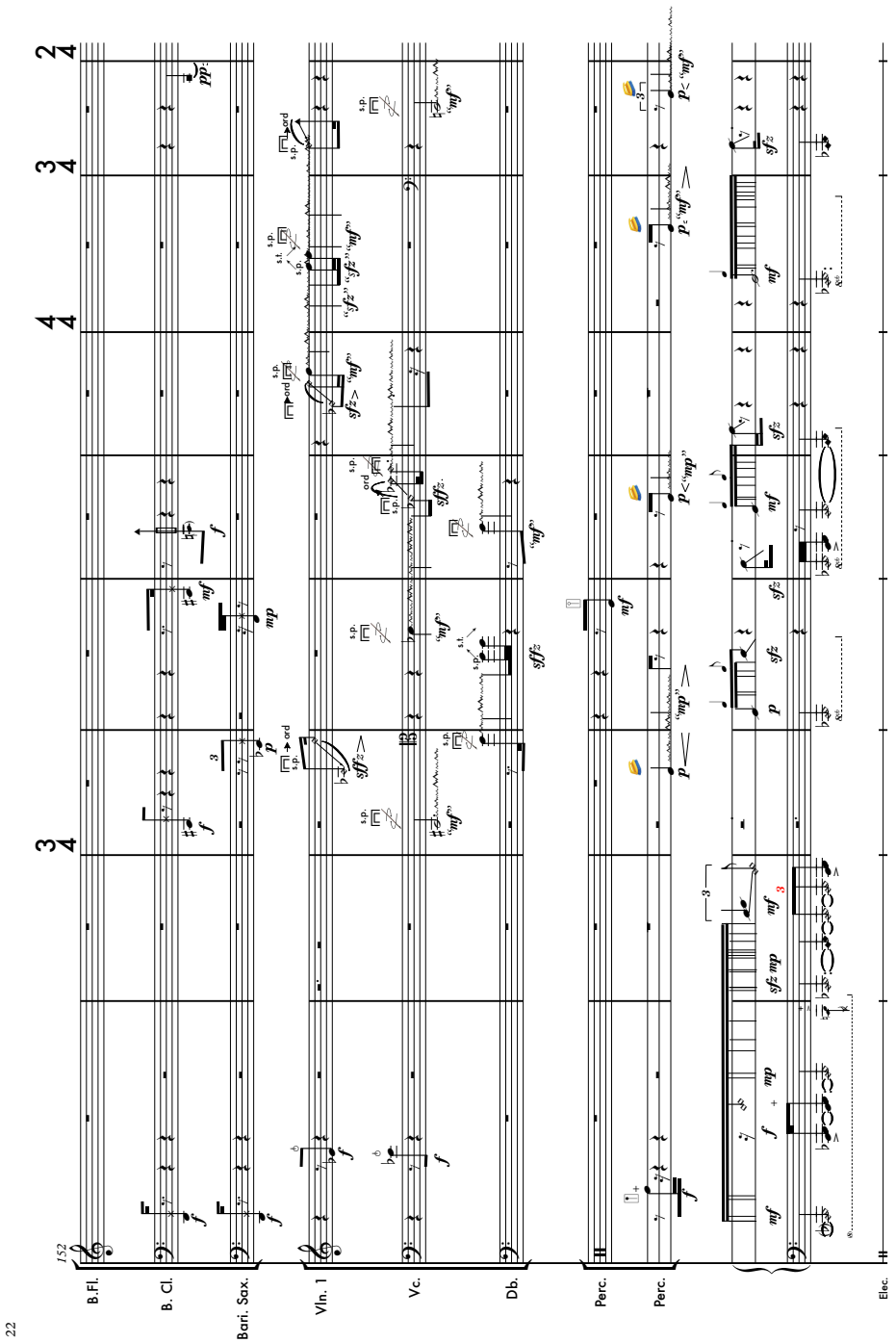

B.Fl.
B. Cl.
Bari. Sax.
Vln. 1
Vc.
Db.
Perc.
Perc.
Elec.
accel.
♩ = 90
arco battuto
s.p.
m.s.p.
pizz
arco
ord
arco batt.
Woodblocks
Sulla Tastiera
col Plektro

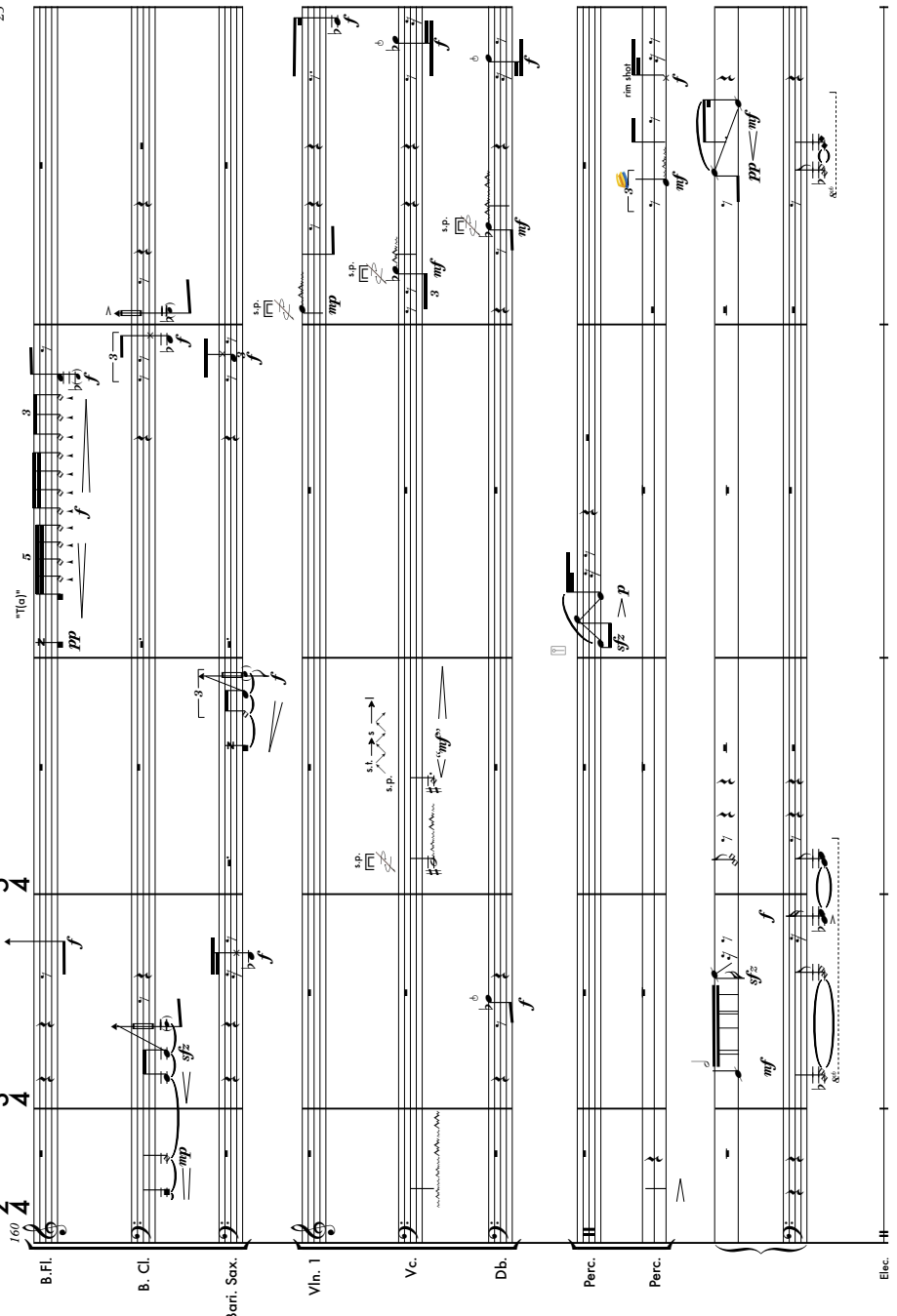

♩=55
♩=75
B.Fl.
B. Cl.
Bari. Sax.
Vln. 1
Vc.
Db.
Perc.
Elec.
"quasi gliss"
arco ord
pizz
arco
Tremolo sulle corde
lento
18
88
89
90

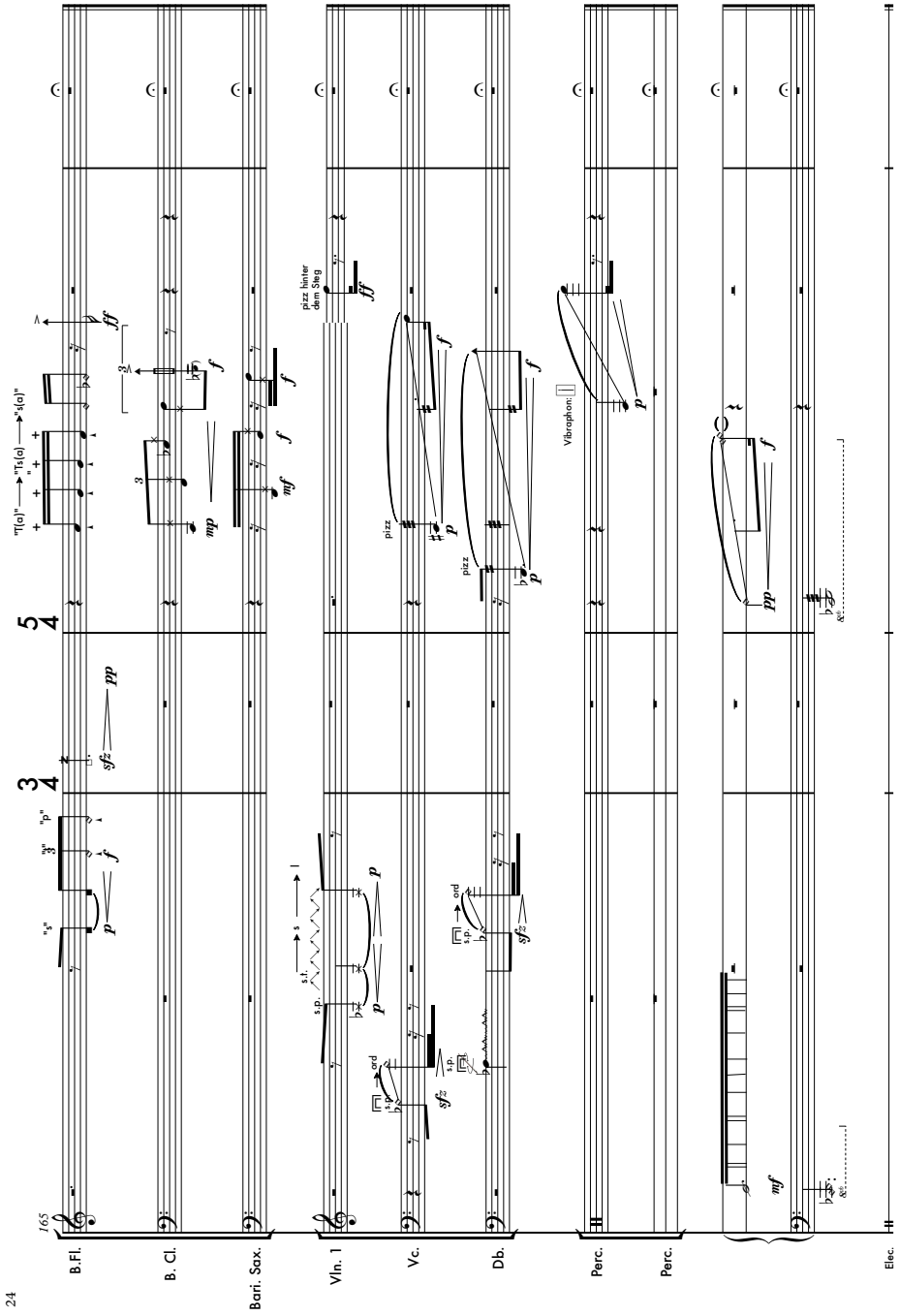

131
B.Fl.
B. Cl.
Bari. Sax.
Db.
Elec.
4
4
pizz


139
20
B.Fl.
B. Cl.
Bari. Sax.
Vln. 1
Vc.
Db.
Perc.
Perc.
Elec.
Woodblocks:
Vibraphon:
41


21
145
B.Fl.
B. Cl.
Bari. Sax.
Vln. 1
Vc.
Db.
Perc.
Perc.
Elec.
Woodblocks:
arco
batt.
arco
gel.atto
s.t.
schnell
lgsm
pizz
s.p.
ord.
"mf"
"f"


152
22
B.Fl.
B. Cl.
Bari. Sax.
Vln. 1
Vc.
Db.
Perc.
Perc.
Elec.


23
160
B.Fl.
B. Cl.
Bari. Sax.
Vln. 1
Vc.
Db.
Perc.
Perc.
Elec.
"T(a)"
rim shot


24
165
B.Fl.
B. Cl.
Bari. Sax.
Vln. 1
Vc.
Db.
Perc.
Perc.
Elec.
Vibraphon
pizz hinter dem Steg
pizz
s.p.
ord
"T(o)" → "Ts(o)" → "s(o)"
"s"
"p"
"3"

Schnur

For Violine, Violoncello, Kontrabass
und Live-Elektronik (2019)

Andrés Gutiérrez Martínez

Schnur - für Violine, Violoncello, Kontrabass und Live-Elektronik

Andres Gutiérrez Martínez (2019)

Performance instructions/ Legende

Quarter tone higher / Viertelton höher

Slightly raised flat pitch/ Etwas erhöhterkleine Sekund

Slightly lowered flat pitch/ Etwas erniedrigte kleine Sekund

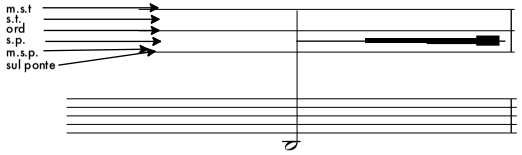
Slightly raised/ Etwas erhöhter Ton

Slightly lowerd/ Etwas erniedrigter Ton

ordinario pitch/ Ordinarioton

Half pressed string. In some positions no real harmonic will sound
/ Halbgedrückte Saite. In manchen Stellen erkling keinen Flageolettton.

Bow Notation/ Notation Des Bogens



The position of the bow is given by the position of the line of the upper system.
/ Die Kontaktstelle des Bogens is durch die Position der Linie auf das obere System angegeben.

The Thickness of the line indicates the bow pressure.
/ Die Breite der Linie bezeichnet den Bogendruck

Bow on the bridge, the resulting sound should be similar to a pitchless noise
/ Auf dem Steg streichen. Das erklingende Resultat soll ein tonloses Geräusch ähneln

2

Spielanweisungen für den Wiederholungs. und den Schlussteil

1) Mit jeder Wiederholung soll eine Variation in der Aufführung stattfinden.

1.1) Die Sektion kann 5x aufgeführt werden, wenn alle im Ahnlichen Tempo seid. Wenn den Notentext extrem variert wird mussen alle SpielerInnen, die den Teil zu Ende gespielt haben im folgenden Takt auf alle Andere warten (ohne hier die Klangqualität zu ändern) um alle gemeinsam (aber nicht Synchron!) den Schlussteil zu spielen.
1.2) Die Variationen können das Tempo, die Dynamik, Kontaktstelle, Bogenaktionen betreffen.
1.3) Die Kontour der Melodie kann mit jeder Wiederholung allmählich in die Extremen geführt werden.
1.4) Das Tempo kann etweder sehr schenll werden oder auch eventuell sehr langsam, oder abwechselnd hin und her gehen.

Es geht darum, dass das Ensemble nicht mehr zusammen spielt. Nach dieser Sektion kommen wieder die gehaltenen Tönen vom Anfang.
Da jede/r in unterschiedlichem Tempo am Ende der Sektion ankommt mussen alle SpielerInnen den Letzten Takt spielen und allmählich wieder Synchron werden.
Das heisst, dass am Ende der Wiederholungssektion spielt jeder für sich und sich langsam allmählich annähren (Im tempo und klangfarbe).
Die SpielerInnen sollten nicht Plötzlich ihre Klangfarbe anpassen sondern da, wo jede/r die letzte Sektion geendet hat (im Tempo, Klangfarbe, Lautstärke, usw...)
langsam den weg zur Klangfarbe- und Tempo- gleichung machen über die Dauer der letzten Sektion (zw. 30 und 45 Sekunden. .

Performance Instructions for the last section:

1) With each repetition a variation must be performed in the performance of the given material.

1.1) This section should be repeated 5 times if the performers maintain a similar Tempo. If the variations are too extreme the performers who finish first must wait to the other performers in the following repeating bar until everybody arrives there to start together (but not in synch) the last bar.
1.2) The variations can include tempo, dinamics, contact position of the bow.
1.3) The melodic countour can be progressively altered to its extremes.
1.4) The speed of reading can become progressively faster or slower. It can change drastically r langsam. .

The intention of this is to let each musician peroform on its own. After this section the repeating sustained tones from the beginning appear again.
Because each performer finished the last section in a different tempo, timbre and dinamics these elements have to become synched again in the last beasure of the piece.
This means that after the individual repetition segment in pages 20-21 all the musicians should progressively approach eachother in terms of timbre, dinamics, spead and synchornicity. This should happen over the span of 30-45 seconds.
Es geht darum dass ihr als Ensemble nicht mehr zusammen spielt. Nach dieser Sektion kommen wieder die gehaltenen Tönen.

Elektronik

Instrument Input console:

- ◢ Automated Delay1 w/ Feedback Control
- ◆ Automated Delay2 w/ Feedback Control
- ▼ Automated Pitch Shifter w/ Feedback Control
- ■ Pitchshifter with Rate Control
- ◒ FFT freq Shift with Shift Control
- Input with frequency modulattion with pitch follower Control, Feedback and frequency Division (to control modulation rate)

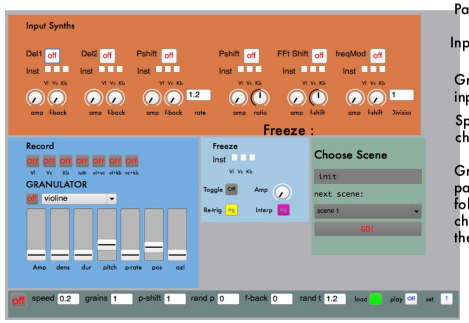
17

Kontrabass
Violoncello
Violine
Granular Delay

FFT - Sustain
Granular Sampler

1 Cue number

Patch Interface



Patch Instruments and processes

Input Synths: Six different processes for each instrument. (see above). NOTE: Only after turnin on the synth you sellect the desidered input instrument!

Granular Sampler : A buffer-based granulator that takes the input from the recorded buffers above.

Spectral Freeze - If opperated manually the Instruments have to be checked before toggling the sustain!!

Granular Delay : A real-time Granulator witht he given parameters. The interpollation of values muss be ussed as followed. First. Click on load, then play. If you want to manually change the configuration in a random fashion of the elements in the patch click on Set " T"

Cue Description:

// scene 1 // // Interacting with the musicians, free set amplitude of violin pitch shifter, no pitch control. "semi periodic" - mechanic. used synths for midi mapping: ~input4[0] -> pitch shifter amp

// scene 2 /// Continue to play with violin's pitch shift. Slow curves no sudden movements. "realistic glissandi" - freqShift on Cello and DoubleBass as amplification only (without modulation!). This part is automated. towards the end of scene turn down amplitude of violin.

// scene 3 /// a new phrase begins now with the pitch shift control in the cello. The violin and the double bass signals are going through automated delay lines. // midi mapping for cello ~input4[0]. additional possible mapping feedback (slight modulations) ~input1[1], ~input2[1] -> feedback factor of the first two synths.

// scene 4 /// the previous phrase ends and a new set of synths are turned on: The pitch shifter is turned off and turned on again on the violin. Then a couple of bars later the violin is turned off and the cello is turned on. You may play the the pitch rate here.Slow fluctuations Additionally the granular delay is turned on.

/// scene 5 //// after three seconds the fft sustain synths are turned on with amplitude automation. For the subsequent bars fade the amplitude in and out manually! After 40 seconds the sustain will turn off automatically. midi control: ~resynthAmp. Additionally, the granulator delay is turned on again after 3 seconds (this synth functions by itself).

/// scene 6 ///// FFT sustain turns on and maintains for the entire section. The pitch of the instruments determins the amplitude modulation of the sustain pitches. The granular delay continues in the background with some small changes in the parameters.

// scene 7 /// This scene toggles the record synths to track around 9 seconds of all three instruments for the latter use in the granulator delay.

// scene 8//// The Fft sustain takes the signal from the contrabass and sustains it for the duration of the bar, as the fft fades out the granular sampler fades in as a kind of "resonsance of the resonance"

// scene 9//// Similar as the sequence 8

// scene 10//// Similar to 9 but without the granular sampler as resonance

// scene 11 /// similar to 10

// scene 12 /// The fft sustain is then followed by the pitch shifter an all three instruments. Here it is derable for the performer to manually control the pitch rate. Midi assignment ~instruments4[1]

// scene 13 /// The fft sustain is now interpollated between different spectra taken from the instrumentalist until the end of the section.

// scene 14 /// FFT sustain turned off. Granular Sampler turned on with tutti buffer. the parameters are free to mainpulate or can stay static. Some manipulation of amplitude (~granular[0]), pitch (~granular[3]) and spacialization (~granular[6]) could be manually performed.

// scene 15 //// Granulator delay is turned on and contrabass pshift is turned on. Pitch can be manipulated: to access : ~input4[1]

// scene 16 /// FFt sustain on the Contrabass. Additionally, the variable delay 1 with the violin and the cello is turned some bars later. The perfomer can control the amount of feedback of the delay as well as the amplitude. controls: ~input1[0] -> amp, ~input1[1] -> feedback. Once the delay is turned off the granular sampler enters with the recorded buffer of the previous violin and cello chords. The performer must perform the increase and decrese of amplitude in this section. The performer can also manipulate the other parameters of the synth. Controls: ~granular[0] amp. Additional parameters are //~granular[1] -> density
//~granular[2] -> duration
//...[3] -> pitch ratio
//...[4] -> random pitch speed
//...[5] -> buffer position -> this parameter could be used
//...[5] -> panning -> this parameter could be used (preferably)

/// scene 17 /// The granular synth is turned off (automated) and the fft sustain of all three signals starts.

// scene 18 //the fft sustain continues and the contrabass automated pitchshift starts. Here it is desirable to play with the amplitude and the feedback of the instruments. controls: ~input3[0] -> amp ~input[1] -> feedback

// scene 19 //// Here beginns a more interactive part: The performer should control the parameters as notated in the score. The initial configuration of the patch will be triggered by the scene change but the subsequent change of instruments must be done in real-time by the performer.

// scene 20 /// fft sustain of contrabass and freqmod synth on the contrabass line. In this section the performer must control the feedback rate and the "div-rate" in order to vary the incoming signal.

/// scene 21 ///// The freq modulator is turned off and the fft sustain continues with less modulation.

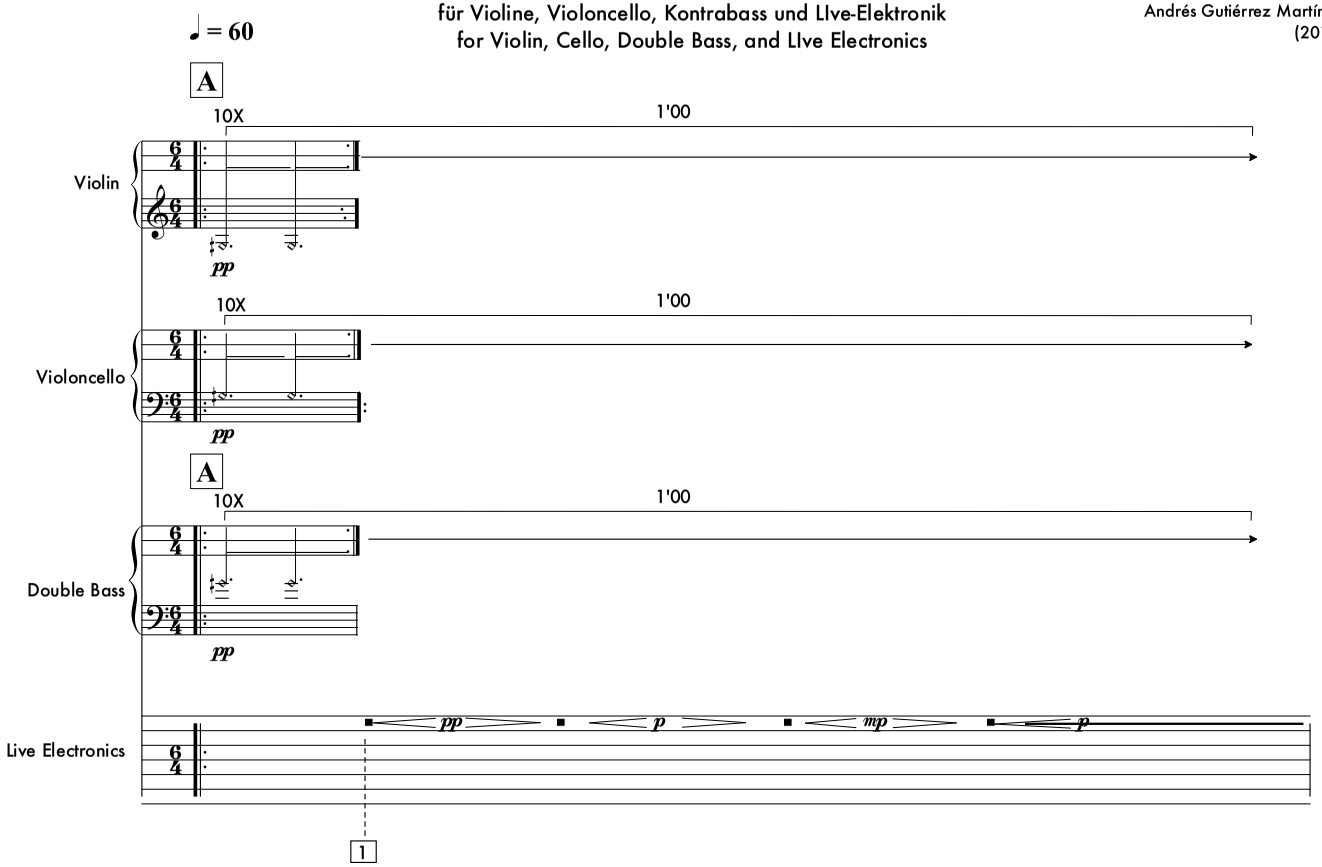
// scene 22 ///// Adlib section. here The performer is free to choose and change the parameters during the entire duration of the segment. Parallel to the variation of the instrumental performers the electronic performer must progressively seek extreme "distortion" and variabilty without saturationg the overall musical texture.

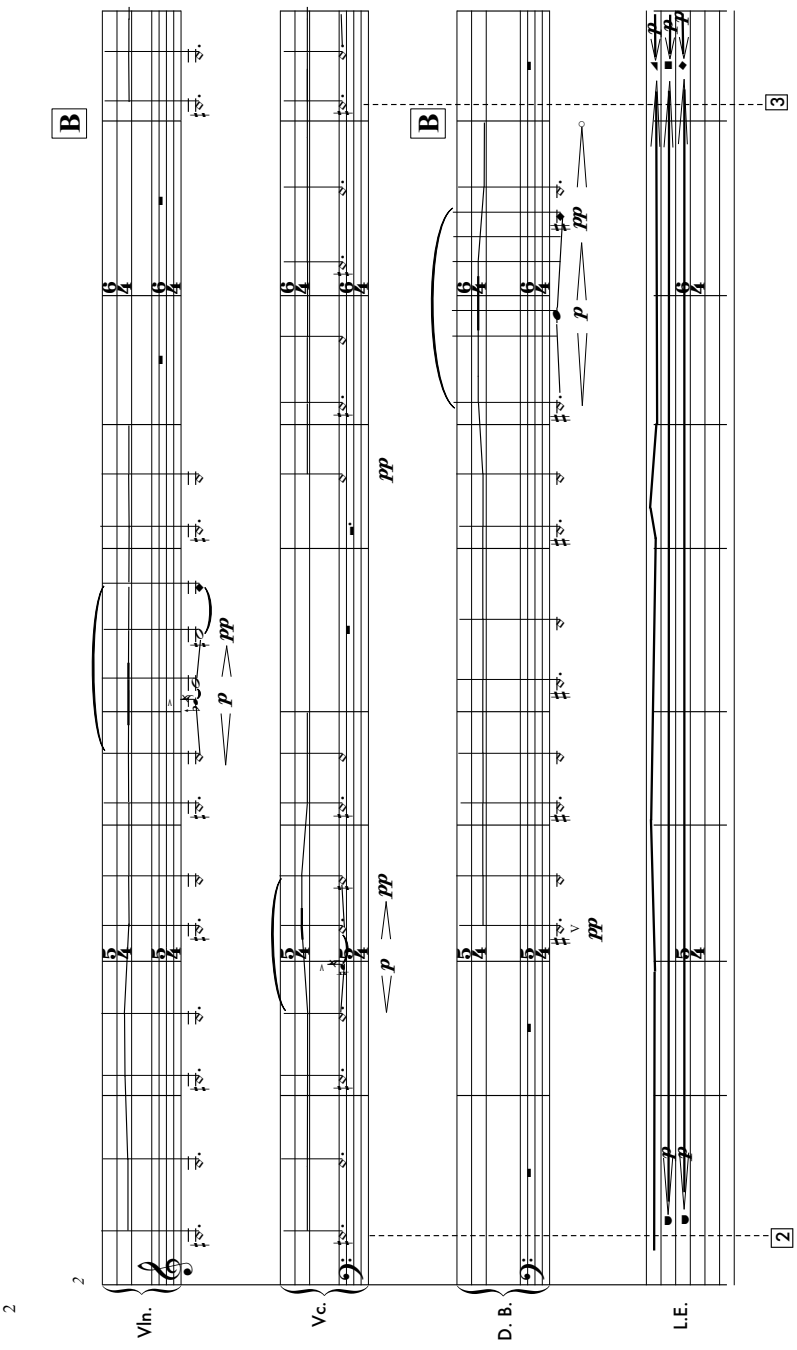
// scene 23 //// Slowly the performer plays the granular sampler live swelling the dinamics in the same direction as the instrumentalist. Here it is important that a clear audible cross-fade occurs between the decaying caotic fft sustain and the clear harmonic material of the granuar sampler.

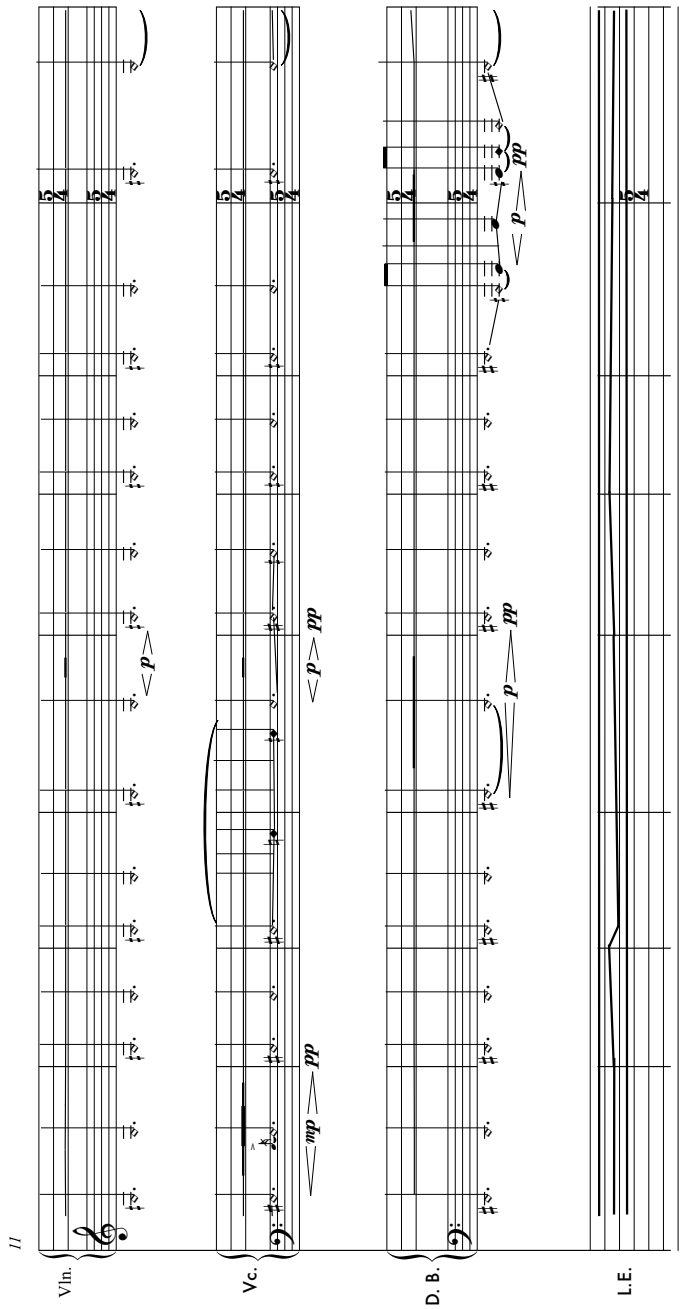
Schnur

für Violine, Violoncello, Kontrabass und LIve-Elektronik
for Violin, Cello, Double Bass, and LIve Electronics

Andrés Gutiérrez Martínez
(2019)




B
B
3
2
Vln.
Vc.
D. B.
L.E.
pp
p
pp
p
pp
pp
p
p
p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Vc.
D. B.
L.E.
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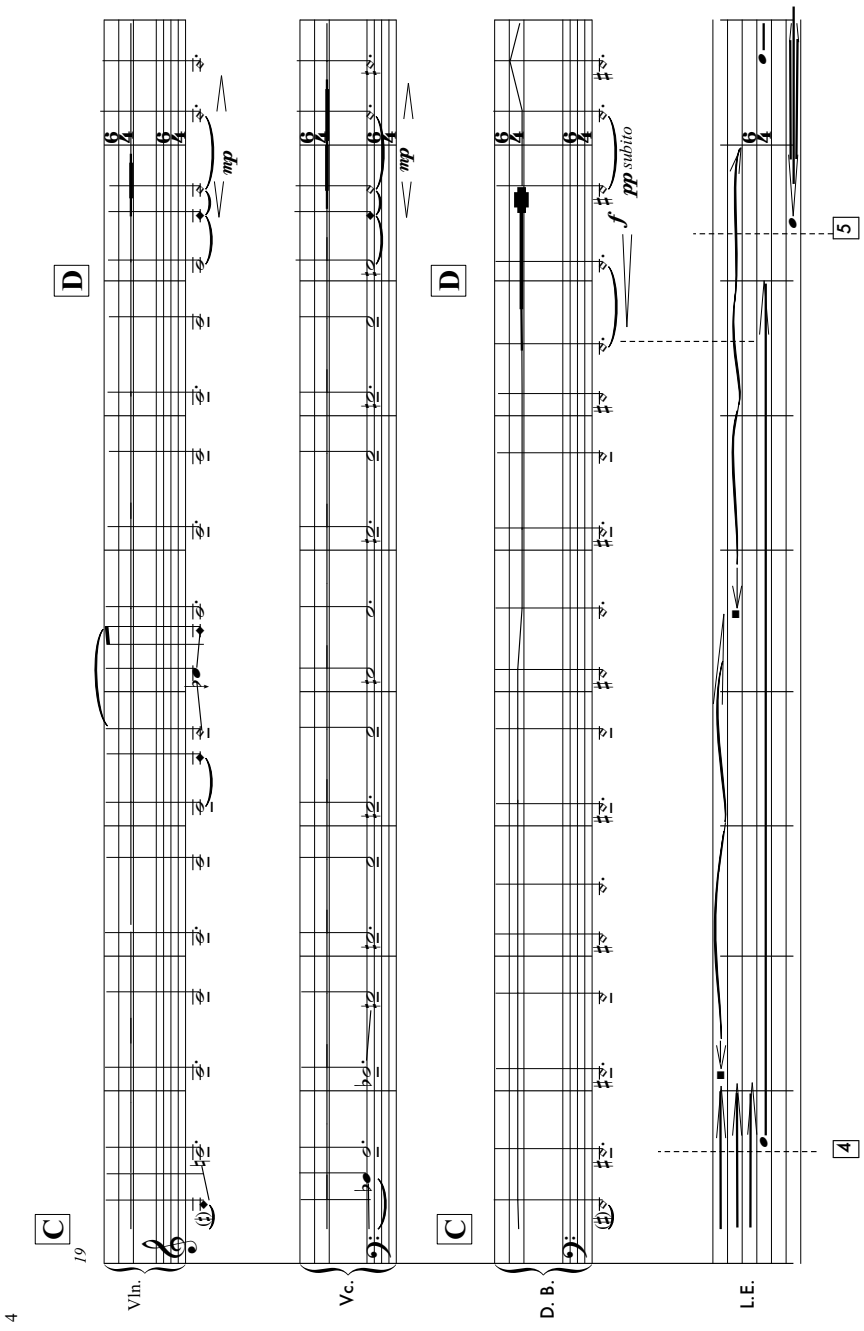
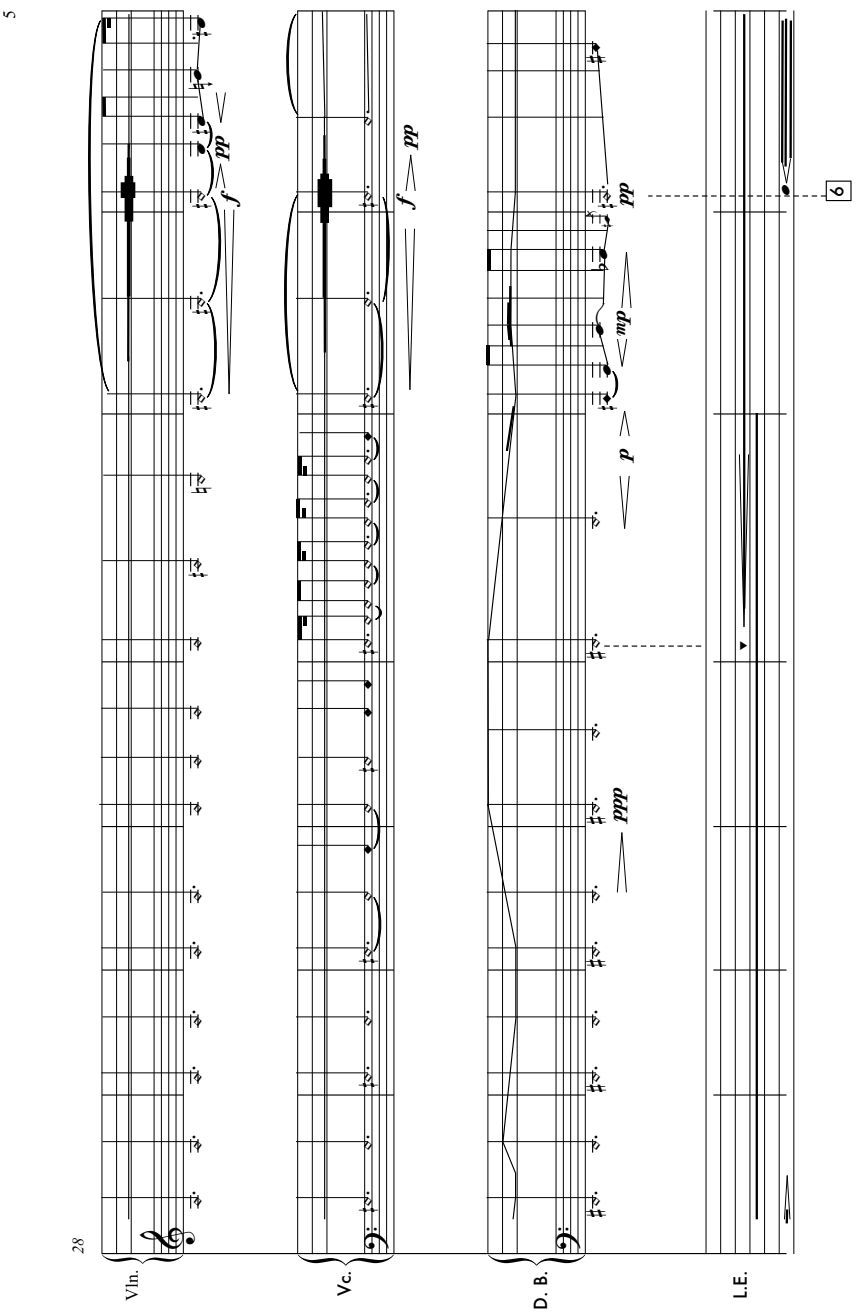
pp
mp


C
D
Vln.
Vc.
D. B.
L.E.
mp
mp
f
pp subito
4
5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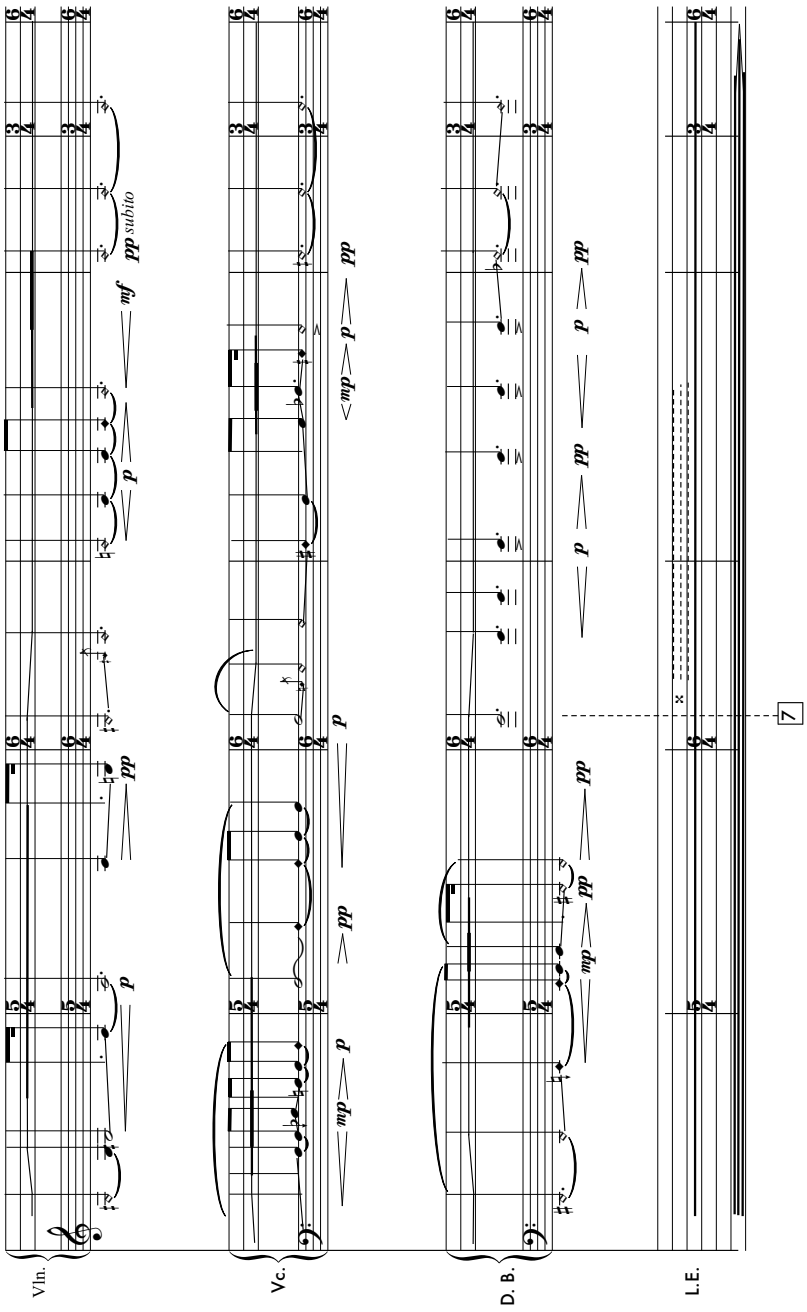
Vln.
Vc.
D. B.
L.E.
pp
f
pp
f
pp
mp
p
ppp
9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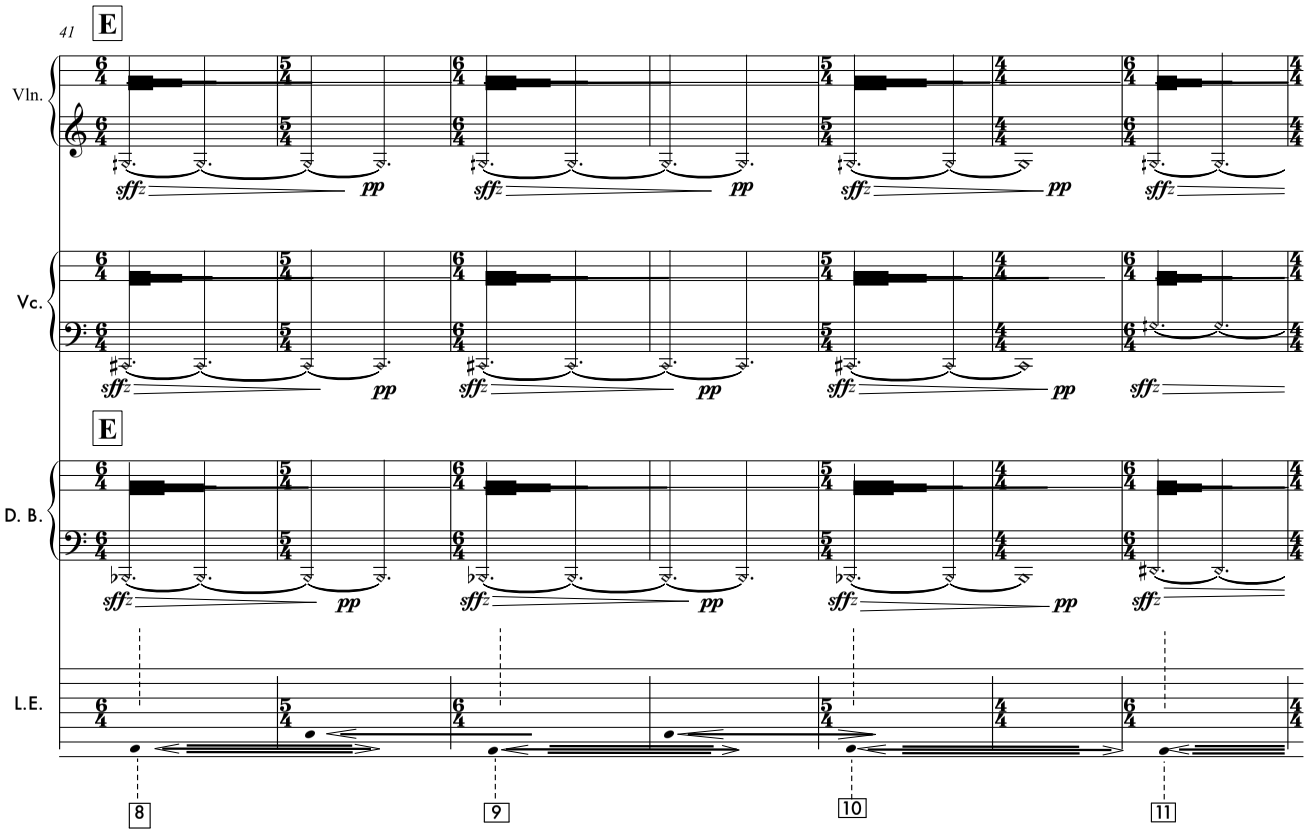
Vln.
Vc.
D. B.
L.E.
7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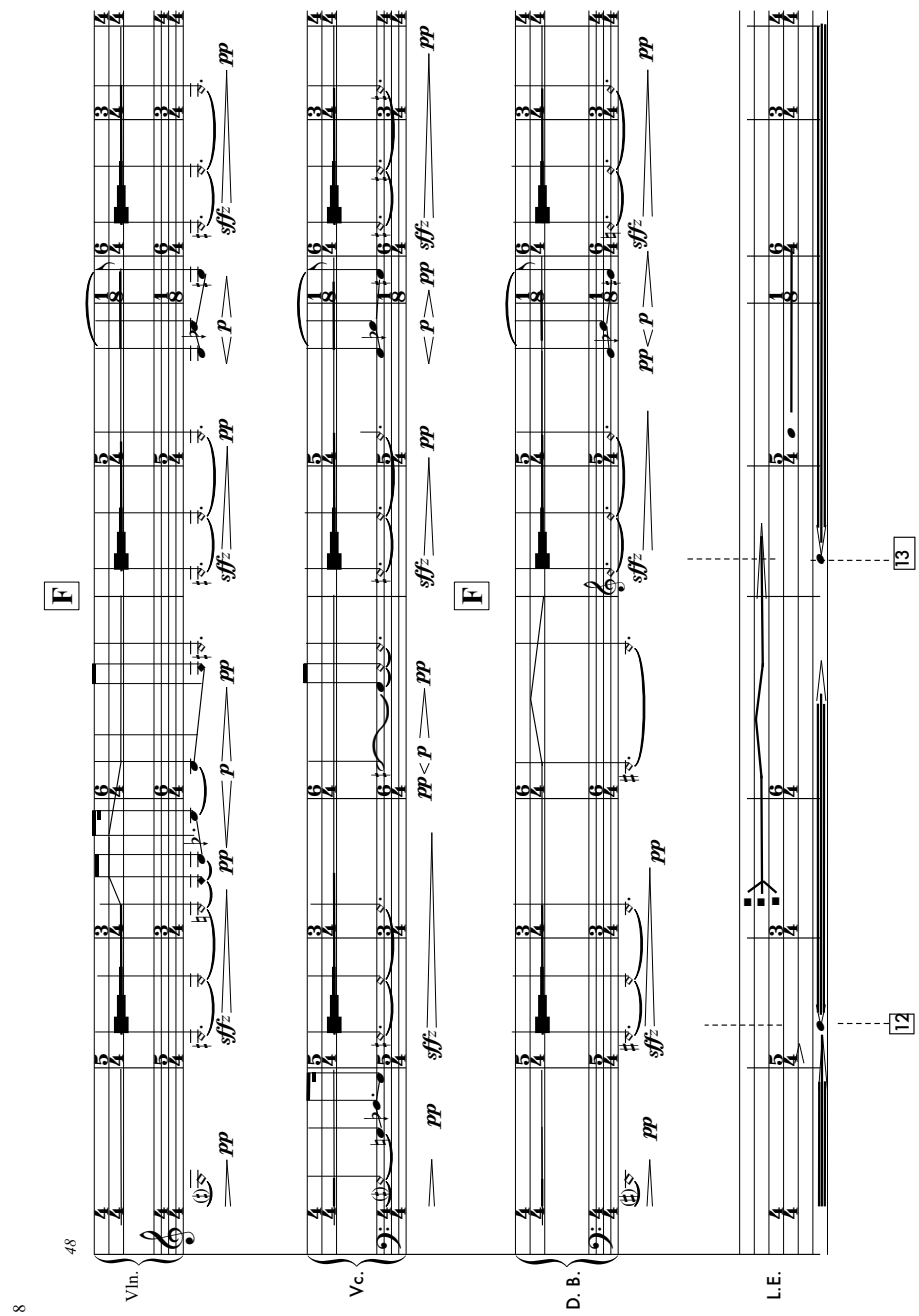
E
Vln.
Vc.
E
D. B.
L.E.
sffz
pp
8
9
10
11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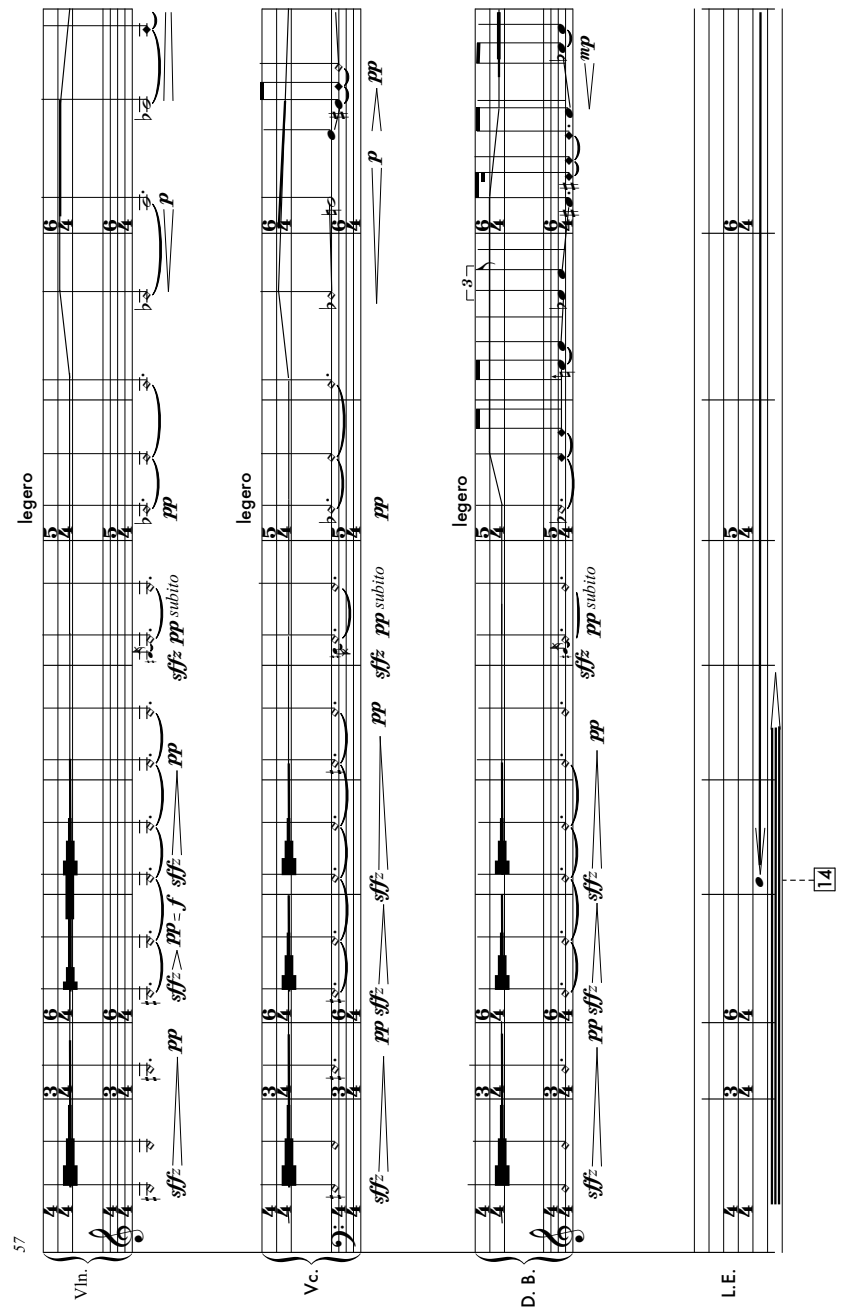
F
Vln.
Vc.
D. B.
L.E.
12
13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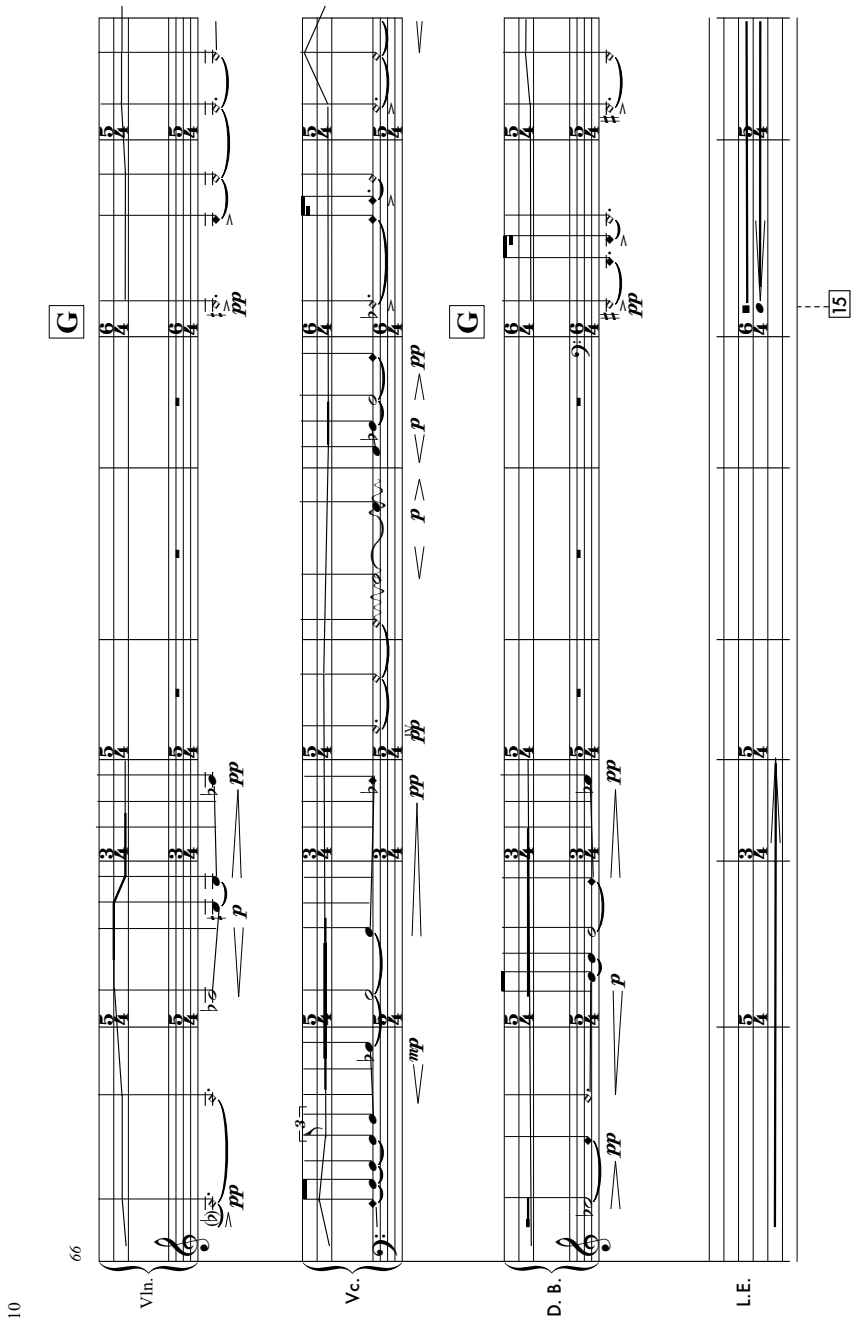
p
subito
mp
14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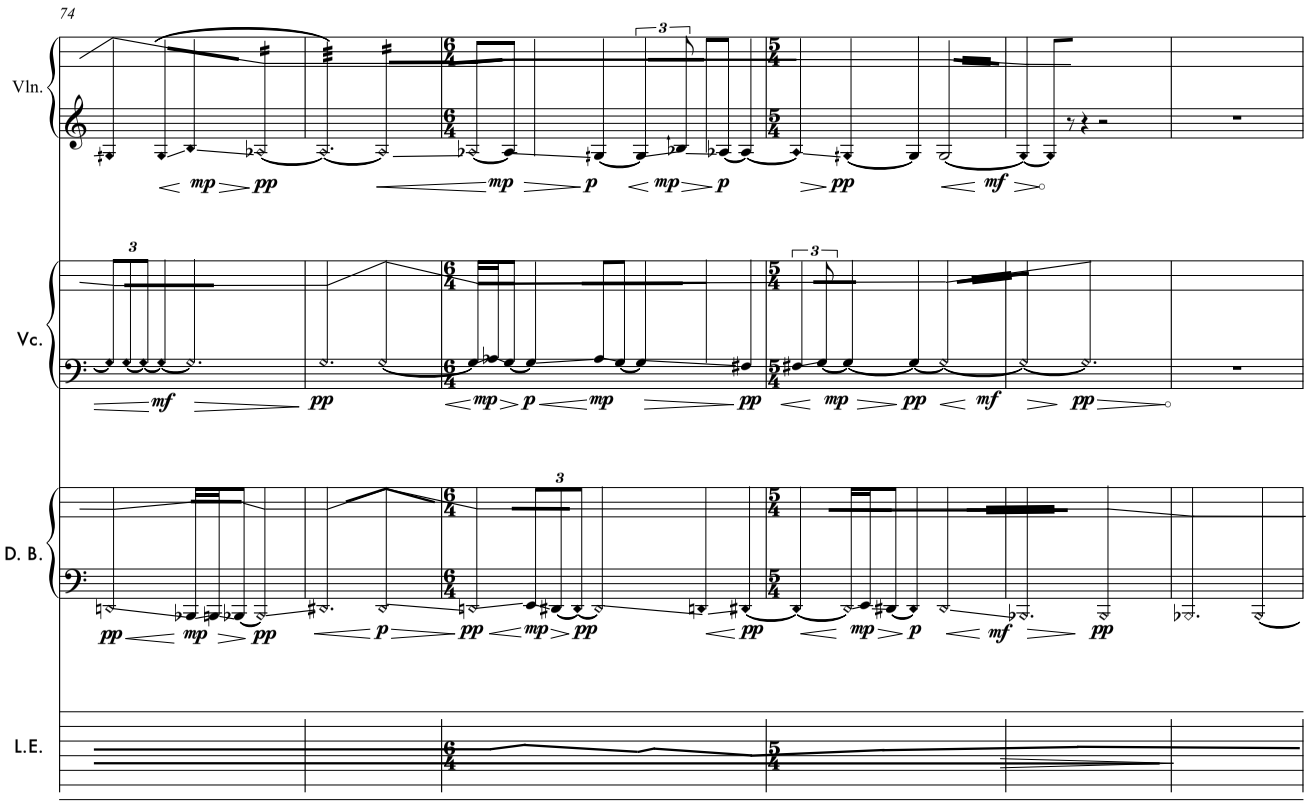
G
Vln.
Vc.
D. B.
L.E.
15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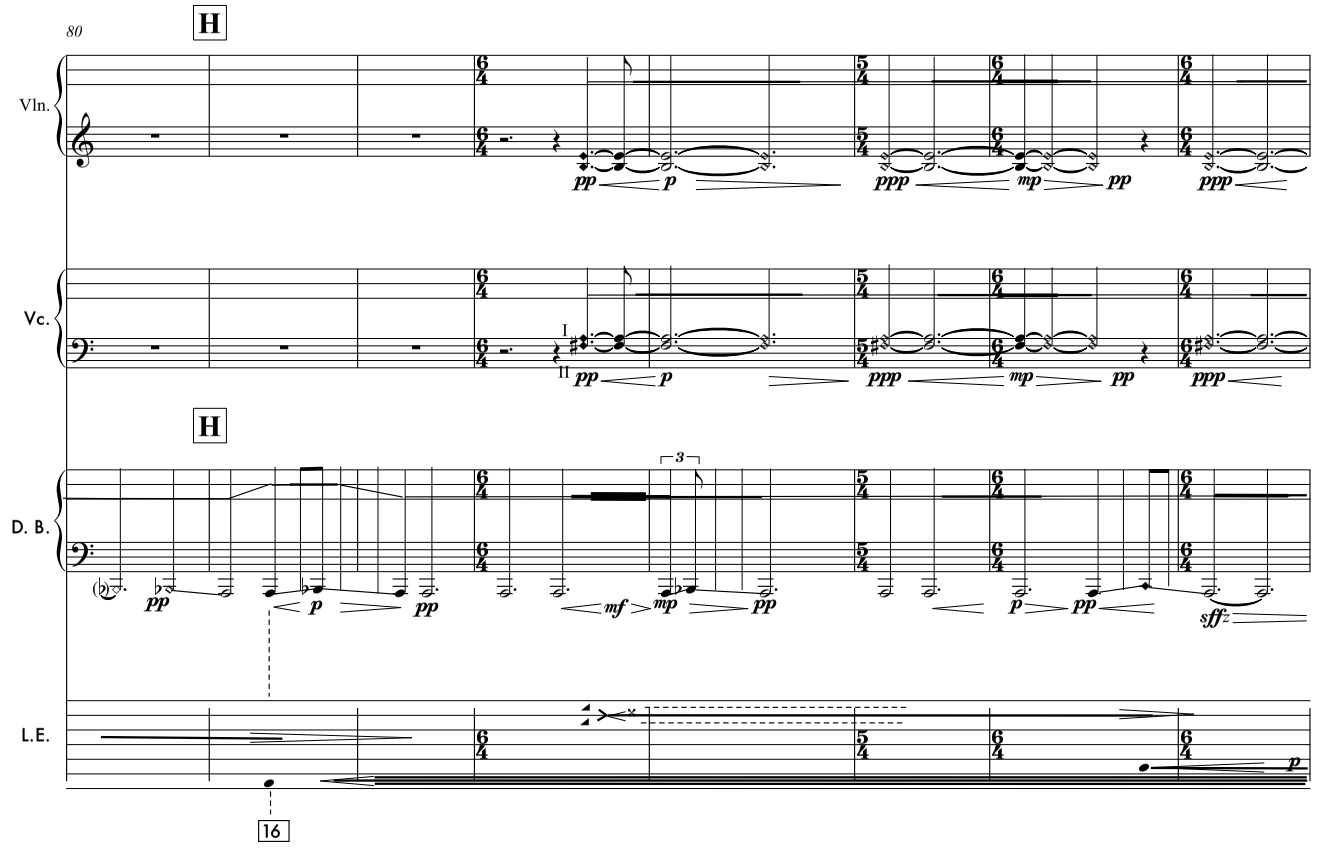
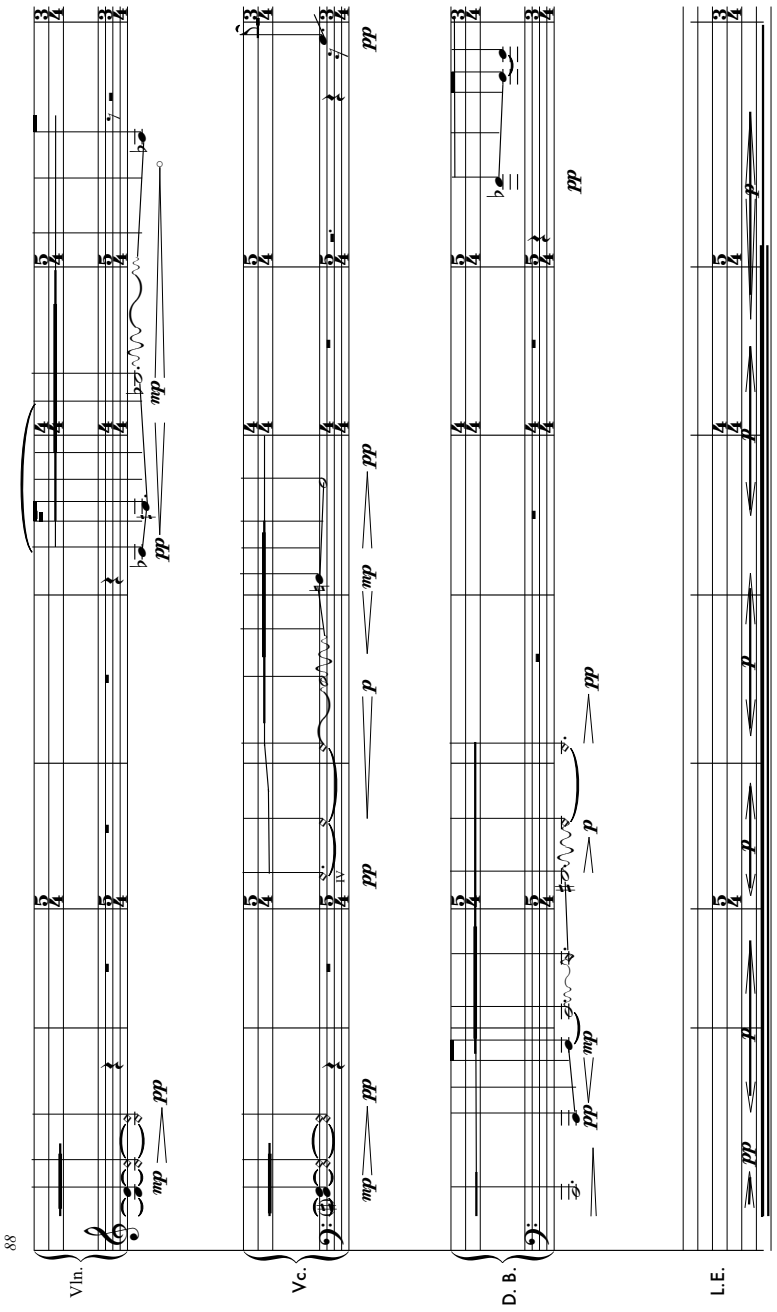
Vln.
Vc.
D. B.
L.E.


80
H
Vln.
Vc.
I
II
H
D. B.
3
L.E.
16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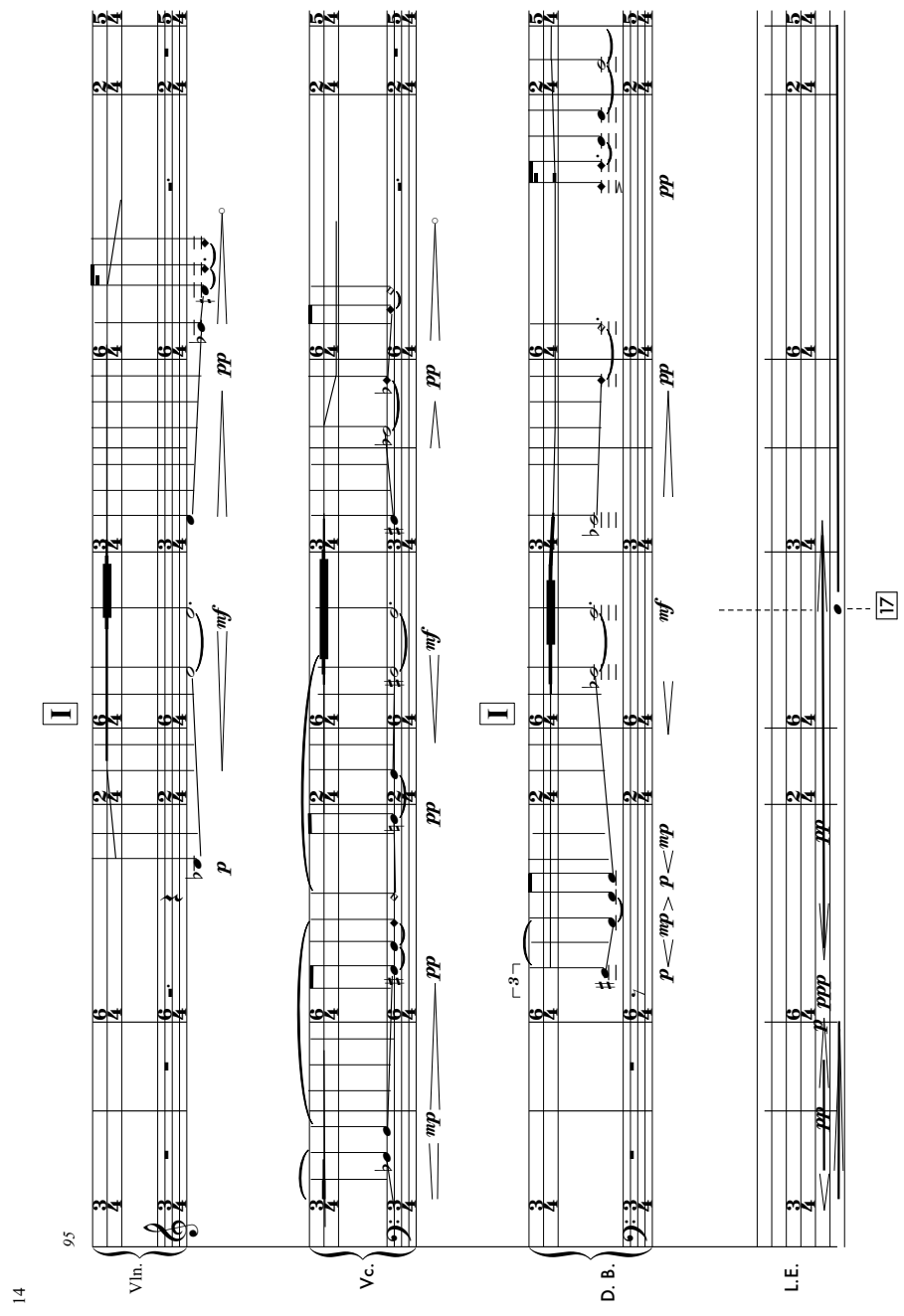
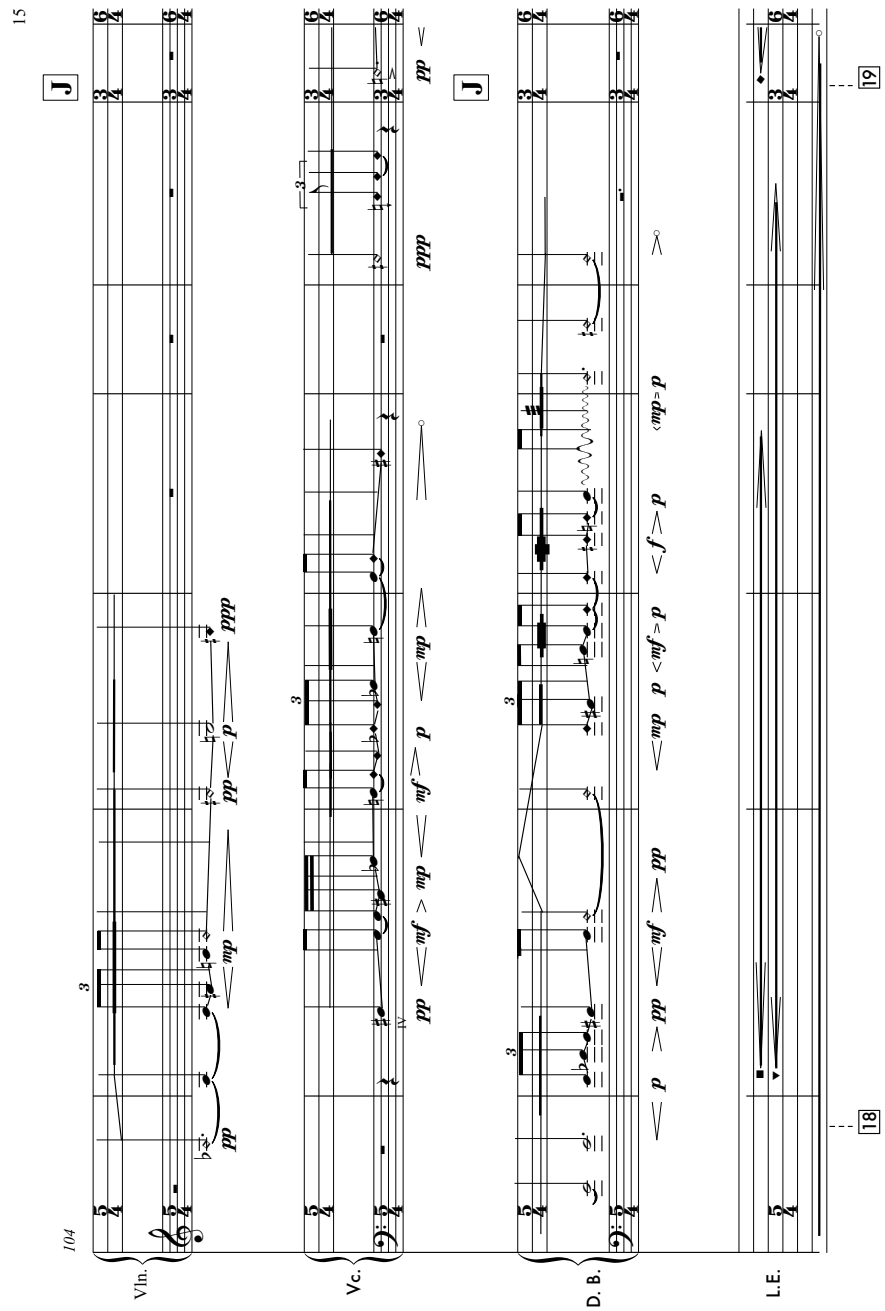
Vln.
Vc.
D. B.
L.E.


14
95
Vln.
Vc.
D. B.
L.E.
I
I
17
p
mf
pp
mp
p < mp > p < mp
ppp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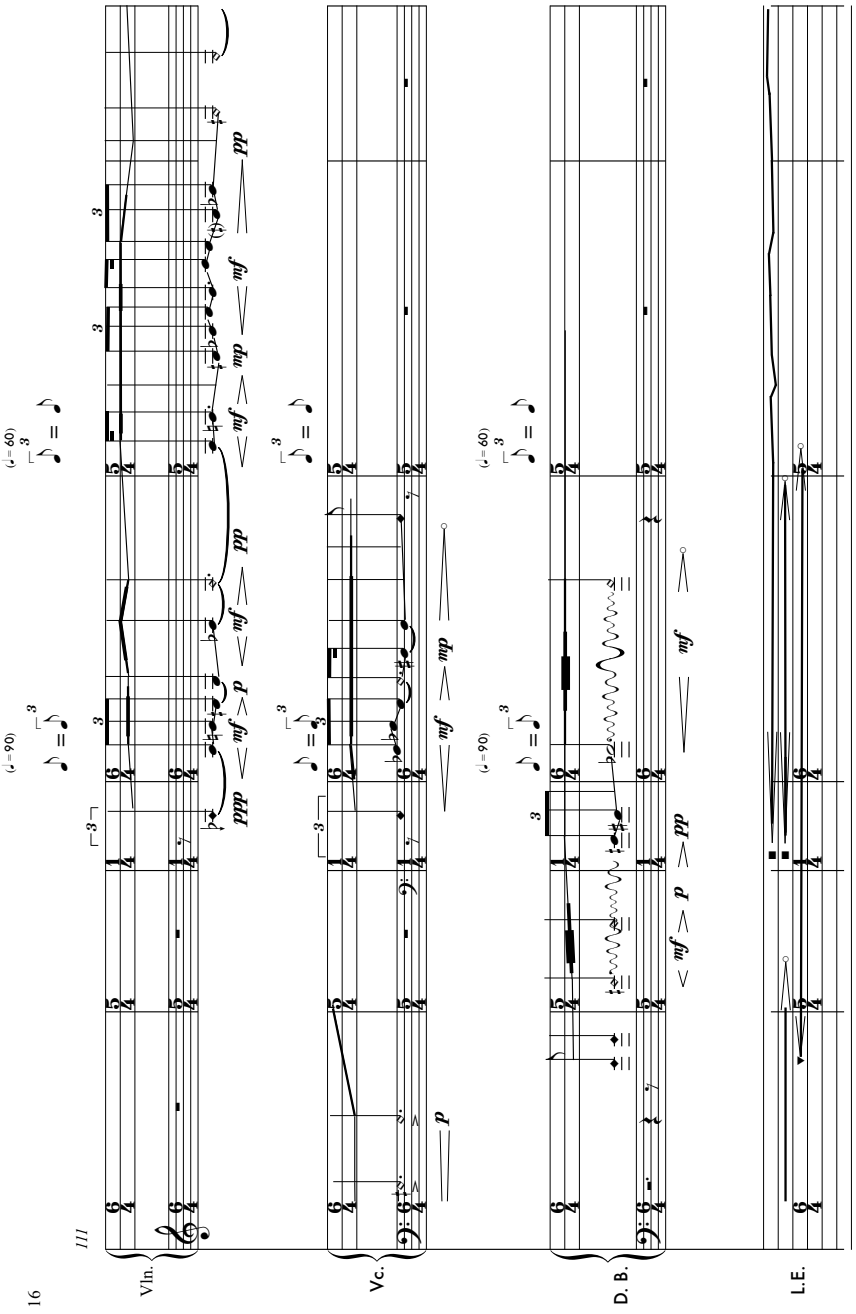
104
J
Vln.
Vc.
D. B.
L.E.
18
19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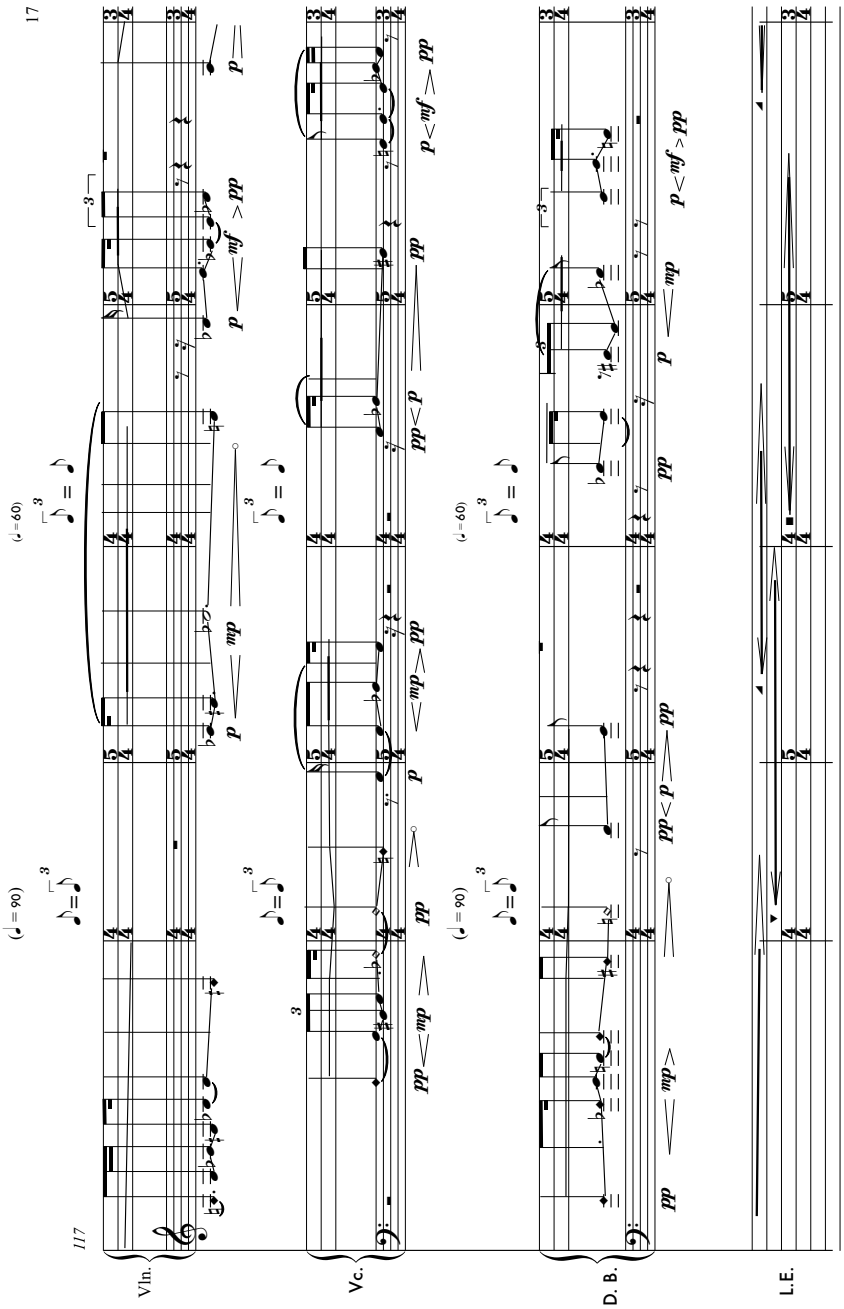
111
Vln.
Vc.
D. B.
L.E.
(♩=90)
(♩=60)
3
mf
dim
dd
p
pp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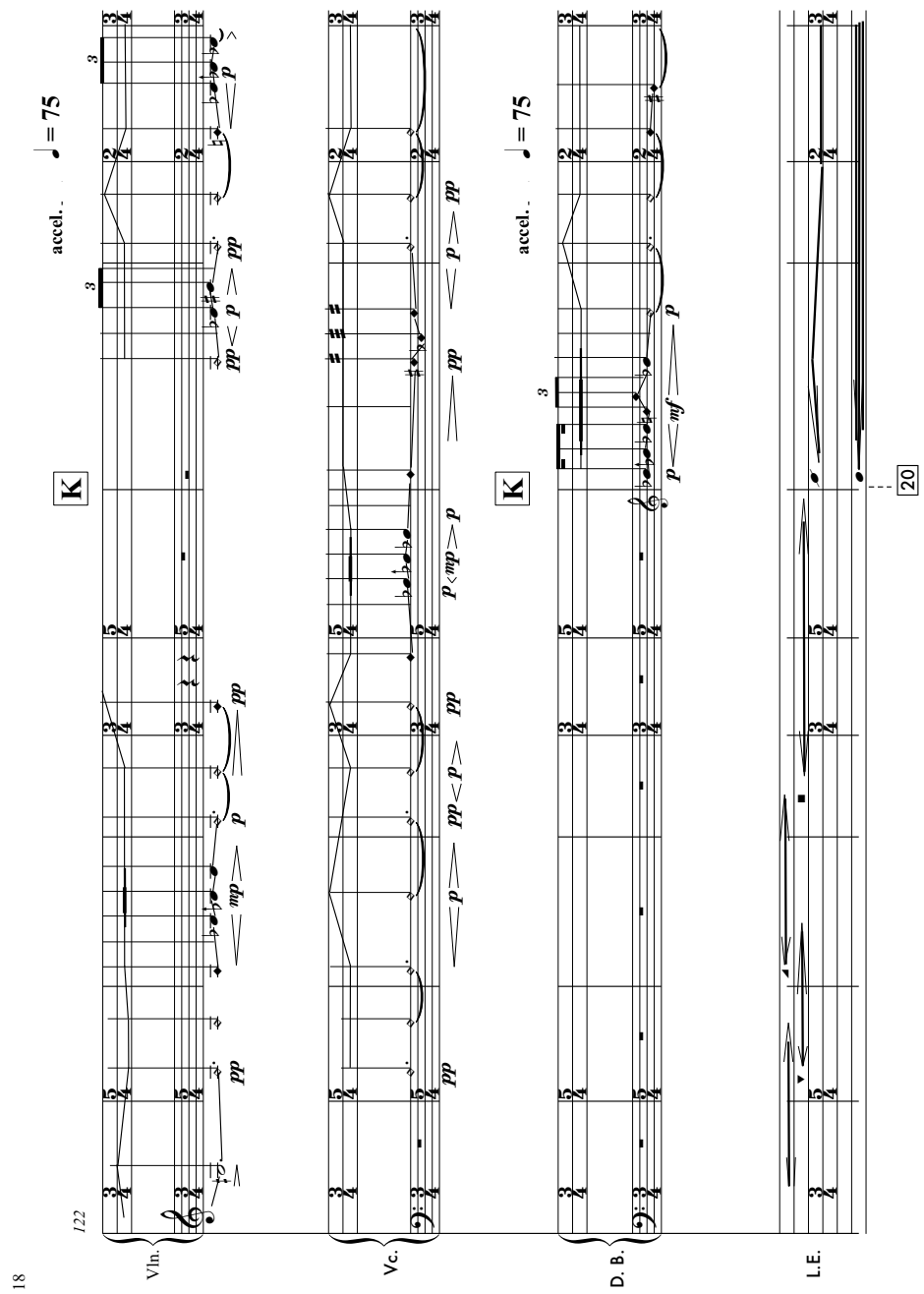
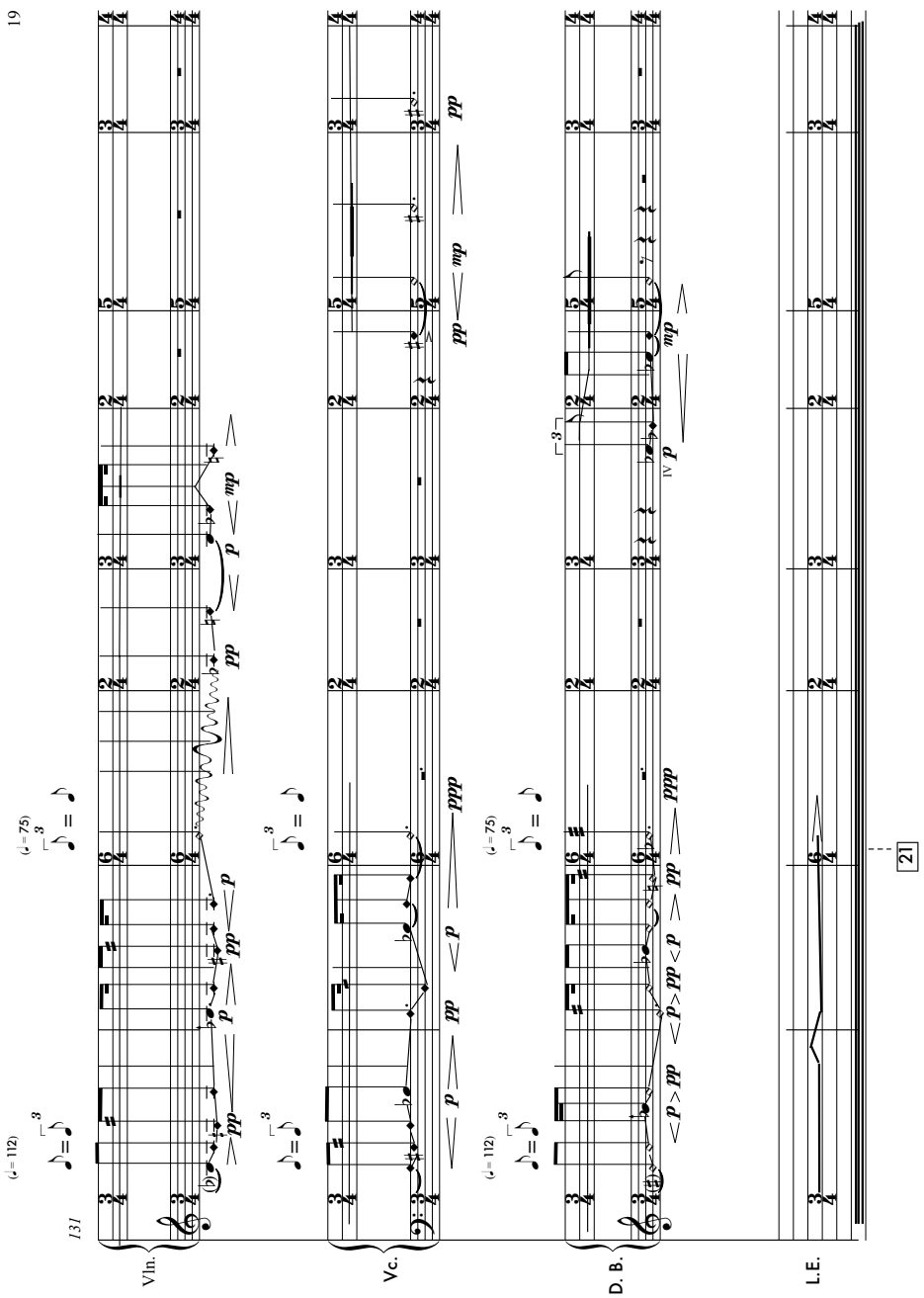
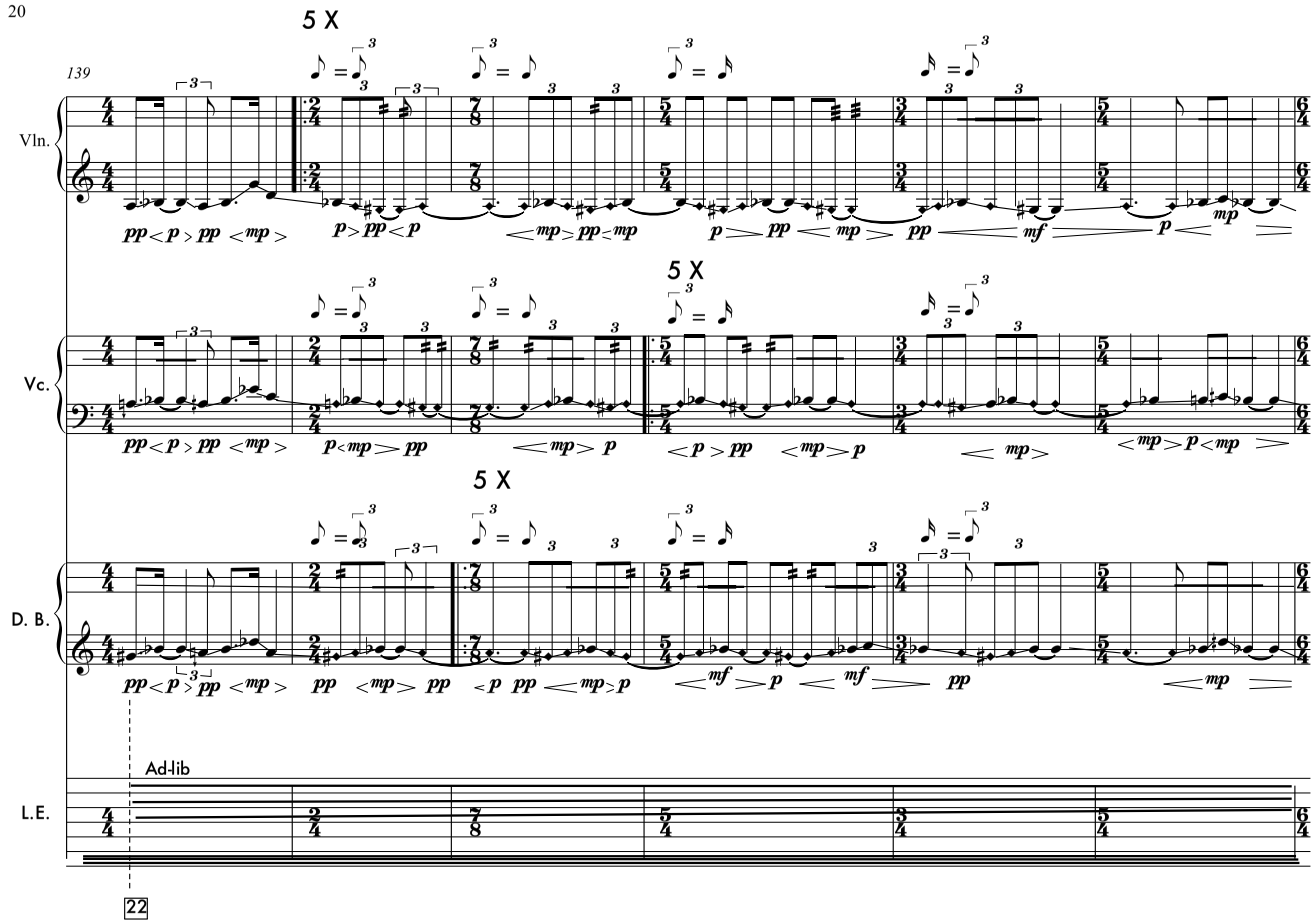
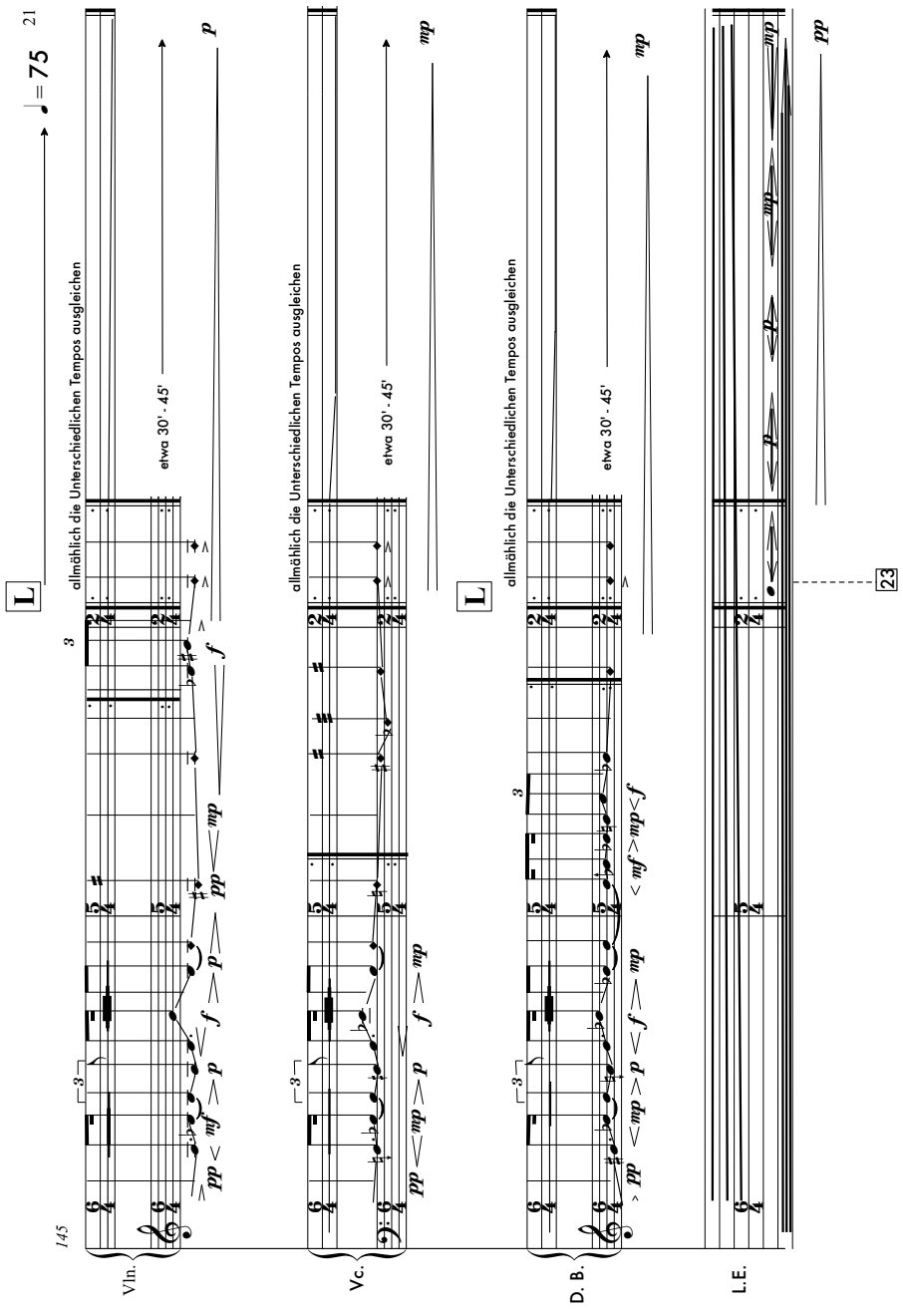
Vln.
Vc.
D. B.
L.E.


18
122
accel. - ♩= 75
K
Vln.
Vc.
D. B.
L.E.
20


19
131
Vln.
Vc.
D. B.
L.E.
21


20
5 X
139
Vln.
Vc.
5 X
D. B.
5 X
L.E.
Ad-lib
22


L
♩= 75
allmählich die Unterschiedlichen Tempos ausgleichen
etwa 30' - 45'
Vln.
Vc.
D. B.
L.E.
23

Duo for Percussionists

For Percussion, Surface Feedback, and Live Electronics

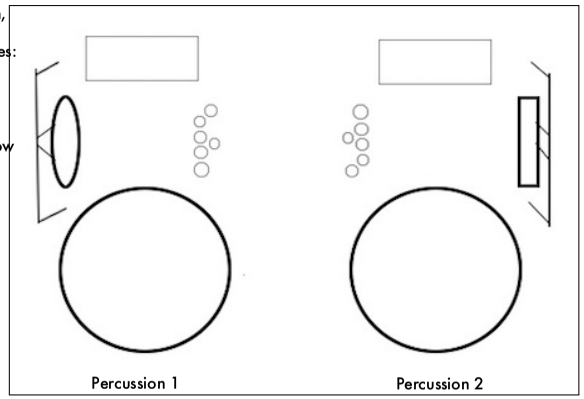
Andrés Gutiérrez Martínez

Duo for Percussionists - with surface feedback and live electronics
Andrés Gutiérrez Martínez - 2021

I - For 2 Bass Drums and Feedback System on Tam - Tam and Metal Plate **(mouted on tables)**
II - Entire percussion set, surface feedback on bass drums, and live electrnics
III - For crotales and sruface feedback on bass drums

Percussion 1: Tam-tam, Bass drum, Crotales (secondocatave pitches: F#, G, A, B, B , C),

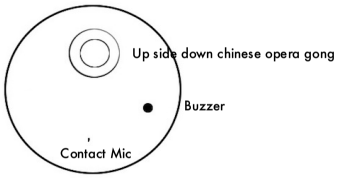
choose an additional resonantig metal instrument you can bow (ex. cymbal, alm glocken...).



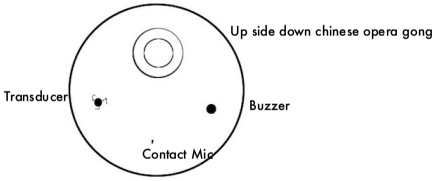
Percussion 2: Metal Plate, Bass drum, Crotales (secondocatave pitches: F#, G, A, B, B , C),

Choose an additional resonantig metal instrument you can bow (ex. cymbal, alm glocken...).

Setup 1 Speaker



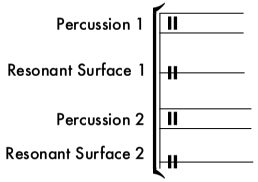
Setup 2 Speakers



Large bass beater for drone-like roll. Soft attack

Beater for metal instruments: tam-tam, metal plate. Soft attack, low ringing. Soft attack

Bow



Tam-tam

Bass Drum

Shows the onsets and offsets of the resonant surface either a bass drum or tam-tam on table (depends on section)

Metal Plate

Bass Drum

Shows the onsets and offsets of the resonant surface either a bass drum or tam-tam on table (depends on section)

The chinese opera gong helps to add some innitial tension so that the ringing doesn't become unstable right away

Basic Performance instructions:

The resonant surface are activated through a feedback loop between the contant speaker and a contact microphone, and in some cases a directional microphone placed about 1.5 feet above the surface. The surface of the drum will resonante at different frequencies depending on the energy in the feedback loop, which excites different resonant modes. Through **equalization performed at the mixer**, the **contact pressu**re, the **contact position** and the **position of the loudspeaker**, it is possible to change the resonant modes of the reonant suface.

The speakers:

There are two different contact speakers that will be used:

a "buzzer", which, favors low resonances. but can also produce high resonances, if the equalizer at the mixer favors high frequenciesYou can stop the buzzer from ringing by lifting it from the surface or applying some pression.

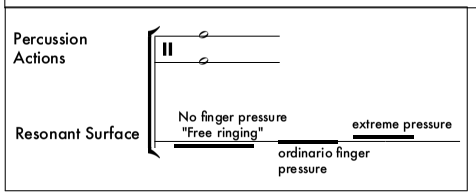
The Transducer is the second contact speaker, this speaker has poor bass respose, but has a wide variety of mid and high frequencies. If you apply pressure to the transducer on the surface, you won't stop the sound, but you might produce a change in the resonant mode.

The microphones:

Two different types of microphones are used in the piece:

a contact microphone, which attaches to the surface through a non invasive sticky material. The contact microphone picks up directly the vibration of the surface and this is sent back to one of the speakers. By adding pressure to the contact microphone you can influcence the resonant mode of the surface. In some cases, at lowerver volumes and low frequencies, adding pressure to the microphone will stop the feedback completely.

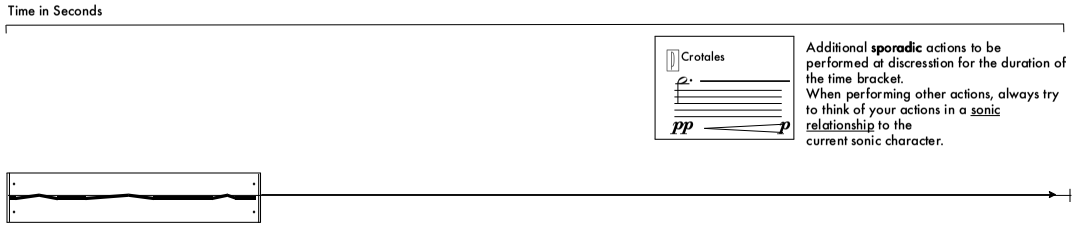
a directional microphone (cadioid, small diaphragm condenser), is palced about 1.5 to 2 feet over the surface pointing at the center of the surface, avoiding any of the speakers. By putting your heads close to the speaker or the microphone, you can also influence the the feedback frequency and energy.



Notation of the interaction with the resonant surface:

gradually add and release pressure at different speeds. Avoid fast and sudden actions. Favor slow change. Find the "vocal" character and "expression".

The actions will be varied for the entire duration of the time-bracket.



Additional **sporadic** actions to be performed at discresstion for the duration of the time bracket.
When performing other actions, always try to think of your actions in a sonic relationship to the current sonic character.

Depending on the section, either 1 or the other spekar, or both will be activated making the results more timbrally more complex.

Propmts for exploration

Vocality: Buzzer, Contact Microphone, and Chinese Opera Gong on surface. Placed in a triangle-like position with enough distance between them. (this can and will be changed later). (see diagram)

When the surface starts resonating, get a sense of the changes to the system when you slighly change the tension of the drum head with your finger tip.

1) Notice what happens when you add different degrees of pressure (from very light to extreme)
2) Notice what happens when you do this on different places of the surface.
3) Notice what happens when you apply finger pressure on different places: simultaneously, sequentially or gradually.
4) What happens when you move the opera gong: When you lift it, stand while supported on the surface?

1: Choose 3 or 4 actions that you can repeat confidently producing similar results.
2: Create phrases where you combine these varying the sequence and duration.
3: Between phrases let the surface ring by itself. The phrases can also be slowly changing. (gradual adding of pressure in the span of 4 or more seconds)...

Multiphonics: Transducer, Buzzer, contact micorphone, cardioid microphone, chinese opera gong. In a "prism" like form place the contact microphone in the middle of the buzzer and transducer. The contact microphone about 3 to 4 inches from the rim. (see diagragm)

this feedback loop includes an additional microphone and the trnasducer as well as the buzzer. In addition to the actions and explorations from the previous situation,

1) Notice how the sound changes when you put your hands between microphone 2 and the surface.
- about 2 inches from microphone
- Halfway between microphone and surface
- one hand close to the mic, the other close to the speaker
- without touching th emic try to cover the microphone using to hands.
- Open and close slightly your hands while in close position.
- In addition to stopping the ringing by applying pressure, use fingers to tap/ strike the surface.

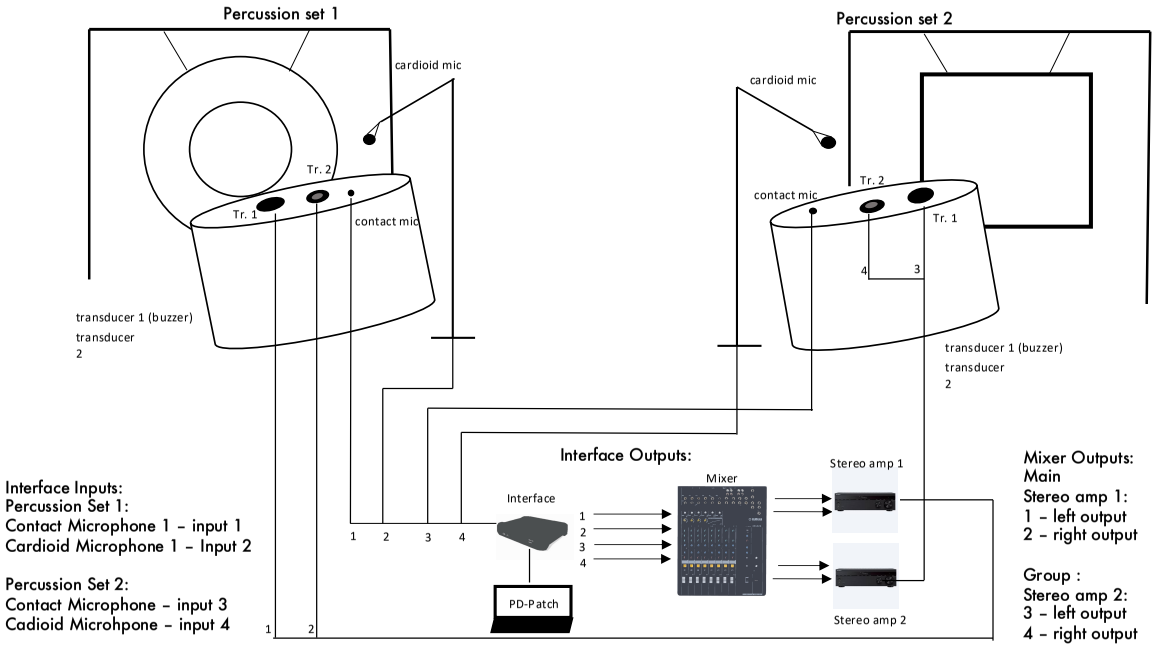
2) Notice how the two speakers interact creating multiphone like sounds

1: Choose 3 or 5 actions that you can repeat confidently producing similar results. This can also be gestural when interacting with microphone 2
2: Create phrases where you combine these varying the sequence and duration.
3: Between phrases let the surface ring by itself. The phrases can also be slowly changing. (gradual adding of pressure in the span of 4 or more seconds

AVOID PEEKS!

Duo for Percussionists

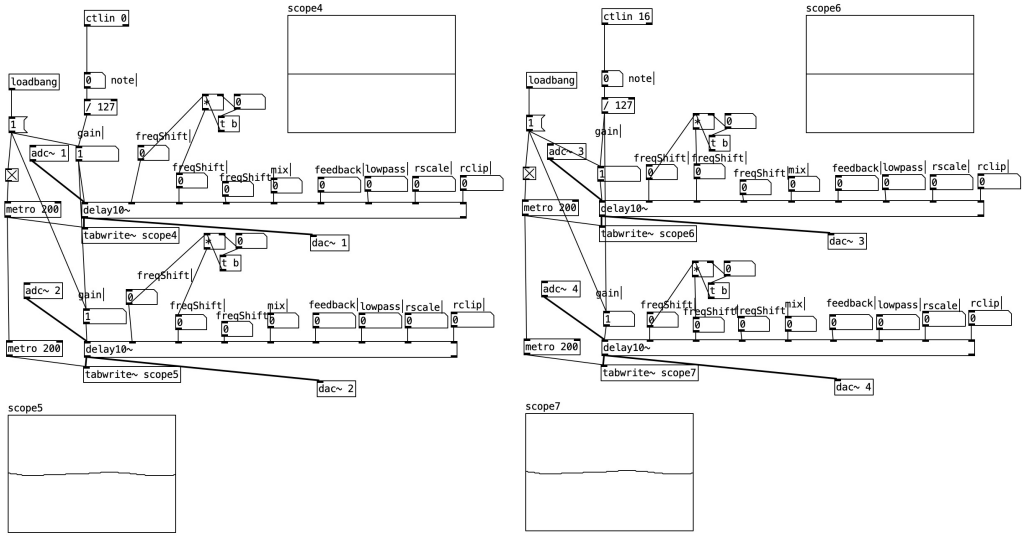
Setup Diagram – Surface Feedback



Duo for Percussionists

Surface Feedback Patch.

Each input is assigned to one of the delay10~ objects. Each object is routed to an independent output matching its input. (input 1 -> output 1, etc.).

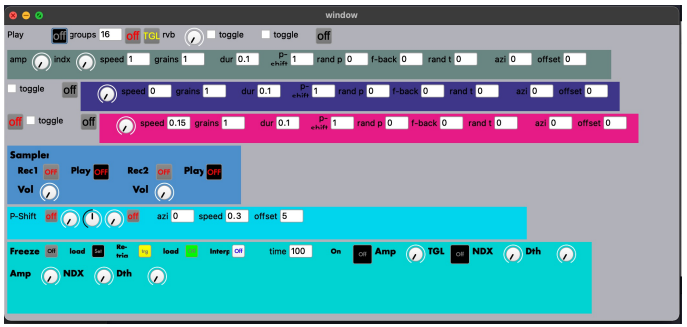


Once the PD Patch is running, there is no manipulation done.

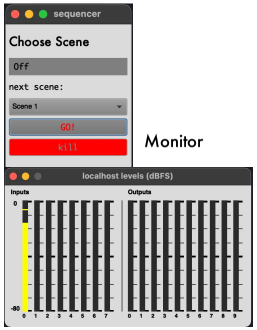
Duo for Percussionists

Electronic Patch – Live-electronic processing

Main Patch Window



Sequencer

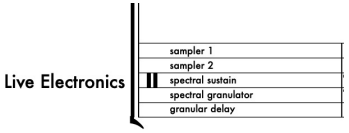


Monitor

A mono mixdown of the percussion set microphones is sent to the second interface/computer which are used to perform the live-electronic processing and spatialization.

The control parameters of the digital instrument are controlled through a Behringer BCF 2000 controller, however, performers can use other interfaces. An important consideration for the control interface is the possibility to access different presents in order to be able to control different combinations of presents.

Live electronic notation:



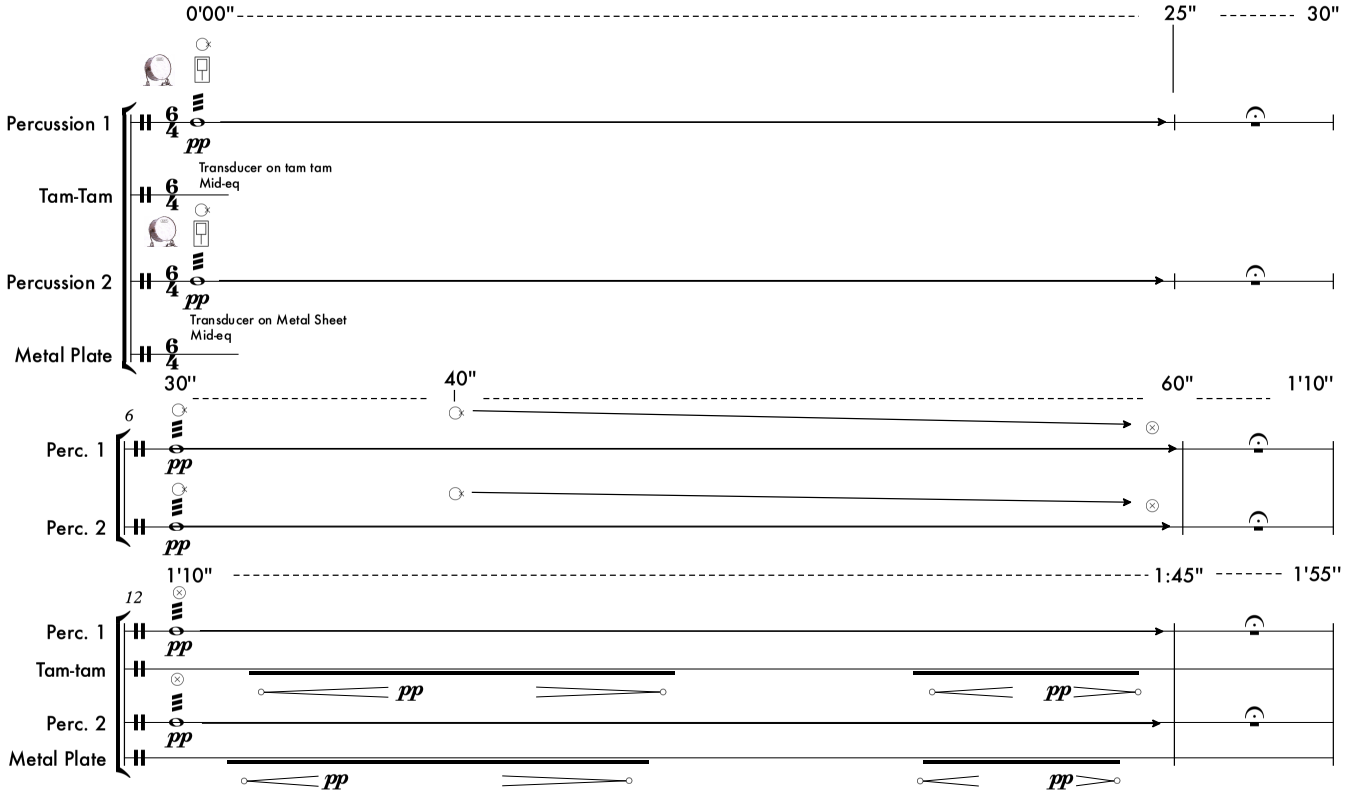
The live-electronic part is notated in the lower system of the second movement. Each digital instrument is assigned an individual line in the system.

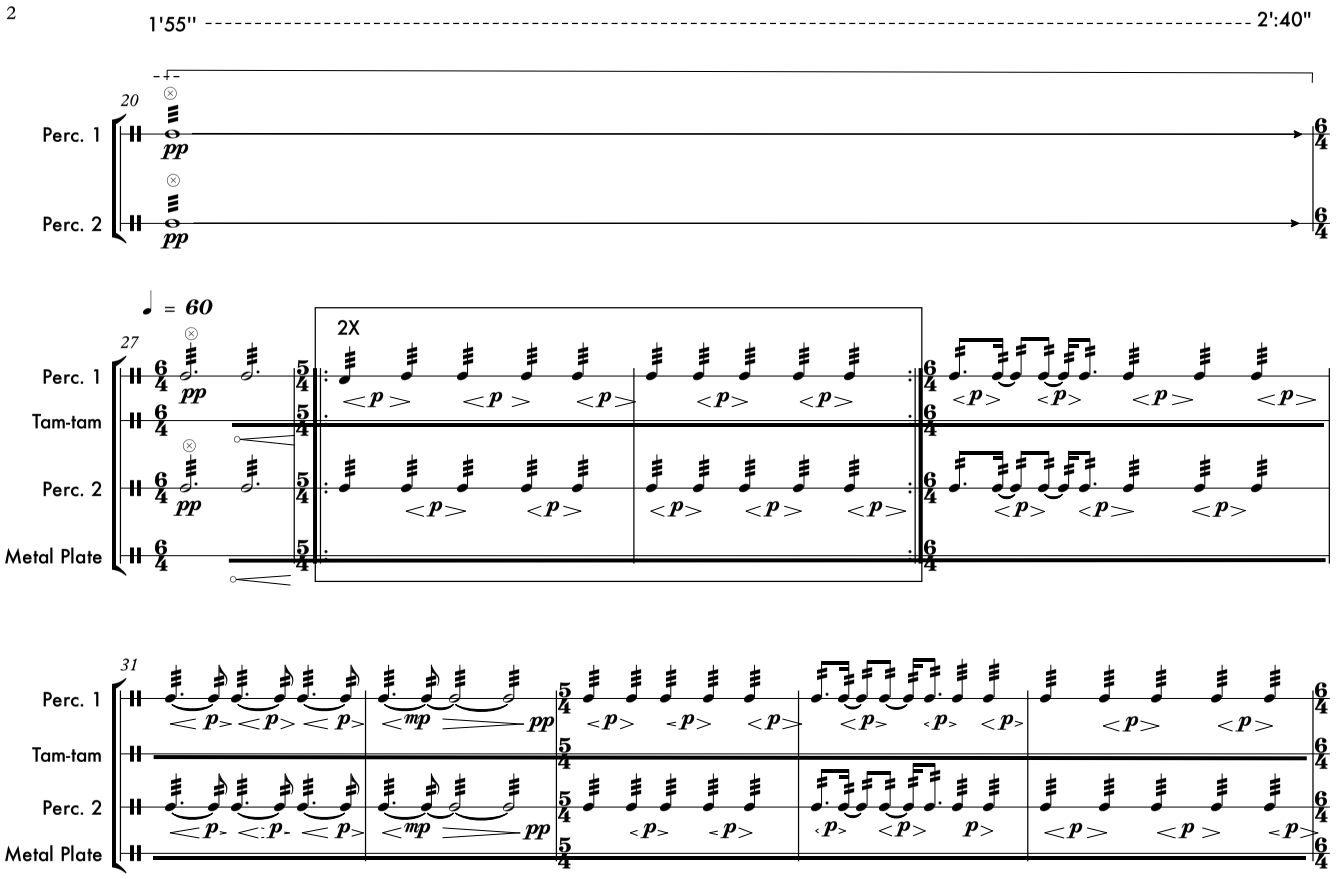
Duo for Percussionists

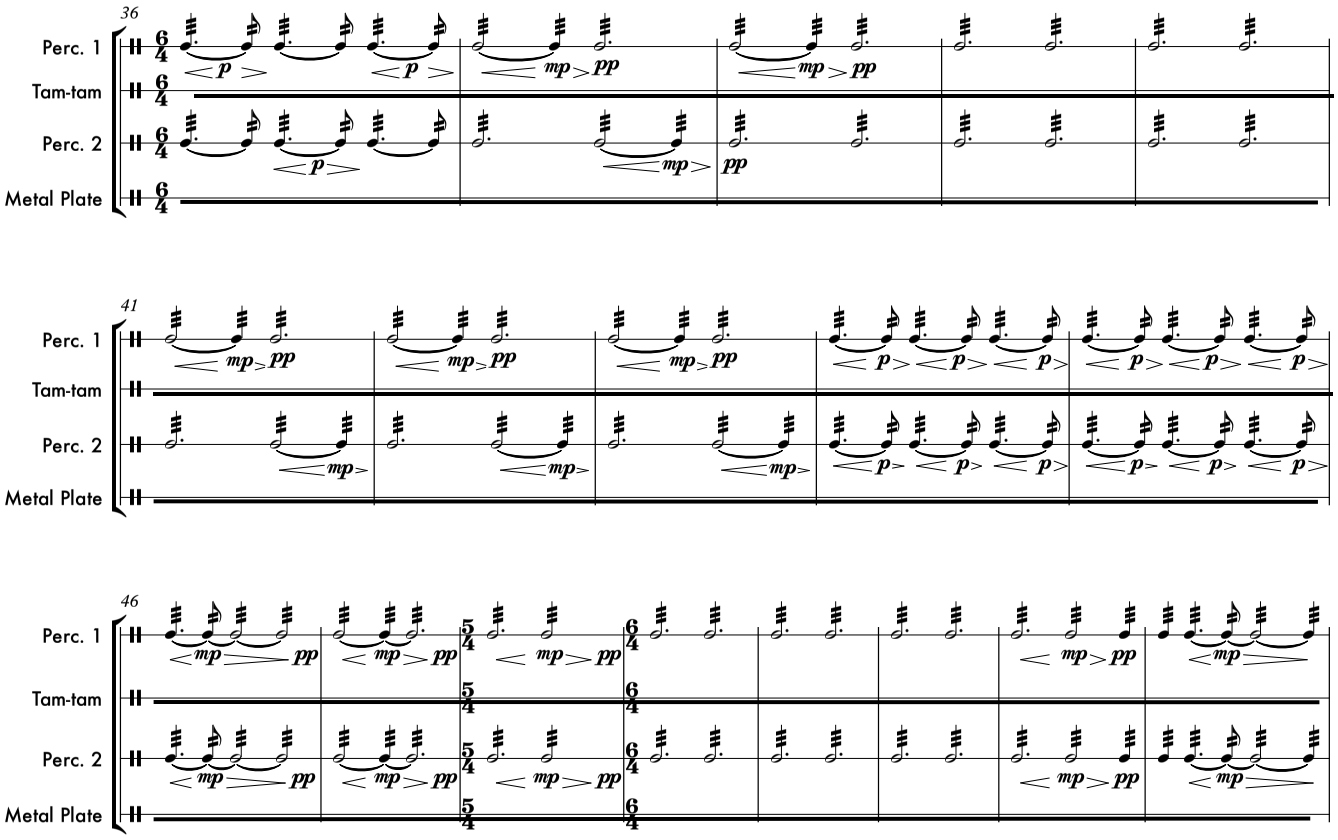
for Percussion, surface feedback, and live-electronics

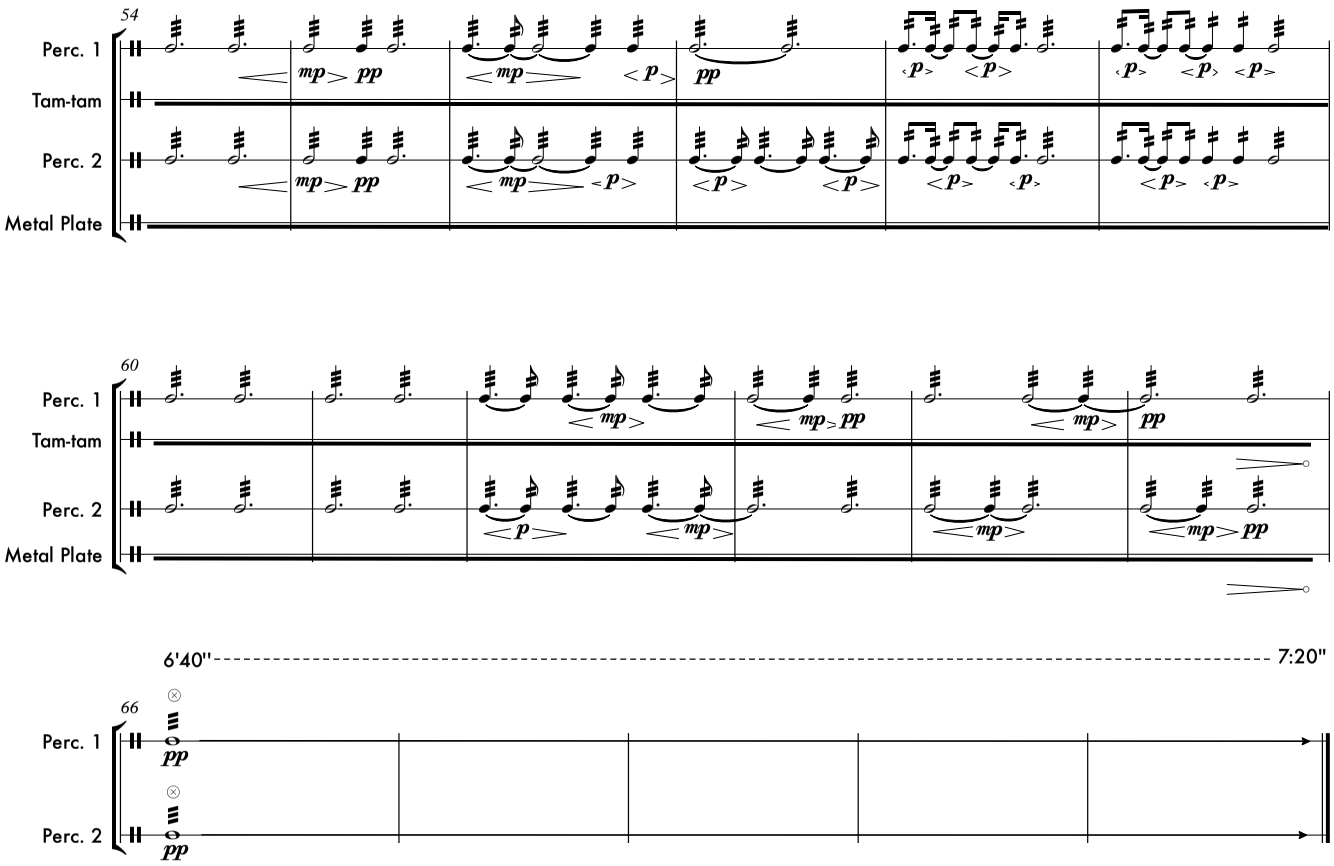
Andrés Gutiérrez Martínez
(2021)

I




2
1'55"
2':40"
20
Perc. 1
Perc. 2
pp
= 60
27
Tam-tam
Metal Plate
2X
31
mp


36
Perc. 1
Tam-tam
Perc. 2
Metal Plate
41
Perc. 1
Tam-tam
Perc. 2
Metal Plate
46
Perc. 1
Tam-tam
Perc. 2
Metal Plate


54
Perc. 1
Tam-tam
Perc. 2
Metal Plate
60
Perc. 1
Tam-tam
Perc. 2
Metal Plate
6'40"
7:20"
66
Perc. 1
Perc. 2

Duo for Percussionists

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II

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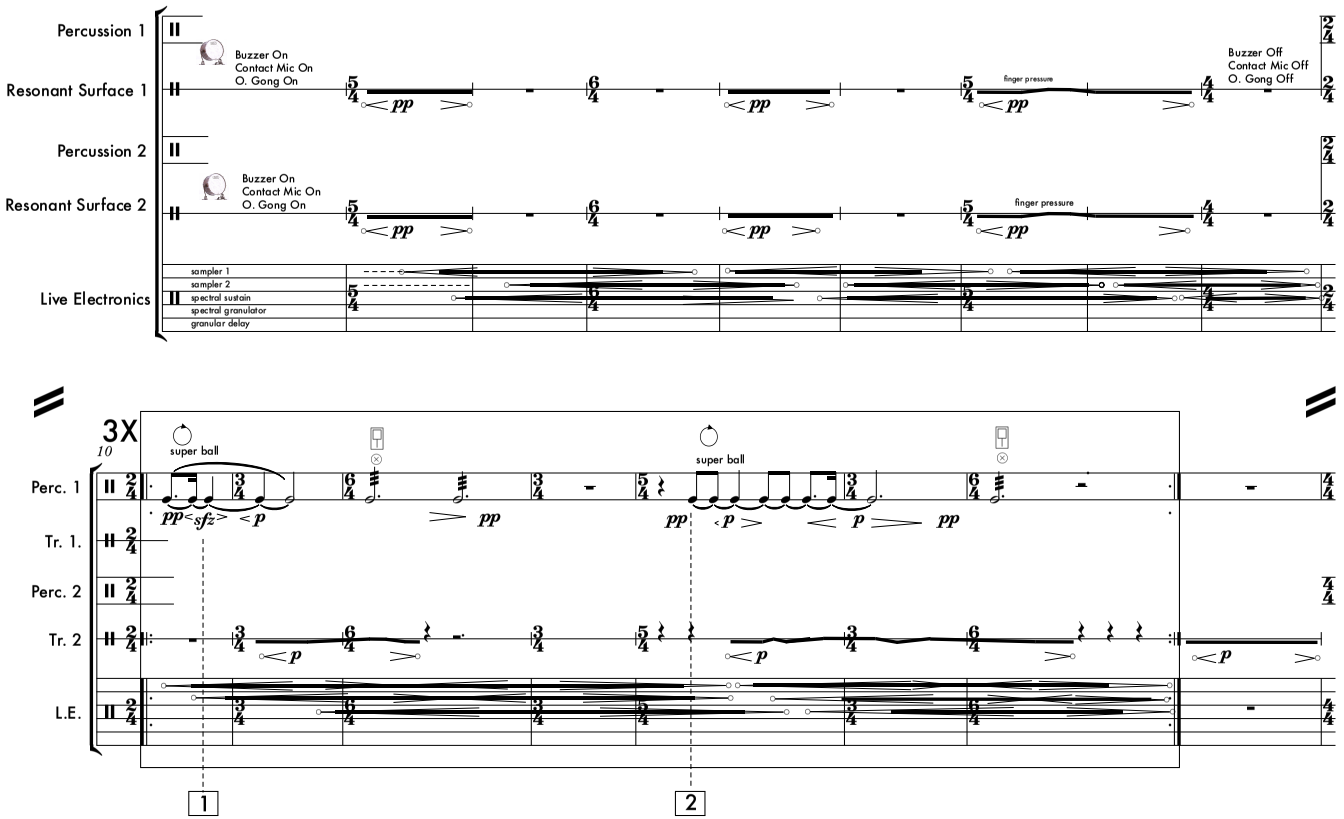
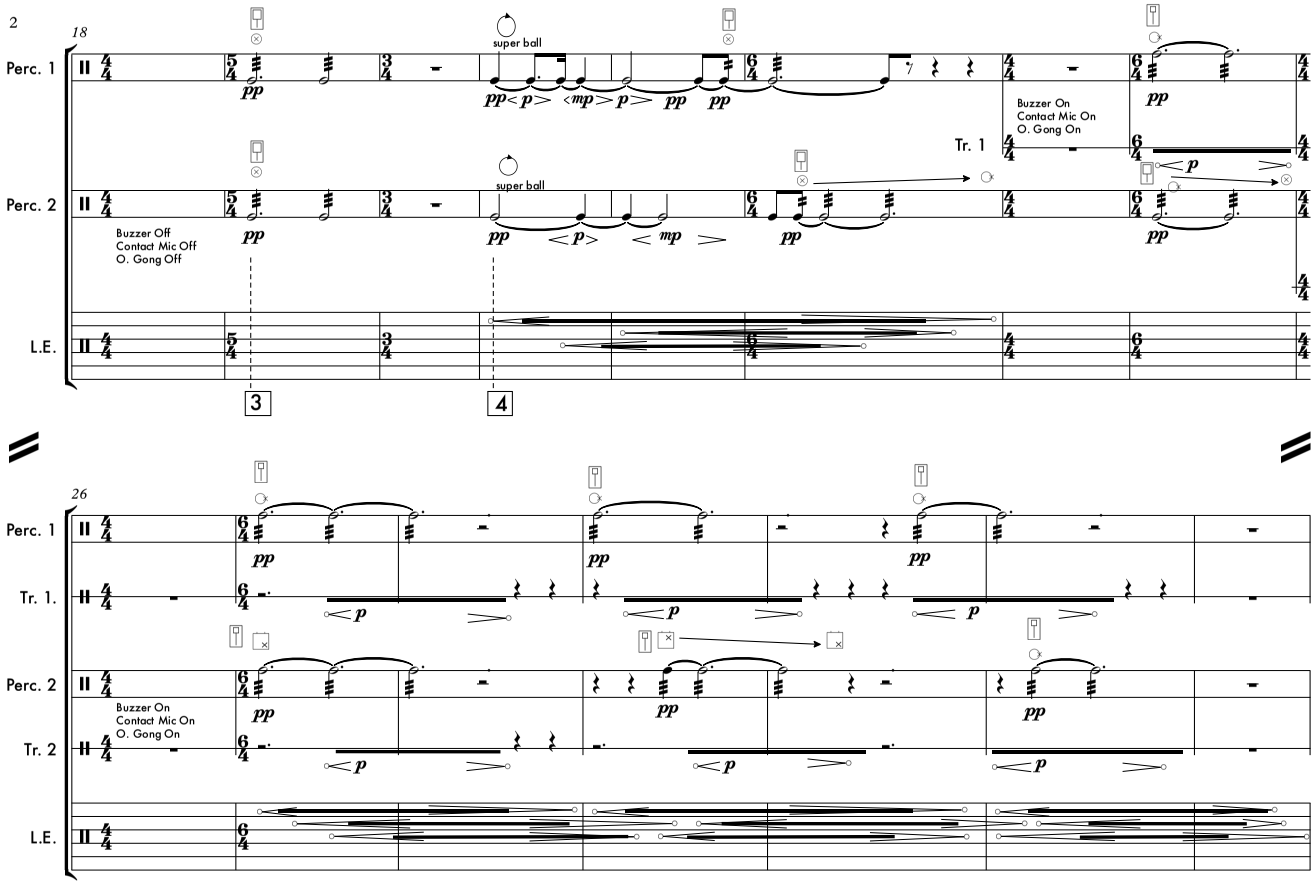
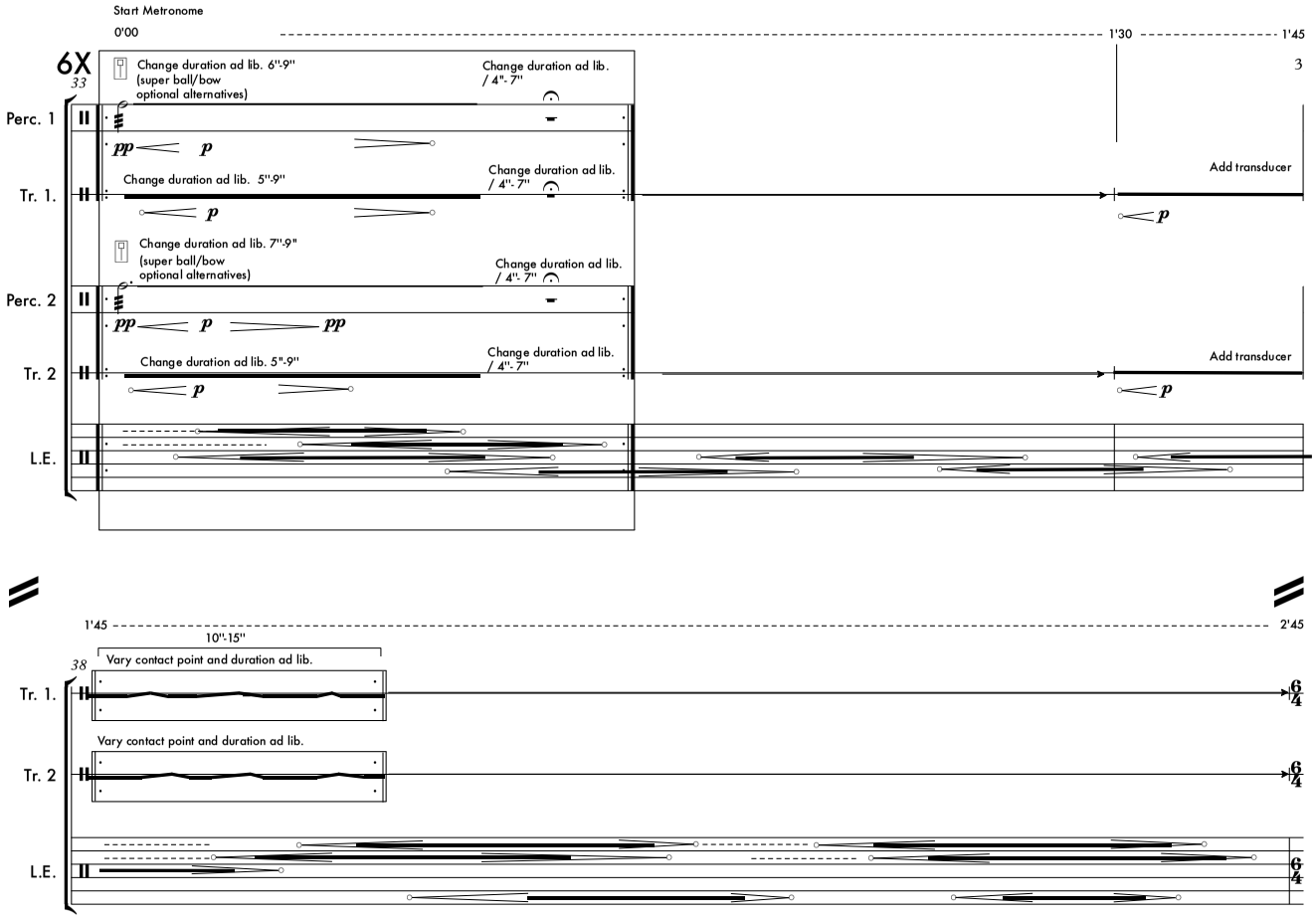
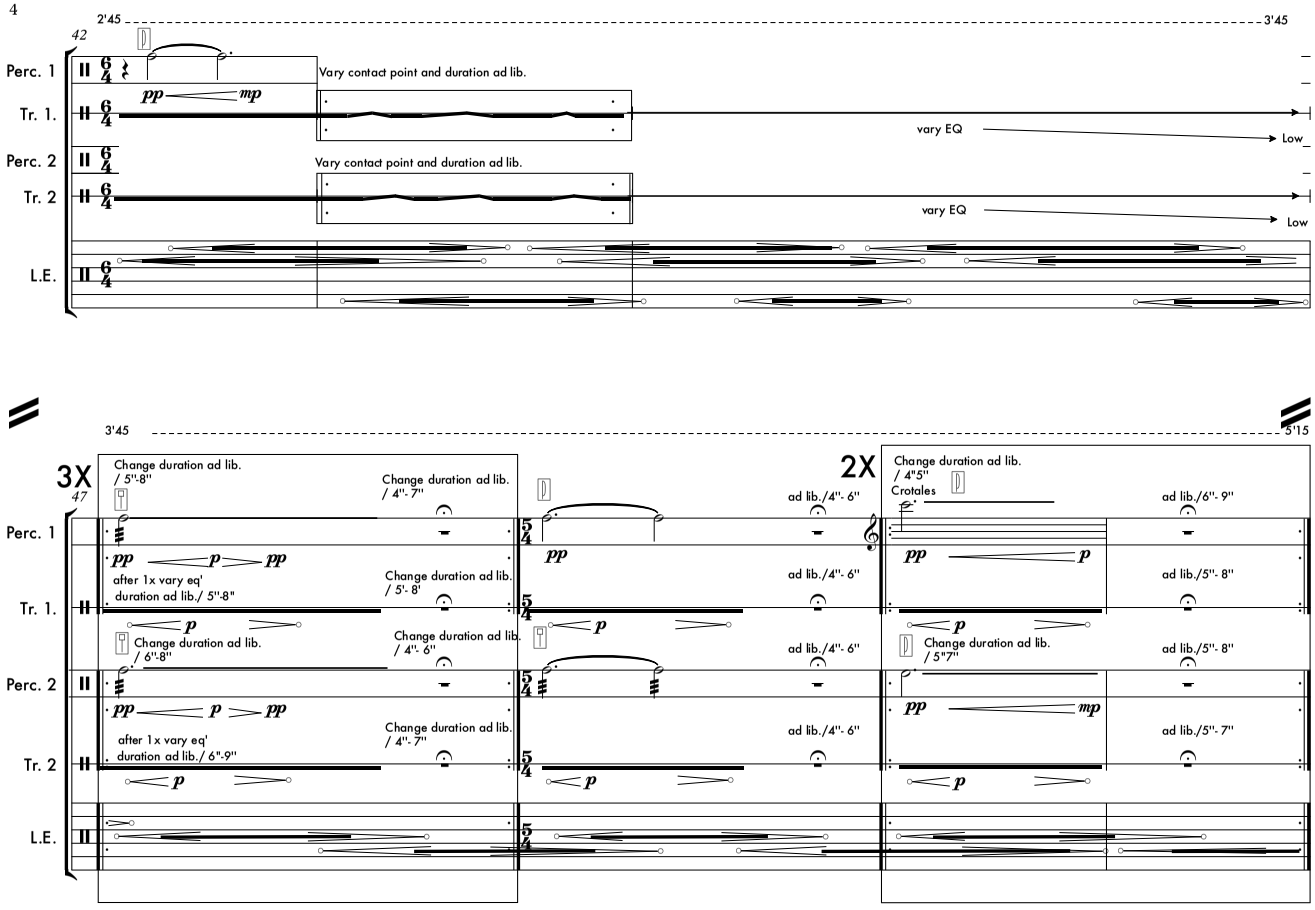
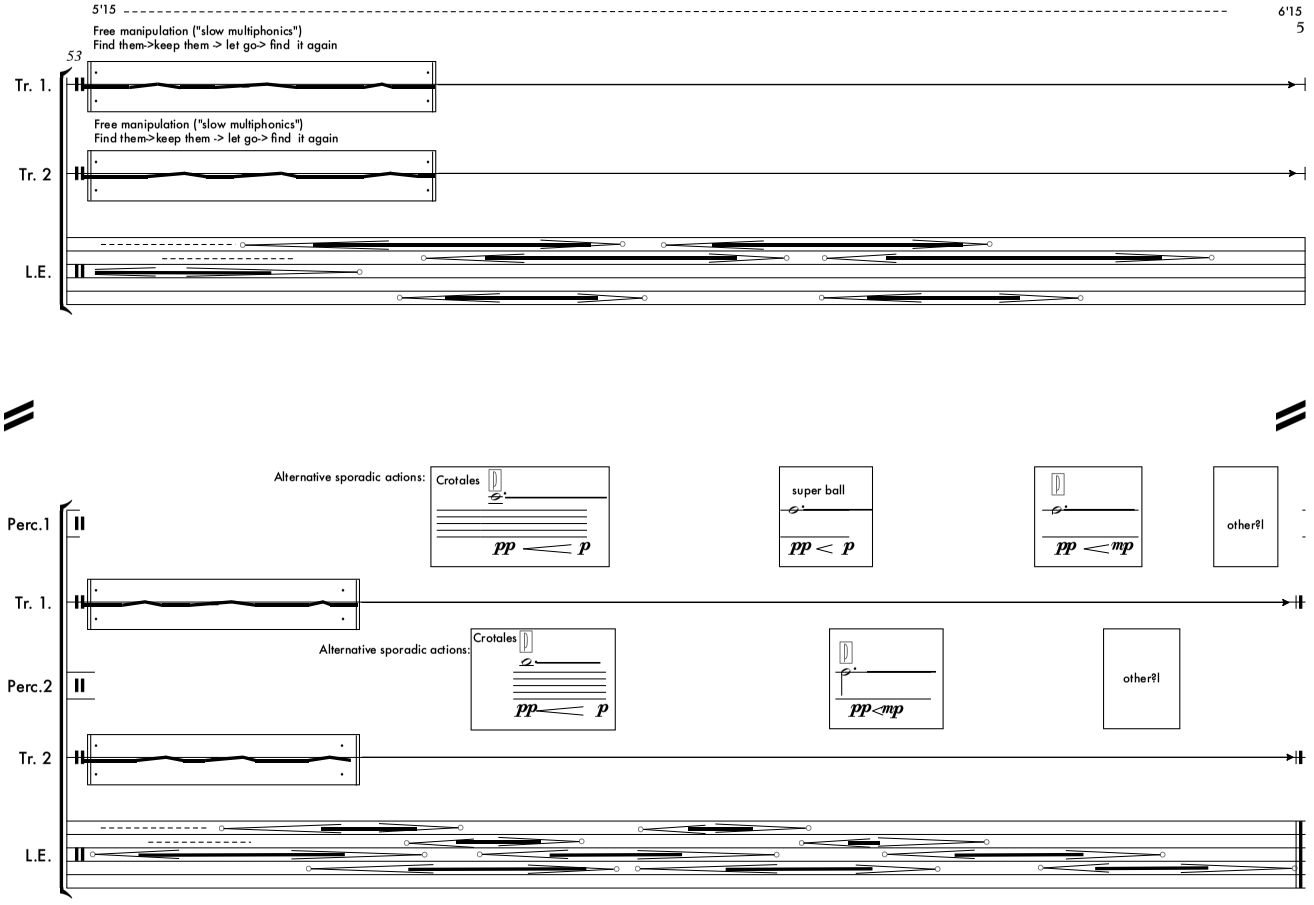



2
18
Perc. 1
Perc. 2
L.E.
super ball
super ball
Buzzer Off
Contact Mic Off
O. Gong Off
Tr. 1
Buzzer On
Contact Mic On
O. Gong On
3
4
26
Perc. 1
Tr. 1.
Perc. 2
Tr. 2
L.E.
Buzzer On
Contact Mic On
O. Gong On


Start Metronome
0'00
1'30
1'45
6X
33
3
Change duration ad lib. 6"-9"
(super ball/bow
optional alternatives)
Change duration ad lib.
/ 4"- 7"
Perc. 1
pp
p
Change duration ad lib. 5"-9"
Change duration ad lib.
/ 4"- 7"
Add transducer
Tr. 1.
p
Change duration ad lib. 7"-9"
(super ball/bow
optional alternatives)
Change duration ad lib.
/ 4"- 7"
Perc. 2
pp
p
pp
Change duration ad lib. 5"-9"
Change duration ad lib.
/ 4"- 7"
Add transducer
Tr. 2
p
L.E.
1'45
2'45
10"-15"
38
Vary contact point and duration ad lib.
Tr. 1.
6/4
Vary contact point and duration ad lib.
Tr. 2
6/4
L.E.
6/4


4
2'45
3'45
42
Perc. 1
Tr. 1.
Perc. 2
Tr. 2
L.E.
Vary contact point and duration ad lib.
vary EQ
Low
Vary contact point and duration ad lib.
vary EQ
Low
3'45
5'15
3X
47
Change duration ad lib.
/ 5"-8"
Change duration ad lib.
/ 4"- 7"
after 1x vary eq'
duration ad lib./ 5"-8"
Change duration ad lib.
/ 5'- 8'
Change duration ad lib.
/ 6"-8"
Change duration ad lib.
/ 4"- 6"
after 1x vary eq'
duration ad lib./ 6"-9"
Change duration ad lib.
/ 4"- 7"
2X
ad lib./4"- 6"
ad lib./4"- 6"
ad lib./4"- 6"
ad lib./4"- 6"
Change duration ad lib.
/ 4"5"
Crotales
Change duration ad lib.
/ 5"7"
ad lib./6"- 9"
ad lib./5"- 8"
ad lib./5"- 8"
ad lib./5"- 7"


5'15
6'15
5
53
Free manipulation ("slow multiphonics")
Find them->keep them -> let go-> find it again
Tr. 1.
Free manipulation ("slow multiphonics")
Find them->keep them -> let go-> find it again
Tr. 2
L.E.
Alternative sporadic actions:
Crotales
pp < p
super ball
pp < p
pp < mp
other?!
Perc.1
Tr. 1.
Alternative sporadic actions:
Crotales
pp < p
pp<mp
other?!
Perc.2
Tr. 2
L.E.

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III

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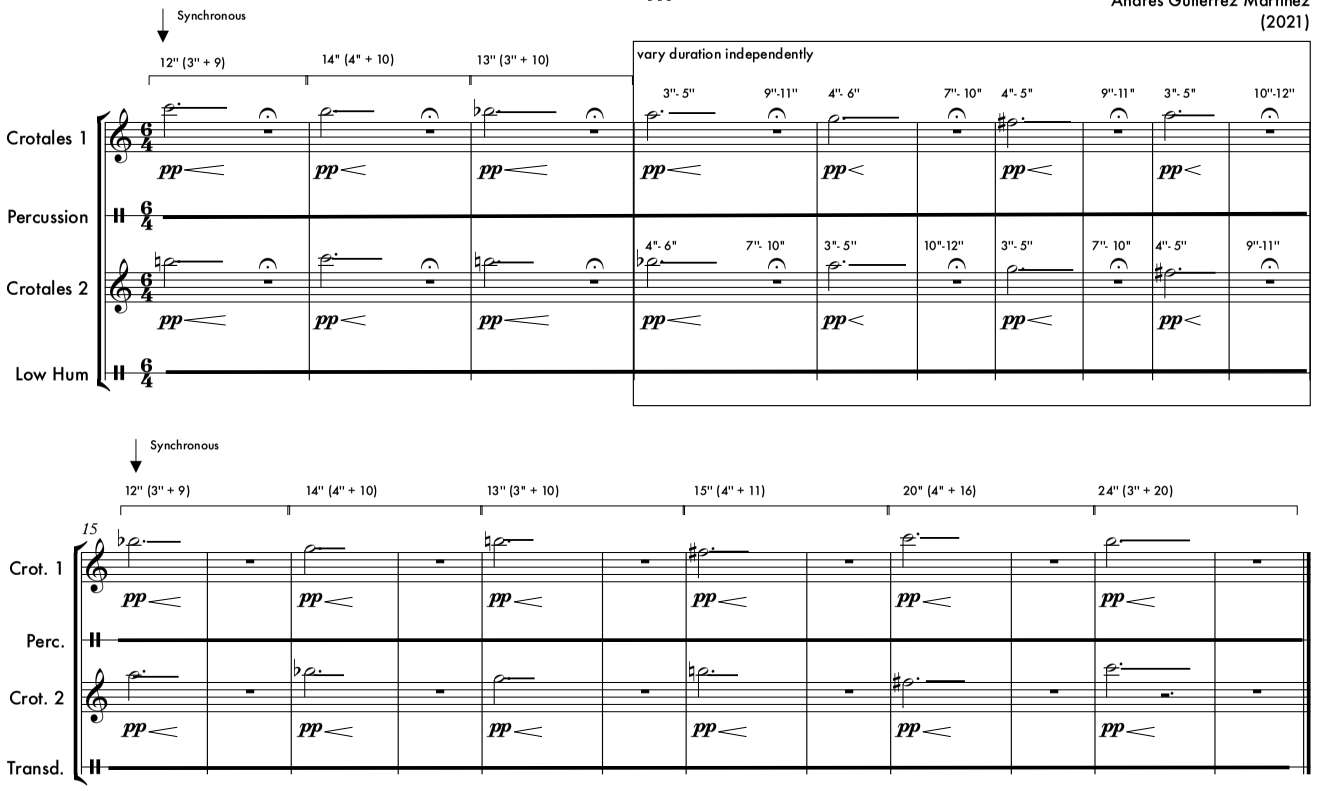

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