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Music

Alias States: Composing (for) Electronically Enhanced Set-ups

Volume 1 of 8

by

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<u>Abstract</u>

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The forces used in the realisation of a musical work have typically been conceived of as independent to the compositional process. For example, composing a piece for a wind quintet historically has meant writing for the five instruments that make up that culturally defined ensemble configuration, and writing for the standard way in which those instruments are constructed and presented. This has changed within recent New Music. It has become commonplace for works to involve the adaptation of the physical properties of the instruments, and the application of electronic technology to acoustic instruments. This change marks an expansion of where the creative act of composition is located to include the construction of the set-up. A particular focus of engaging with the composition of the set-up is the creation of uncanny experiences of conventional musical instruments. This approach opens up possibilities to engage and transform established relationships between instruments, performers, and audiences.

This project investigates the creation of hybrid set-ups that combine acoustic instruments with electronic technology and investigates how musical works can be composed for these bespoke set-ups. The submitted compositions engage this two-fold act of composition to focus on instrumental construction; instrumental techniques; and the cultural ground instruments occupy. Chapters one and two present frameworks to open up ways of theorising such works, the possibilities afforded by such works, and their effects. These ideas are developed in the two case studies that follow: Stockhausen's *Mikrophonie I* (chapter three) and Nemtsov's *Drummed Variation* (chapter four). Chapter five provides commentary on how these issues relate to each of the submitted works, and chapters six and seven draw out larger thematic concerns across the works.

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All recordings can be found here: https://doi.org/10.5258/SOTON/D2173

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Research Thesis: Declaration of Authorship

Print name: Oliver Arthur Ashworth Sellwood

Title of thesis: Alias States: Composing (for) Electronically Enhanced Set-ups

I declare that this thesis and the work presented in it are my own and has been generated by me as the result of my own original research.

I confirm that:

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7. None of this work has been published before submission

Signature: .... Date: ....

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Definitions and Abbreviations

[Audio signal processing ...... Refers to the manipulation of an audio signal to change the resulting sound qualities. Examples of this include distortion, delay, and reverb]

[DAW .... Digital audio workstation]

[DMI .... Digital musical instrument]

[LFO .... Low frequency oscillator]

[MIDI .... Musical instrument digital interface]

[MIDI data processing .... Refers to the mechanism that links hardware devices with the DAW]

[[1] .... Rehearsal mark one]

[[2] .... Rehearsal mark two]

[[3] .... Rehearsal mark three] etc.

Introduction

This project explores composition for electronically enhanced acoustic musical instruments. In this context, the term 'enhancement' indicates the application of electronics somewhere in the signal chain of a performer interfacing with a musical instrument. The focus of this project is not on innovation within the domain of electronic technology. Rather, in this creative-practice submission, each composition investigates how the electronic enhancement of acoustic musical instruments can create new sounding results, open out new compositional possibilities, and challenge and expand our ways of thinking of, and listening to, these instruments.

Throughout this commentary the word 'set-up' refers to all the material aspects available within a given work. This includes all the human (musician) and non-human material (e.g., musical instrument, electronic technology) resources engaged in a composition. This moves away from the term 'medium' and considers the elements involved in the production of a composition from a less culturally occupied position, distinct from the traditions of Western classical music (see 2.1 for further discussion). In each composition, my intention is to create a new set-up and to produce musical material that explores the affordances[1] of that set-up.

The submitted compositions are for instruments which have been central to Western musical practice for at least the last seventy years. I refer to musical instruments as those objects commonly understood as such (e.g., guitar, oboe), although part of our understanding of musical instruments is constructed through their context and their use (see 1.1). The inclusion of musical instruments is central to my research. For Western classical music, musical instruments, either individually or in groups, have been the primary means in which musical ideas have been expressed. In order for performances of musical works to be repeatable, musical instruments are necessarily fixed, stable and static; they exist before and after the composition and, crucially, don't change (or aren't perceived to have changed) in the meantime. While the rise of solely electronic musical practices (e.g., electronic dance music or acousmatic music) in recent decades

[1] The term 'affordances' comes from the work of James Gibson. "The *affordances* of the environment are what it *offers* the animal, what it *provides* or *furnishes*, either for good or ill." James Gibson, "The Theory of Affordances," in *The People, Place, and Space Reader*, eds. Jen Jack Gieseking and William Mangold (New York and London: Routledge, 2014), 56.

has weakened the place of acoustic musical instruments, they remain central to much contemporary music making.

I am interested in using electronic technology to critically engage the relationship between performer and instrument, and the relationship between audience and performer/instrument. In the submitted works, performers typically utilise established instrument-specific techniques. The use of technology modifies and extends the physical and mechanical qualities of those techniques to produce new sonic outcomes. Beyond simply creating new sonic outcomes, the technological mutation transfigures the semantic and cultural associations of these techniques.

A large number of New Music works combining acoustic musical instruments and electronic sound were created during the twentieth century. In the twenty-first century, the percentage of New Music compositions that in some way involve electronics has dramatically increased.[2] This commentary argues that alongside the increasing ubiquity of electronics, there has been a rise in an approach of 'composing the set-up'. As is discussed in 1.6, this is distinct from other approaches to composing with electronics, such as pieces that used pre-recorded sound like Luigi Nono's *sofferte onde serene* for piano and tape (1976)[3].

As this approach remains under-theorised, documenting this shift within contemporary music practice; providing terminology and frameworks for discussing this approach; and articulating different sub-strands within this broader approach are all integral to the research aims of this project, as they provide the context within which to discuss my own work.

This portfolio features seven works:

1. *Nara* (2017) for solo hexaphonic electric guitar.

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[2] Celeste Oram, in her reflection of Darmstadt 2014, highlights the ubiquity of electronic technology in the festival. "This year's Darmstadt Summer Courses for New Music were plugged-in, wired-up, mixed-down, line-out. Scarcely a main-stage concert wasn't amplified, at the very least. More often, new works synthesised spatialised sound design, video material, lighting and electronics in high-tech, high-concept performances." Celeste Oram, "Darmstadt's New Wave Modernism," *Tempo* 69, no. 271 (2015): 57

Compare with Steve Crowther's review of 1994's Huddersfield Contemporary Music Festival, which highlights ten works. Only two of which contain electronics (both tape parts only). Steve Crowther, "Huddersfield Festival, 1994," *Tempo* no. 192 (1995): 38

[3] I am not including links to repertoire works, although I have provided them in some instances.

Duration: 12’30
Performances: The Harrison, London (November 2018).
Performed by Ben Jameson.

2. *Partial Arenas* (2018) for four electric guitars and live electronics.
Duration: 12’30
Workshopped at City, University of London (June 2018).
Performed by Zwerm Electric Guitar Quartet.

3. *Mikrophonie III* (2018) for percussion trio.
Duration: 9’30
Performances: Austin, Texas (January 2019) and the University of Texas – San Antonio (March 2020).
Performed by Line Upon Line.

4. *Candela* (2019) for violin, electronics and light.
Duration: 9’30
Workshopped at the University of Southampton (March 2019).
Performed by Mira Benjamin.

5. *Alias States* (2019) for piano and electronic drumkit.
Duration: 10’
Performances: City, University of London (December 2019) and Kings Place (June 2021).
Performed by GBSR Duo.

6. *Charlene from Big Data* (2021) for voice, accordion, clarinet in Bb, and electronics.
Duration: 5’15
Workshopped at the University of Southampton (June 2021).
Performed by Peter Falconer, Heather Roche and Eva Zöllner.

7. *Piano Nudes* (2020 – 21) for piano and electronics.
Duration: 18’40
Movement 1 workshop recorded June 2020. Performed by Yshani Perinpanayagam.
Movement 2 (computer mock-up).
Movement 3 workshop recorded October 2021. Performed by Yshani Perinpanayagam.

The commentary is structured in two parts. The first part consists of four chapters. Chapter one considers musical instruments in relation to technology, performers, context and listening. By considering musical instruments through this relational definition of four key areas, new creative possibilities are opened for composition. Chapter two defines the key term ‘set-up’. Part of this definition is created through a review of eight contemporary works that locate my approach within a network of other practitioners. This review illustrates the importance of ‘set-ups’ when working with electronically enhanced musical instruments. The third chapter presents a case study of Stockhausen’s *Mikrophonie I*. I argue that this work from 1964 is an important antecedent of this compositional approach, as part of the creative act is the construction of the highly specific set-up. The set-up and the relationship between the set-up and musical material are considered. Chapter four presents a second case study of Sarah Nemtsov's 2014 composition *Drummed Variation.* Of particular interest here is the way that the set-up transfigures largely idiomatic drum writing.

The purpose of both case studies is twofold; to investigate the works themselves but also to build up language and frameworks that will enrich the discussion in part two.

The second part features chapters five, six and seven. Following a section that explores the methodological approach of the creative work, chapter five provides information and commentary on each of the seven compositions included in the portfolio. That is, the set-up for each piece is defined, followed by reflection on the relationship between the set-up and the musical material. Chapters six and seven provide a critical reflection across the submitted compositions, focusing on the key themes of form and technology. These themes are important and relevant to all compositions and allow me to explore central components across my practice. Finally, I reflect on the works and offer some concluding remarks.

Part One: Context

Chapter 1 Approach to Musical Instruments

This research engages the conventional playing techniques of musical instrumental practice, as well as the idiomatic associations of instruments. The use of electronic technology is engaged to defamiliarise these conventions while retaining the identity of the instrument. The term 'identity' is explored in the following chapter, but essentially refers to the combination of physical, sonic, and cultural characteristics of a given instrument. This approach is distinct from other compositional traditions that turn objects into instruments, such as the siren in Edgard Varèse's *Ionisation* (1929 – 31); build new instruments, such as Evan Parker's heteroglottal clarinet[4] ; or that develop new, extended techniques for playing instruments, such as Helmut Lachenmann's *musique concrète instrumentale*. Rather this work engages conventional instruments and largely conventional idiomatic instrumental writing within the context of an electronically enhanced environment to create new creative and compositional possibilities for those materials and new (defamiliarised) ways of hearing them.

The electronic technology is not intended to significantly disrupt the relationship between the performer and instrument; the technology doesn't require performers to develop new skill sets or to extensively modify existing skills but is intended to alter how audiences hear musical instruments. The electronic technology changes our experience of these familiar objects, listening methods, and cultural connotations. It is in the space that opens between the sounds we hear, the playing we see, and the connotations we have that I explore new musical expressions. The musical material for each work investigates these ideas through exploration of the qualities of each specific set-up.

In these compositions, familiar musical instruments are positioned as dynamic artefacts that exist in a network of relations that highlights their technology; instrument-to-performer relationship; context; and how we listen to them. Simultaneously retaining and displacing the identity of the existing instruments produces a blending of the familiar and unfamiliar. Within literature studies, this has been discussed as a disjunct or the 'uncanny':

> But the uncanny is not simply an experience of strangeness or alienation. More specifically, it is a peculiar commingling of the familiar and unfamiliar. It can take the form

[4] David Toop (ed.) *New/Rediscovered Musical Instruments: Volume 1* (London: Quartz/Mirliton, 1974), 14.

> of something familiar unexpectedly arising in a strange and unfamiliar context, or of something strange and unfamiliar unexpectedly arising in a familiar context.[5] [6]

In this compositional approach, the addition of electronic technology to the set-up offers the possibility for uncanny experiences of musical instruments.

In the eighteenth and nineteenth centuries, most Western art works were for a relatively small number of instrumental combinations (the musical 'medium'), such as the orchestra, piano trio, string quartet, or wind quintet. Furthermore, the understanding and practice of musical 'medium' in the eighteenth and nineteenth centuries was both highly standardised and circumscribed. Standardised in that it referred to specific configurations (e.g., the orchestra or string quartet) and circumscribed in the sense that the realm of possibility was limited: only certain types of activities could take place; the pianist could not start clapping. The understanding and practice of musical 'medium' expanded in the twentieth century to include non-standardised instrumental configurations (e.g., Varese's *Octandre* (1923) for four woodwinds, three brass and double bass). More radically, the scope of 'medium' also expanded to include instrumental modification (e.g., Cage's prepared piano) and the use of sound-producing devices not typically regarded as a musical instrument (e.g., Satie's use of the typewriter in *Parade* (1917)). While the works by Varese, Cage, and Satie are acoustic, from the perspective of this commentary, their approach to instrumentation can be viewed as precursors to the 'set-up' approach. That is, these works devise a distinctive musical situation rather than relying on the historical approach of composing for established ensembles. Like the works composed for this PhD, these works comprise the physical and sounding possibilities of unique musical situations. Parts of the work cannot be abstracted and arranged for other configurations, as the work is not just the musical material; the construction of the set-up is an intrinsic part of the work. Finally, this approach makes use of existing relationships performers and audiences have with established musical instruments.

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[5] Nicholas Royle, *The Uncanny* (Manchester: Manchester University Press, 2003), 1.

[6] Or more specifically, *Das Unheimliche*, from Freud, rather than with the more common association to the supernatural: "Freud was perhaps the first to foreground the distinctive nature of the uncanny as a feeling of something not simply weird or mysterious but, more specifically, as something strangely familiar". (Ibid., vii.)

The set-up is central to all seven works in the portfolio. In short: *Alias States* features an electronic drumkit programmed to produce piano pitches. In *Candela*, the violin is extended into a super instrument of sound and light. *Charlene from Big Data* is for live and sampled accordion and clarinet, as well as auto-tuned voice. *Mikrophonie III* takes a multimedia approach to investigate Stockhausen's work. In *Nara* the audience is 'placed' within the impossible listening position of in-between guitar strings. *Partial Arenas* elevates the often 'hidden' mechanical sounds of performance into musical material. And *Piano Nudes* adds microtones from an extensive piano sample library into an equal-tempered piano.

1.1 Towards a definition of musical instruments

Academic discourse on musical instruments is predominantly the domain of organology, the scientific study of sound-making devices. Although this approach in recent years has expanded beyond the study of the physical attributes of musical instruments, historically organology primarily engaged with this definition of musical instruments.[7] Physical attributes are important to this research but provide a point of departure, rather than a primary focus, to further consider what musical instruments are and how we, as composers, approach writing for them. This departure from the physical attributes of musical instruments leads us to ontological questions (what is a musical instrument?)[8] and onwards to more complex queries, such as: where are the limits or boundaries of what this musical instrument is? When does it stop being this musical instrument? How much of the instrument can we alter before it is no longer that instrument? And what opportunities do these perspectives offer the composer?

In order to move beyond the physical, we need to consider some other ways in which musical instruments can be defined. Alongside the physical elements, here I propose an approach to musical instruments that accounts for issues of technology, engagement, context, and modes of

[7] See the Hornbostel–Sachs system.

[8] This draws on Samuel Wilson's analysis of Helmut Lachenmann's *Serynade*, in which he asks, "what is the piano?" to deconstruct how the instrument is used in the composition. Samuel Wilson, "Building an Instrument, Building an Instrumentalist: Helmut Lachenmann's Serynade," *Contemporary Music Review* 32, no. 5 (2013): 426.

listening. This relational conceptualisation[9] of musical instruments provides a way to discuss works that include composed set-ups as an intrinsic part of the artistic practice.

1.2 Musical Instruments as Technology

Acoustic musical instruments are not typically presented as technology. This can lead them to be seen as 'natural' and outside or separate from the forces at work in technological design, development, and modification: "'technology' is not just what is new and, as such, visibly technological; there is technology in what is taken for granted, a dimension that is naturalised, and hidden."[10]

When musical instruments are seen as technologies, we can understand their histories of change and development before becoming 'closed'. Technological closure is a term Bijker and Pinch use to describe the process of an object achieving a period of stasis in its development:

> Closure occurs in science when a consensus emerges that the "truth" has been winnowed from the various interpretations; it occurs in technology when a consensus emerges that a problem arising during the development of technology has been solved. When the social groups involved in designing and using technology decide that a problem is solved, they stabilize the technology. The result is closure. Closure and stabilization, however, are not isolated events; they occur repeatedly during technological development.[11]

The social construction of technology (or SCOT), which emerged in the 1980s through the work of Bijker and Pinch among others, aimed to "extend… the relatively new but already well-established

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[9] Wilson and Magnusson provide other ways to conceptualise the musical instrument, both of which have informed this work. See Samuel Wilson, "Building an Instrument, Building an Instrumentalist: Helmut Lachenmann's Serynade," *Contemporary Music Review* 32, no. 5 (2013) and Thor Magnusson, *Sonic Writing: Technologies of Material, Symbolic and Signal Inscriptions*, (London: Bloomsbury Academic, 2019).

[10] Samuel Wilson, "Building an Instrument, Building an Instrumentalist: Helmut Lachenmann's Serynade," *Contemporary Music Review* 32, no. 5 (2013): 427.

[11] Wiebe E. Bijker, Thomas P. Hughes, Trevor Pinch, "Common Themes in Sociological and Historical Studies of Technology: Introduction," in *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology*, 4th edition, ed. Wiebe E. Bijker, Thomas P. Hughes, Trevor Pinch (London: MIT Press, 1993), 12 – 13.

sociology of scientific knowledge into the realm of technology."[12] Appraising musical instruments through this lens introduces some useful language, as well as challenges the perception of them as fixed or static artefacts; musical instruments exist as dynamic objects in flux that change according to use.

Although, as Bijker and Pinch describe, technologies do stabilise, they can be 'opened' and 'closed' repeatedly when 'problems' in the technology need to be 'solved'. Perhaps the modular nature of some musical instruments could be considered as simply the opening and closing of the design of that instrument: brass instruments with mutes, the electric guitar with amplifiers and audio effect pedals[13], or the drumkit with its many possible setups.

Consider a piece of technology *par excellence*: the piano. The mechanisms and construction of the piano are due to development of different complementary technologies over centuries. The development is not linear and the stabilised closed instrument of the 21st century[14] belies the many modifications, changes, and models of its history. These versions of the piano include, but are not limited, to extra pedals; changes to the physical structure; pipes; extra strings; and more keyboards.[15] Today the number of pedals on a piano isn't fixed and depends on the model. Without specifying a particular piano, however, compositions for piano necessitate a level of standardisation and convention, that is predicated upon the agreement of the 'social groups' who use the technology, that the piano is stabilised. The piano then, as any musical instrument, is a technology with a history of development, modification, and change. As technology, it has the possibility to be opened and closed while retaining its identity as a piano. This ability is crucial for this study.

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[12] Wiebe E. Bijker, Thomas P. Hughes, Trevor Pinch, "General Introduction," in *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology*, 4th edition, ed. Wiebe E. Bijker, Thomas P. Hughes, Trevor Pinch (London: MIT Press, 1993), 1.
[13] Audio effects are different from sound effects. See Vincent Verfaille, Catherine Guastavino, Caroline Traube, "An Interdisciplinary Approach to Audio Effect Classification," *Proceedings of the 9th International Conference on Digital Audio Effects (DAFx-06)* (Montreal, Canada, September 18th to September 20th, 2006): 1.
[14] Modifications to the piano continued until the 19th century. See Gary Butler, "Prepared Instruments in Improvised Music: Precedents and Purposes," (PhD diss., University of Wollongong, 2000), 44.
[15] Ibid., 42 – 73.

1.3 Musical Instrument-to-Performer Relationship

Another way to consider the musical instrument is in relation to its users; that is, the terms with which performers interact with it. Magnusson has provided a useful set of terms to describe musical instruments, our relationships with them and how these change with time, material, and tradition. Of particular relevance here is the notion of *ergomimesis,* which refers to how instrumentalists apply performance techniques from acoustic instruments to new digital instruments.[16] Ergomimesis describes the gestures that are adapted from the interaction with existing technologies to new technologies and, broadly, across different media too. This idea can also be applied to the new technology itself (the object or artifact). An example of an object displaying *ergomimetic* qualities is a MIDI keyboard, which is ergomimetic because its physical structure is based on the piano.

Gestural types of ergomimesis can be considered in three ways: *identical*, *divergent*, or *transduced*. These three types describe the closeness of simulation to the original: identical ergomimesis could simply be the replication of performative gestures from watching others; divergent ergomimesis suggests a modification of performative gestures; transduced ergomimesis is a further step away from the initial embodied technique and suggests a greater disruption in interface that would lead to substantial physical adaptations from the performer. The three examples Magnusson provides illustrate the differences between identical, divergent, and transduced, respectively: "a student of the guitar learning from a teacher", "a saxophonist applying their skill when playing the clarinet", and "where a pianist plays on a touchscreen".[17]

An example from Pinch further expounds how instruments and instrumentalists impact upon each other. The decision of instrument designer and maker Robert Moog to incorporate a keyboard into the physical design of his new modular synthesizer instrument (1963) meant that performers interacted with it in a similar way to a piano.[18] In contrast, Don Buchla rejected the keyboard interface in the synthesizers he made around the same time: "(a) keyboard is dictatorial. When

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[16] Thor Magnusson, *Sonic Writing: Technologies of Material, Symbolic and Signal Inscriptions*, (London: Bloomsbury Academic, 2019), 10.

[17] Thor Magnusson, "Ergodynamics and a Semiotics of Instrumental Composition," *Tempo* 73, no. 287 (2018): 44.

[18] Trevor Pinch, "Voices in the Electronic Music Synthesizer: An Essay in Honor of Don Ihde," in *Postphenomenology: A Critical Companion to Ihde*, ed. Evan Selinger (Albany: State University of New York Press, 2006), 55.

you've got a black and white keyboard there it's hard to play anything but keyboard music."[19] While Moog synthesizers offer a range of controls over the sound, the keyboard strongly impacts how performers interact with it. This interface encourages divergent ergomimetic gestures from keyboard and piano players. In the case of Buchla, the absence of this interface means that the synthesizer is approached without this relationship; in this respect we could consider the Buchla example, and not the Moog, a new instrument.

Samuel Wilson's concept of 'pedagogy' offers another way of conceptualising the relationship between performer and instrument. For Wilson, the term describes the learnt, embodied relationship between instrument and instrumentalist and is used in order to "evoke the fact that relationships between bodies and instruments are shaped by specific forms of training".[20] Rather than considering a musical instrument's development as a separate process, in his analysis of Lachenmann's *Serynade*, Wilson argues that both instrument and instrumentalist are "shaped in relation to each other".[21] Instruments and performers are shaped by historical forces and, importantly, each is shaped in relation to the other and not separately. When an audience experiences the immediacy of performance, in which the performer interacts with their instrument, this is the front-facing sheen that hides a complex relationship between past and present.

The piano, therefore, has helped shape the pianist and vice versa. The pianist playing the Moog Synthesizer, through the application of divergent ergomimetic piano technique shapes the way we experience the instrument. The techniques of performers are as much a product of established conventions over time, as the instrument-object. Both Magnusson's ergomimesis and Wilson's *pedagogy* help us understand that our perception of the identity of a musical instrument is, in part, due to the human user, how they negotiate the physical artifact, issues of performativity, and movement.

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[19] Trevor Pinch, "Voices in the Electronic Music Synthesizer: An Essay in Honor of Don Ihde," in *Postphenomenology: A Critical Companion to Ihde*, ed. Evan Selinger (Albany: State University of New York Press, 2006), 57.

[20] Samuel Wilson, e-mail message to the author, April 17, 2019.

[21] Ibid.

1.4 Musical Instruments and Context

The identity of musical instruments is impacted on by the context in which they are experienced. Context, here, relates to musical instruments in time and space. Musical instruments occupy spaces and places and, as such, are entangled with peoples, societies, and cultures. This relationship is interdependent; musical instruments shape and are shaped by the cultures in which they exist.

<u>Spaces and places</u>

The listening environment confers cultural and social meaning and, as such, listening spaces are not neutral. An acoustic guitar played on a beach is different from one played in a pub or a concert hall, and in turn is experienced differently in each place. In spaces in which dancing is encouraged, our listening might be in conjunction with physical movement – "physical listening". In a concert hall we may attend to the music played by an ensemble in a highly focused way – "musical listening."[22] Although there is a rich discourse on listening conventions in different spaces[23], the key point for this project is that the listening space factors into our understanding of musical instruments.

<u>Cultural context</u>

The violin and fiddle are considered two distinct instruments, even though they are technologically identical. The distinction is formed beyond the physical and highlights the importance of context to how musical instruments are understood; they are cultural objects and connote symbolic, referential, and social meaning.[24] In addition to the co-dependent history and

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[22] Marko Ciciliani, "Music in the Expanded Field – On Recent Approaches to Interdisciplinary Composition," in *Darmstädter Beiträge zur Neuen Musik*, eds. Michael Rebhahn and Thomas Schäfer (Mainz: Schott, 2017), 31.
Further to this, David Huron's *Listening Styles and Listening Strategies* outlines twenty-one distinct ways we listen, highlighting how interrelated space and listening practices are.
[23] See Christopher Small, *Musicking: The Meanings of Performing and Listening*, (Middletown: Wesleyan University Press, 1998).
[24] Eliot Bates, "The Social Life of Musical Instruments," *Ethnomusicology* 56, no. 3 (2012): 364.

relationship between instruments and instrumentalists explored above (see 1.3), instruments also shape and are shaped by their societal and cultural environments.[25] In this sense, musical instruments are objects that produce, develop, and retain cultural identity:

> A musical instrument offers a special kind of materials memory, in its dual capacity of a physical body and its embodied acoustic identity. As a cultural product and also a tool to articulate cultural meaning through repeated sound, an instrument becomes a privileged site for retaining cultural memory[26]

Musical instruments are also themselves shaped, sometimes physically, by the culture in which they are used. Mark Katz, in his study of traditional Indian musics and the incorporation of musical instruments from outside of these traditions[27], observes that the violin in India was left technologically unmodified, as it could accommodate the needs of the social groups (see 1.2) that used it: the violin is capable of glissandi and microtones. The examples of the violin situated in Western classical music, the fiddle in Western folk, and the violin in traditional Indian musics highlight how the cultural context changes our experience of the same technology.

Furthermore, Katz highlights how the violin and the harmonium have been shaped differently by the cultural traditions of Indian musics. Whereas the violin remained technologically unmodified, the harmonium was adapted to allow for different tuning systems.[28] Matt Rahaim details these adaptations to the harmonium, including different reed tunings;[29] the addition of drone stops;[30]

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[25] Kevin Dawe, "People, Objects, Meaning: Recent Works on the Study and Collection of Musical Instruments," *The Galpin Society Journal* 54 (2001): 220.

[26] Regula Burckhart Qureshi, "The Indian Sarangi: Sound of Affect, Site of Contest," *Yearbook for Traditional Music* 29 (1997): 4

[27] Mark Katz, "Music as Technology" (lecture, St John's college, Oxford University, October 19, 2017).

[28] Ibid.

[29] Matt Rahaim, "That Ban(e) of Indian Music: Hearing Politics in The Harmonium", *The Journal of Asian Studies* 70, no. 3 (2011): 662.

[30] Ibid., 662.

and brass studs as extra keys to allow for microtonal pitches.[31][32] The harmonium in India has been technologically opened and closed to accommodate the needs of the societal groups that use it.

Therefore, the cultural context of musical instruments is, in part, key to audiences' experience, performer practice, and how composers write. Bates points to the importance of cultural context by highlighting the network of connections between instruments and people in different cultures: "Even the same instrument, in different sociohistorical contexts, may be implicated in categorically different kinds of relations".[33]

1.5 Musical Instruments and Listening Practices

Another key component within a relational understanding of musical instruments is the audience. Consideration of audiences centres listening experiences, instrumental practices, and the role of the visual in our experience of musical instruments. As such, discussions of listening practices include musical idioms, the visual domain, and the audience's relationship to the sounds themselves. Two ways of thinking about this rich and complex topic (which is increasingly the subject of creative and academic attention) are explored in the section below. Firstly, the physical construction of instruments stabilises and so does the kind of sound they produce; and secondly, listening to musical instruments engages the visual domain.

<u>The physical construction of instruments stabilises and so does the kind of sound they produce</u>

Instrumental practices develop within the context of idioms. As such, the sounds produced by musical instruments stabilise within specific socio-cultural contexts. For example, as Pinch says of the Moog synthesizer (although he could be talking about any number of examples) when he writes:

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[31] Matt Rahaim, "That Ban(e) of Indian Music: Hearing Politics in The Harmonium", *The Journal of Asian Studies* 70, no. 3 (2011): 665.

[32] Even these modifications didn't successfully enculturate the harmonium into Indian music practice. "There have been three principal objections to the harmonium. First, that it cannot glide smoothly between discrete notes; second, that its tuning is wrong; third, that it is un-Indian." Ibid., 658.

[33] Eliot Bates, "The Social Life of Musical Instruments," *Ethnomusicology* 56, no. 3 (2012): 364.

> The story is one of the interweaving of this technology with different "contexts of use" in the social construction of sound. Certain sounds predominate, they are recognizable sounds, sounds that are materially built into the technology and that can be reproduced.[34]

Returning to the distinction between the violin and the fiddle exemplifies this idea. The physical construction of both instruments is stabilised; the instrument-as-technology is the same. Through the context of their idioms, however, the kind of sound produced by both instruments is distinct.

Additionally, instrument sounds develop idiomatically in relationship with performer use. The drum-kit is an interesting case. It is not a single entity materially and sonically speaking. It connotes different things across musical practices and, as such, there are multiple stabilised drumkits and drum sounds that exist simultaneously.

Jimmy Cobb's jazz drumming techniques were developed from working through the acoustic possibilities of the drumkit, played with either drum sticks or brushes. Generally in a supporting role, this tradition of drumming also celebrates solos in which the drummer is given primary focus. Cobb's type of jazz drum solos elevated the possibility of variation and explored timbral and textural effects, dynamic variation, and changes in pitch, as well as more commonplace rhythmic complexities.

In contrast, we could consider the rock drummer Phil Collins who produced sounds that were far removed from those made by Cobb. The drum sound that Collins developed throughout the 1980s moved away from the limitations of the acoustic sounds producible from the materials of the drumkit's construction. Part of the quality of the deep rack and floor tom sounds that are clear identifiers of Collins' signature-sound is the combination of heavy reverb with a noise gate, which are typically post-production studio-based audio signal processing[35] effects but are here fundamental to the Collins drum sound. In this example, the influence of the recorded domain is felt on live performances. This development of drum sound is predicated on the affordances of rock performance venues; in order for the natural acoustic dynamics to be matched (or exceeded)

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[34] Trevor Pinch, "Voices in the Electronic Music Synthesizer: An Essay in Honor of Don Ihde," in *Postphenomenology: A Critical Companion to Ihde*, ed. Evan Selinger (Albany: State University of New York Press, 2006), 62.

[35] I use the phrase 'audio signal processing' to refer to the manipulation of sound before it is heard. This includes processes often referred to as 'audio effects', such as the addition of artificial reverbs, distortion, and delays.

by live audio signal processing there needs to be the context where loud amplification is possible and necessary for the music, genre and situation. While the Cobb example represents a purely acoustic approach, the Collins sound reflects a more technologically mediated approach.[36] This combination of acoustic musical instrument and electronic technology to produce a characteristic set-up is explored and developed in chapter two.

Instruments stabilise and produce recognisable sounds. These recognisable sounds are further stabilised within the context of idioms. Additionally, certain performers have shaped the sounds of instruments within genres idiosyncratically, allowing for a range of stabilised sounds to exist simultaneously. Both Cobb and Collins extended drum practice within the conventions of their respective genres, expanding the sonic qualities of the drumkit and drum performance techniques, and contributing to the constitution of these cultural grounds. The idiomatic differences between Cobb and Collins are subsumed into the instrumental practice of the drumkit, rather than seen as distinct instruments with their own practices.

<u>Listening to musical instruments engages the visual domain</u>

Part of the experience of listening to acoustic musical instruments is visual. In live performance, the input action of the performer and the resulting sound produced by the instrument has a direct and clear relationship. The mechanisms for producing the sound can be visible (i.e., the violin bow exciting the strings of a violin) or hidden (i.e., hammers striking the strings of a piano). The instrument's interface (i.e., where the performer engages with the instrument) can be part of the sound production mechanism (i.e., the strings and fretboard of a guitar) or adjacent to it (i.e., the keyboard of an organ). Furthermore, the gestures of a performer add a cultural layer to these movements. How these actions are performed with instruments is located in, and informed by, different musical idioms. "The human gesture, the action, exists as a neurological structure in the individual, and as a cultural phenomenon supported by technology".[37] Our experience of the sounds produced by performers interacting with acoustic instruments engages both the causal and the cultural.

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[36] Compare Cobb's drumming on *A Kind of Blue* (1959) with Collins' drumming on *Face Value* (1981).

[37] Thor Magnusson, "Ergodynamics and a Semiotics of Instrumental Composition," *Tempo* 73, no. 287 (2018): 44

Performances using digital musical instruments (DMIs) disrupt this observable gestural cause and sonic effect. The mechanisms of sound production in DMIs are largely hidden and are programmable to produce different sonic outputs. Magnusson describes this as a 'black box'[38] because the internal workings of DMIs are hidden, changeable, and multi-valent. DMIs typically have single or multiple interfaces that range from those with a level of similarity to acoustic instrument interfaces (i.e., a MIDI keyboard resembling an acoustic piano keyboard) to those that are completely dissimilar (i.e., the Kaosspad (see Chapter 4)). As such, DMIs can reproduce or disrupt how audiences and performers experience the sound-making processes of performance.

The visual domain becomes more complex when considering that modern music performances from a range of traditions often utilise mediatised[39] images. These appear either in the form of film[40] or static images/text, projected onto different materials in live performance spaces, from the standard projection screen to television screens, gauzes, or other non-specialist surfaces. Arguably, the most common mechanisms used to present mediatised images are either to use real-time footage captured by a camera, or to use pre-made content.[41]

An example of real-time footage captured by a camera and replayed into the performance space is Michael Beil's *Caravan* (2017) in which the actions of the live performers are filmed and then replayed onto a projection screen (see pic. 1.1). Here, the mechanism of live capture is focussed on the performers.

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[38] Thor Magnusson, *Sonic Writing: Technologies of Material, Symbolic and Signal Inscriptions*, (London: Bloomsbury Academic, 2019), 35

[39] I use the term 'mediatised' to refer to images reproduced on film. This comes from Auslander's text on 'liveness' discussed in this section.

[40] Following on from Kyriakides, I use the term 'film' to refer to moving images: "the term 'film'…is no longer used just for the medium itself, but to describe a process and an object of moving images." Yannis Kyriakides, "Imagined Voices: A Poetics of Music-Film-Text," (PhD diss., Leiden University, 2017), 6.

[41] Others include producing generative visuals through the use of algorithms, or VJing, in which performers mix video in real-time from a library of pre-made clips.

Picture 1.1: Michael Beil's *Caravan*[42]

Using pre-recorded clips is another way of incorporating mediatised images into a performance space. This is the mechanism that underpins Stefan Prins' *Piano Hero #1* (2012) in which the MIDI keyboard is programmed to trigger pre-made film clips (with sound) of another performer interacting with the insides of a piano, projected onto a screen behind the live performer (see pic. 1.2). This work also features a moment of real-time film capture (explored further in 2.2) where the live performer is projected onto the screen in place of the pre-recorded material, illustrating both types of mechanism discussed.

[42] "Michael Beil: Composer," Michael Beil, accessed August 17, 2021, https://www.michael-beil.com/caravan/2018/3/25/z175oypg5vi0dxe6abst0ju9nb3oro.

Picture 1.2: Stefan Prins' *Piano Hero #1*[43]

Another category to consider is where in the performance space the visuals are presented. The most common example, as seen in both the Beil and the Prins examples above, is to project onto a screen placed above and behind the performers. Projection onto the performers or instruments offer alternatives: Celeste Oram's *Toccata & Bruise* (2016), for example, treats the piano as the canvas for the film projection of moving hands (see pic. 1.3).[44]

[43] "Stefan Prins," Stefan Prins, accessed August 17, 2021, https://www.stefanprins.be/eng/composesInstrument/comp_2011_01_pianohero.html.

[44] Another example of this is the use of gauze in Prins' *Generation Kill* (2012).

Picture 1.3: Celeste Oram's *Toccata & Fugue*[45]

Most commonly, there are works that share a similarity with film music, in which we watch a film accompanied by live music. One example is Philip Venables's *Illusion* (2015, revised 2017) in which the film is synchronised with the score via a click. In this work the projection screen is placed above and behind the performers and the film content is pre-made, rather than real-time (see pic. 1.4).

[45] "Celeste Oram," Celeste Oram, accessed May 5, 2018, http://celesteoram.com/toccata-bruise-2016-score-materials.

Picture 1.4: Philip Venables' *Illusion*[46]

This 'film music' approach presents a separation between the two domains of live performers and mediatised images. This separation is physical (i.e., the screen is placed above and behind the performers (unlike the Oram example), but also performative (i.e., the film is not triggered by the performers and no attention is drawn to the relationship between the gestures of the performers and the outcome of the film, as in conventional film music). Other examples of this fourth type include the 'music-text-film' works of Yannis Kyriakides, such as *The Musicians of Dourgouti* (2017) in which text is projected behind the performers; the collage of quotations from the music and life of the pop star Prince in Nicole Lizee's *Softcore* (2017); and Simon Steen-Andersen's *Asthma* (2017, revised 2019), which offers another version of this approach and enacts a strong synchronicity between film and audio; the unpitched 'breath' noises made by the opening and closing of the accordion bellows provides the audio to a film made from clips depicting breathing, breath, or air.

[46] "Philip Venables," Philip Venables, accessed August 17, 2021, https://philipvenables.com/wp-content/uploads/2017/07/DEUVVrJWsAANtLx.jpg-large.jpeg.

In works in which the film is projected above and behind the performers, there is "the natural tendency for the visual image to predominate."[47]

The potential dominance of the screen is addressed by Auslander in his text *Liveness, Mediatization, and Intermedial Performance*, where he considers how audiences experience multimedia performance. Auslander argues that the culturally dominant medium of the time (in this case, television) acts as a frame to fuse the different domains of the live and pre-recorded: "It is, then, distinctly possible that in a culture dominated by the television, live and recorded images are not perceived as intrinsically different – both are perceived as potentially televisual."[48] In this reading, the separation between the performance space of the live performers and the projection screen for the film in the Venables, Kyriakides, Lizeé, and Steen-Andersen examples is bridged by the televisual frame. The physical separation of each place of performance (i.e., the stage and the screen), however, is important and is less obvious than in works in which these two places are joined (e.g., the Oram) or there is a clear and active relationship between the two domains (e.g., the Beil).

Beil sets out three possible relationships between live music performance and film: 1) both elements run independently; 2) the use of cues or sync points in order to provide a fixed and synchronised relationship; or 3) the film becomes a part of the compositional process.[49] Beil's work synthesises the film element with other musical materials, engaging the third of these relationships. Beil's more integrated approach provides the strongest reference point to my work and provides a model for the incorporation of film into composed set-ups. *Mikrophonie III* (see 5.5) uses this solution to synthesise mediatised images into the set-up and overcomes potential issues of hierarchical inequality between live performers and film.

The discussion of musical Instruments and listening practices has included consideration of two ideas. Firstly, as instruments become stabilised as technological objects, the sounds that they produce become stabilised and recognisable. These recognisable sounds are developed within the

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[47] Michael Beil, "AV - Music and Video," *eContact!*, 13, no. 2 (2011). https://econtact.ca/13_2/beil_AV.html.

[48] Philip Auslander, "Liveness, Mediatization, and Intermedial Performance," *Degrés: Revue de synthèse à orientation sémiologique*, no. 101 (2000): 10.

[49] Michael Beil, "AV - Music and Video," *eContact!*, 13, no. 2 (2011) https://econtact.ca/13_2/beil_AV.html.

context of idioms. Furthermore, instrumentalists shape the sound of instruments within idioms, allowing for multiple simultaneous stabilised instrumental sounds. Secondly, part of the listening experience is visual. The action of an acoustic instrument performer produces a consequent sonic result. In some situations, such as performances that make use of mediatised images, this relationship is disrupted. Audiences' relationships with musical instruments, therefore, contribute to the construction of the identity of musical instruments. The two areas explored (instrumental practices and the visual domain) provide a starting point for the inclusion of the listener in this relational definition of musical instruments.

1.6 Electronically Enhanced Musical Instruments

The addition of electronic technology into ensembles performing concert music[50] has become commonplace. In this context, the use of technology could fall into three main categories. Firstly, the use of electric instruments in ensembles, including electric guitars and synthesizers. Secondly, through the use of a fixed media or tape part. Tape parts are pre-recorded and designed to be performed synchronously or asynchronously with live performers. A prominent example of this is Steve Reich's *Electric Counterpoint*, in which the recorded guitar parts are played back into the performance space while the live guitarist plays synchronously with them. Finally, through the use of live electronics in which acoustic sounds are processed in real time. Stockhausen's *Mikrophonie I* (discussed in chapter three) exemplifies this approach.

Super Instruments and Hyper Instruments

Further to the categories set out above, and providing possibility of a synthesis of all three, is the rise of the 'super instrument':

> The idea of a super instrument is rather broad and almost philosophical: it is a piece-specific concept or phenomenon that does not refer to a specific instrumentation or technological solution but to any constellation that aims at multiplying the capabilities of a performer, making them to (sic) achieve results that they normally could not reach.[51]

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[50] Distinct from electro-acoustic music or sound art.

[51] Maria Kallionpää, "Performing the Super Instrument: Reaching Beyond Technical and Expressive Capabilities," (paper presented at the Electronic Visualisation and the Arts Conference, London, July 12-14, 2016): 28.

The super instrument provides a useful starting point for this project, in which the 'piece-specific concept' is relatable to 'composing the set-up'. However, super instruments foreground the physical characteristics of the musical instrument-as-object over other important components in the set-up, including the performers themselves.

Hyper instruments combine (often physically adapted) musical instruments with computer systems to translate performance gestures into new sonic outcomes: "The basic concept of a hyperinstrument is to take musical performance data in some form, to process it through a series of computer programs, and to generate a musical result."[52] One example is the Electrumpet[53], in which a trumpet is enhanced through the addition of extra knobs and sensors on the existing valves that are linked to an operating system built in Max. An example of this interactivity between the acoustic trumpet and the digital system is on the third valve of the Electrumpet, in which two pressure sensors gauge changes in valve position resulting in continuous pitch transposition over three octaves.[54]

This PhD project shares some similar characteristics with the approach of hyper instrument makers, as this way of working often requires technological adaptations to an instrument that produces changes to performance technique. Hyper instruments, however, often require performers to make significant changes to their established technique, unlike the works that comprise this PhD, in which retention of the existing relationship between instrumentalist and instrument is key. As a result of producing new instruments or devices, hyper instruments are often developed by, or in conjunction with, specific performers.

Both super and hyper instruments combine electronic technology with acoustic musical instruments but deviate from the approach of this project, as they primarily engage with the

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[52] Tod Machover, "Hyperinstruments" (A Progress Report 1987 – 1991, MIT Media Laboratory, 1992), pp. 4. https://www.media.mit.edu/publications/hyperinstruments-a-progress-report-1987-1991/.

[53] Hans Leeuw, "Designing Expressive Engagement with Electronic and Hyper Instruments. The Electrumpet a Case Study", (PhD diss., University of Huddersfield, 2019), 12 - 13.

[54] Ibid., 56.

physical properties of the instrument-as-technology. This focus of technological innovation, emphasis on expanding technological possibilities, and production of individual and idiosyncratic instruments differs from works discussed in this PhD.

1.7 Musical Instruments: Conclusion

In proposing a relational conceptualisation of the musical instrument, we can move beyond an ontology deriving solely from the physical. Although the physical domain is an important component of musical instruments' identity, conceiving them as more complex assemblages provides a framework to discuss the relationship between instrument and instrumentalist and how this relationship is experienced by audiences. This relational approach, therefore, requires an understanding of technology, performers, context, and listeners. Firstly, musical instruments are technological objects that develop according to the contexts of their use. Traditional acoustic instruments are 'closed' technological objects but are, as they have been historically, capable of being 'opened' to allow for modifications while retaining their identity. Secondly, musical instruments exist in relation to their performers and, as such, the techniques, gestures, and actions used by instrumentalists to interact with their instruments are part of the identity of musical instruments. Thirdly, the context in which we hear musical instruments confers cultural, symbolic, referential, and social meaning to our experience of them. Finally, another key relationship is that of listening practices. This includes: the impact of where audiences listen on how they listen; the implication of instrumental practices on listening; and the role of the visual in our experience of musical instruments. All these interrelated areas are proposed together; each one should not be taken singularly. Additionally, this conceptualisation relates specifically to acoustic musical instruments presented in performance situations.

This conceptualisation provides a framework for discussing works in which acoustic instruments are modified by electronic technology. The discussion of my compositional decision-making (in chapters five, six, and seven) draws upon the different elements of this framework. More prominence, however, is given to issues of technology and the relationship between performers and instruments than the other areas of this framework. The submitted works (discussed in chapters five, six, and seven), as well as the two case study works (in chapters three and four), are composed for set-ups formed from acoustic musical instruments and electronic technology. In each case, the electronic technology used in conjunction with acoustic musical instruments produces a bespoke set-up. The application of electronic technology is engaged to transfigure the relationships outlined above, altering our perception of the acoustic musical instrument. These set-ups critically engage the idea of acoustic musical instruments while retaining their identity.

Chapter 2 Set-ups

2.1 Defining the Term 'Set-up'

The term 'set-up' refers to all the human and non-human components used for the realisation of a work. Traditionally, this is referred to as the medium and is considered as the 'vehicle' for artistic expression: "the kind of stuff employed in the making of the thing that conveys an artistic content".[55] Within this conceptualisation, the art or the creative act is distinct from the medium that produces it. By locating the set-up as an integral part of the compositional process, the 'vehicle' becomes part of the "artistic content." Stockhausen's *Mikrophonie I* is a clear example of this (discussed in Chapter 3), in which the musical material is produced through exploration of the created environment of the tam-tam, performers, and electronics.

Including the performers as part of the set-up is integral to the subsequent compositional possibilities. For example, the feet of a piano player offer potential sites of interacting with an instrument. This identification of all components, human and non-human, in a set-up is influenced by Actor Network Theory (ANT) in which (broadly) each component is considered an actor within a network. All actors are considered to have agency, are not placed in a hierarchy, and "their identity is defined through their interaction with other actors."[56]

Before settling on 'set-up', I considered other terms such as 'environment', 'assemblage' or 'network'. These are useful synonyms, but each carries additional meanings and more cultural associations. 'Environment' suggests the inclusion of the space in which the components are placed, which is not always controllable. 'Assemblage' has its roots in Deleuzian philosophy, which has not especially informed this work. And 'network' is suggestive of ANT, which again was not a central concern. I was attracted to the simplicity and relative neutrality of the term 'set-up'.

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[55] David Davies, "Medium," in *The Routledge Companion to Philosophy and Music*, eds. Theodore Gracyk and Andrew Kania (Abingdon: Routledge, 2011), 49.

[56] Darryl Cressman, "A Brief Overview of Actor-Network Theory: Punctualization, Heterogeneous Engineering & Translation," *Simon Fraser University: Summit – Institutional Repository* (2009): 3. https://summit.sfu.ca/item/13593.

Performer-controlled Set-ups

It is possible to differentiate between two types of set-ups: a fixed set-up and a performer-controlled set-up. This distinction describes the level of integration of all the components of a set-up. Works that include fixed media, such as tape parts or films that run alongside live music performance (see 1.5), are commonplace in New Music. These components are intrinsic parts of the set-up but lie beyond the control of the performer; some elements are fixed. This compares with set-ups in which the performer or performers are able to interact with all the components. I refer to this type of set-up as a performer-controlled set-up. Furthermore, within performer-controlled set-ups there are varying degrees of interactivity.

Working with performer-controlled set-ups became an interest to Stockhausen in the 1960s. He describes placing control of a work's electronics with the performer as a "synthesis of instrumental and electronic music" in which there are "different processes of sound production by instrumentalists and *simultaneous* transformation of these sounds by means of electronic equipment – also operated by musicians – with simultaneous playback over loudspeakers."[57] *Mikrophonie I* (see Chapter 3), with its uses of microphones, filters, and potentiometers is an example of a work in which the performers control all aspects of the electronic technology.

Developing performer-controlled set-ups is important to the compositional approach of this project, as using electronic technology to extend the established relationship between a performer and their instrument is a central research concern (see Chapter 5).

2.2 Set-up Defined with Examples of Bespoke Set-ups in Recent New Music

The following section examines eight contemporary compositions:

1. *Study for String Instrument #2* (2009) - Simon Steen-Andersen
2. *dead wasps in the jam-jar (iii)* (2017-18) - Clara Iannotta
3. *Last Song from Charleroi* (2017) - Joanna Bailie

[57] Karlheinz Stockhausen, *Mikrophonie I* (London: Universal Edition, 1964).

4. *Making One Leaf Transparent and then Another* (2012) - Newton Armstrong
5. *Key Jack* (2016) by Michael Beil
6. *Partial Filter* (2014) - Georgia Rodgers
7. *Piano Hero #1* (2011 - 12) - Stefan Prins
8. *Laplace Tiger* (2009) – Alexander Schubert

Each of these compositions illustrates work for a bespoke set-up that contains electronic technology in combination with musical instruments. In each example, the electronic technology is applied to the musical instruments, changing our experience of them. These changes occur according to the relational conceptualisation presented in chapter one and, as a result of the application of electronic technology, the musical instrument is transformed. This produces set-ups that are more circumscribed than existing configurations of music instruments or genres. Each of the examples show this but offer slightly different compositional approaches.

Each work was completed from 2009 onwards: by focussing on recent works, I aim to demonstrate that the set-up has become more central to New Music. In each case, I identify the components of the set-up before providing a description of the work. By considering them briefly here, I aim to locate my work within a wider network of contemporary practitioners.

Study for String Instrument #2 (2009) - Simon Steen-Andersen

1) For string instrument and whammy pedal.
2) The score offers the possibility of more string instruments/performers.
3) The whammy pedal (set to produce glissandi over two octaves) can be performed by the string player or by a separate performer.
4) A contact microphone is placed on the body of the string instrument routing the sound of the string instrument into the whammy pedal.
5) The sound from the whammy pedal is routed to a loudspeaker.
6) Steen-Andersen aims for the performance to include no acoustic sound of the string instrument through the application of mutes.

The string player uses conventional technique to play the glissandi figures, but the output sound is the string instrument processed through the whammy pedal. The consequent sonic commingling is important to our experience of the piece and exists across other Steen-Anderson works: “In his compositions, he often plays with perceptions in a way that makes it hard for us to distinguish whether what we are seeing is producing and determining the acoustic result, or vice versa."[58] The whammy pedal provides a digital replication of the glissandi possibilities afforded by the physical construction of the string instrument.

This example foregrounds a work for a composed set-up. The glissandi possibilities of both the string instrument and the whammy pedal are explored in the musical material and this interplay is the focus of the work. In the signal chain, the electronic technology is inserted after the instrument/instrumentalist, leaving the established technique of the performer and their instrument unmodified. The sound of the string instrument is affected and distinctly electronic in quality (see the discussion of Demers and electronic aesthetics in 4.2). As such, the identity of the string instrument is presented simultaneously modified (through the sound) and unmodified (through performer technique). Of all the eight examples, the Steen-Andersen work most closely connects with my work: the set-up is highly circumscribed and all components are explored in the work; electronic technology transforms an established acoustic instrument and the possibilities of the musical instrument are extended through this addition; our experience of the musical instrument is simultaneously changed and unchanged, as the string instrument retains its identity; and the musical material explores the affordances produced by the composed set-up.

dead wasps in the jam-jar (iii) (2017-18) - Clara Iannotta

1) For prepared string quartet and sinewaves.
2) Instruments adapted by placing paper clips across the strings.
3) The performers are, in almost all cases, restricted to bowing in between the placed clips.
4) The string quartet plays alongside sine waves which modulate the tones and perception of sound of the musical instruments.
5) The sine waves can be played out of laptop speakers or through a P.A. system.

There is some similarity between the sounds produced by the prepared string quartet and the sinewaves, which is achieved through specifically notated bow positions, pressures, and techniques. Due to this similarity, the sine waves seem like the performance space's resonant frequencies excited by the tones of the strings. The paper clips change the timbre produced by the strings and also delimit a smaller section of the fingerboard for the string players. Apart from

[58] "Ernst Von Siemens," Bernd Künzig, accessed March 28, 2019, https://www.evs-musikstiftung.ch/en/prize/prizes/composers-prize-winners-2017/simon-steen-andersen.html.

this alteration, however, the string players engage conventional performance techniques. The timbral changes afforded by the preparation are distinctive; the paperclips distort the string sound, producing metallic sounds, scratches, and rattles.

Like the Steen-Andersen, the physical relationship between the instrument and instrumentalist is minimally affected by the inclusion of electronic technology (i.e., the sine waves). Similarly, the audience's experience of the acoustic sound is transformed by the addition of electronic technology. The sine waves, however, aren't controlled by a human performer and run from a fixed tape part. This provides a distinct difference from the Steen-Andersen; where the whammy pedal is operated by a performer (a performer-controlled set-up), the sine waves are 'outside' the set-up (some elements of the set-up are fixed).[59]

Another important difference is the use of paper clips. This mechanical intervention in the technological construction of the instruments affects the performance areas of the violins, viola and 'cello. This is a deliberate disruption of the relationship between instrumentalist and instrument.

Last Song from Charleroi (2017) - Joanna Bailie

The set-up is:

1) For electric guitar quartet and tape.
2) The four electric guitars are played on the laps of the four performers or in the conventional playing position.
3) All four guitarists use ebows (a device which resonates the strings), bottlenecks and amplifiers.
4) The signal chains of all four guitars pass through volume pedals.
5) Two guitarists have wah-wah pedals.
6) Two guitarists have tremolo pedals (the speed of which is controlled by additional expression pedals).
7) There is a pre-recorded stereo tape part throughout, synchronised with the performers via headphones and a click track.
8) The tape part is routed to a P.A. system.

[59] The use of fixed components within a set-up is similar to the examples of 'film music' works discussed in the first chapter (see 1.5).

The sounds from the guitars blend with the tape part. For most of the piece, the tape part is comprised of a slowly shifting, low-pitched, environmental rumbling sound. Toward the end, the tape part also includes some limited noise of industry: the sound of mechanisms in motion and voices. This sonic synthesis is the result of expanded guitar practice through the use of specific but limited equipment and playing technique. The combination of ebows and bottlenecks produce the glissandi phrases that form much of the musical material for the guitarists. The effect pedals are used like post-production processors and not used performatively; the pedals craft the outputted sounds, artificially affecting the timbre and amplitude envelopes, rather than as sites of performance (i.e., the musical material doesn't exploit the sonic or gestural qualities afforded by activating the pedals).

The instrumental practice of the electric guitars is expanded through the inclusion of pedals and ebows. This expansion is typical of contemporary electric guitar practice and the inclusion of these additional components directs the types of techniques used by the performers. The ebows enable continuous string sonorities; the volume pedals craft artificial amplitude envelopes; and the tremolo pedals add rhythmic pulses to the output sound. The choice of these components (part of composing the set-up) directs the focus of the musical material.[60] There are, however, unexplored components and this distinguishes *Last Song from Charleroi* from the performer-controlled set-up of the Steen-Andersen. Like the Iannotta, the use of a fixed tape part is an aspect of the composition that is not controllable by the performers. Additionally, the foot pedals offer another site of exploration, which is not a focus of this work.

Making One Leaf Transparent and then Another (2012) - Newton Armstrong

1) For piano and electronic sounds.
2) Acoustic grand piano.
3) One performer.
4) Twelve audio samples.
5) One loudspeaker placed inside the piano, faced down over the lower strings.
6) Microphone.
7) Algorithm to detect pitches and an audio gate.

[60] The use of pedals to shape the qualities of the composed set-up relates directly to two submitted works, *Nara* (see 5.7) and *Partial Arenas* (see 5.8).

The acoustic grand piano is played conventionally by a performer. A loudspeaker is concealed in the body of the piano and, in specific and limited moments, extends the sound of a played note through electronic manipulation. The piano part is limited to single notes, before including two and occasionally three notes sounded together. The electronic sounds are synchronised with this sparse texture, adding to the sense of transparency that underpins the music. As Armstrong writes, the desired effect is that: "There should be a fusion of acoustic and electronic sources, and a clear sense (from the listening perspective of the audience) of a blurring of identities."[61] The restraint of the electronic sounds, both in quality and in number, encourage an inward listening towards the timbral properties of the piano. We hear the individual notes resonate in the space of the room before fading away with the arrival of new sonorities or into silence. The electronic technology challenges our perception of these sonorities, moving from the recognisable, stabilised sounds of the piano to an altered, uncanny expanded piano sound.

The visual absence of any electronic technology shapes our listening; we see only the acoustic piano and performer, and this informs our expectations of the sounds we will hear. The work signifies as an acoustic work until the first electronic sounds emerge at bar 80 (around the 7'20 mark) where another type of listening is engaged. Key to this shift of listening is the obvious absence of modification to the technology of the piano or the technique of the performer. Additionally, the electronics are unexpected and subtle. A listener might, for instance, miss the first few entry points.

The electronic sounds are produced when the pianist plays a note. Using a microphone, an audio gate, and an algorithm to detect struck piano notes, the electronic sounds are synchronised with the acoustic piano notes. As such, this is a performer-controlled set-up where all components of the work are manipulable by the pianist; there is a greater integration of components than in the Iannotta or the Bailie.

Key Jack (2016) by Michael Beil

1) For a pianist without piano with live film and tape.
2) One performer.
3) Wooden plank.
4) Tape with click track to synchronise the tape part with the performer.
5) Three hats.
6) A timpani beater.

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[61] Newton Armstrong, *Making One Leaf Transparent and Then Another* (unpublished, 2012).

7) Projector and two projection surfaces.
8) A piano stool.
9) Camera, laptop, software.
10) P.A. system for audio playback.

Picture 2.1: *Key Jack*[62] (still from recording)

In *Key Jack,* the piano is absent from the set-up but its presence is experienced through the actions of the pianist, the sounds from the tape part, and the presentation of the pianist on a piano stool.[63] The playing technique of the pianist is relocated onto a wooden plank and we see these physical movements as causing piano sounds; the performer's movements are synchronised with a tape part, suggesting that the plank has sound producing possibilities beyond its appearance. This decoupling of action and sound is replicated in the relationship between the live pianist and the film reproductions of the pianist. Film clips are recorded live and reproduced on screens either side of the live performer (see pic. 2.1). The use of three hats, all worn at some point by the live performer, creates an extra layer of interplay between the live and mediatised domains.

[62] "Michael Beil: Composer," Michael Beil, accessed September 6, 2021, https://www.michael-beil.com/key-jack/2018/3/20/michael-beil-key-jack-2017-with-frederik-croene.

[63] Although the score for the work leaves the choice of chair or stool to the discretion of the performer.

Like other Beil compositions[64], the work presents the sounds and gestures of an absent acoustic musical instrument: in this case, the piano. The piano is reconstructed through the gestures of the performer and the distinctive (or stabilised) sound of the piano. Although the conceit is focussed on interplay between the live and recorded domains, the presence of the piano is an intrinsic part of the work and its use in both live and recorded domains ludically stretches the sense of reality and realism. The affordances of the set-up are multifarious and, as such, don't direct the focus of the musical material, as the Steen-Andersen or the Bailie do. The use of electronic technology, however, is used innovatively to explore the relationship between instrument/instrumentalist and audience. Attention is drawn to the gestures and actions of the performer and this performativity is a focus in the work.

Partial Filter (2014) - Georgia Rodgers

1) For solo tuba and electronics.
2) One performer.
3) Microphone routed to a laptop.
4) Laptop routed to loudspeakers.
5) Four loudspeakers set out around the performance space, surrounding the audience.

Rodgers provides a spatialised experience of air blown through a tuba by a performer in *Partial Filter*. Loudspeakers are placed around the audience and sound is routed to them via a microphone placed above the bell of the tuba. Live electronics affect the routed sound, amplifying and filtering the breath sound to direct our attention to different qualities within it. Although the majority of the piece is focussed on the unpitched air pushed through the tuba by the performer, the breath sounds eventually evolve into pitches that fill the space differently before they diminish back into breath sounds. The microphone acts as an artificial ear focussing attention on the air sounds made by the player through the mouthpiece. This ear isn't neutral, however, as the acoustic sound is affected by electronics. Rodgers writes: "My aim in this piece was to approach

[64] See *Caravan* (2017) and *Enter to Exit* (2013).

the tuba from an unusual angle in order to reveal hidden characteristics and really explore its sound world."[65]

The electronic technology provides an unusual listening perspective of the tuba. As with the whammy pedal of Steen-Andersen and the sine waves of Iannotta, the electronic technology is located after the interaction between the instrument and performer. The application of the microphone 'opens up' the tuba to produce a wider range of sonic possibilities. This is not unlike the addition of foot pedals in electric guitar practice, which increases the range of timbral possibilities from the instrument. Unlike guitar practice, however, the control of these sounds doesn't rest with the performer and there is a performative separation. This work shares a similarity to the compositions in the portfolio in that the electronics are used to offer a new listening perspective but differs in that the components of the set-up are less integrated.

Piano Hero #1 (2011 - 12) - Stefan Prins

1) For MIDI keyboard, live electronics, and film.
2) One performer.
3) The keys of the keyboard trigger film clips which contain audio.
4) The MIDI keyboard is also used acoustically (the sound of a finger depressing the notes on the keyboard).
5) The film clips are of one pre-recorded scene, in which a performer interacts with the strings and body of a piano, detached from the frame and keyboard.
6) Camera, focussed on the performer.
7) The sounds of the film are routed to a P.A. system.

Max Erwin describes Prins's work as *Cyborg Virtuosity*[66] and this combination of human and digital is particularly evident here. We experience the performer using conventional piano technique to trigger the film clips. Additionally, there is often synchronicity of movement between the actions of the pianist and the performer's gestures on the film. The playback speed of the film clips changes, producing resulting pitch changes from similar recorded sound events. Additionally,

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[65] Georgia Rodgers, "Partial Filter: Tuba and Electronics." *Georgia Rodgers: Composer* (blog). Accessed June 30, 2021. https://polarpatterns.wordpress.com/2015/03/21/partial-filter-tuba-and-electronics/.

[66] Max Erwin, "Here Comes Newer Despair: An Aesthetic Primer for the New Conceptualism of Johannes Kreidler," *Tempo* 70, no. 278 (2016): 5.

some actions within the clips are looped to produce repeated phrases. In this piece there are two sites of performance: one on the broken acoustic piano of the pre-recorded film from which the clips are made; and the other on the MIDI keyboard reanimating the actions and sounds of the first site of performance. A notable moment of change is when the live pianist becomes mediatised on the film. This live-captured footage alters the established relationships in the piece; the sounds are now the acoustic sounds of the MIDI keyboard being operated and the film is a live reproduction of the movements of the performer.

The divergent ergomimetic performance techniques enacted by the pianist on the keyboard are conventional but, through the use of MIDI mapping to control the audio/visual samples, produce unconventional results. This disarticulation between gestural cause and sonic/visual effect is part of the conditions of the set-up; the configuration of the keyboard limits the possibilities of the work to a distinct set of outcomes. Although the set-up is predominantly in the digital domain and there is an absence of acoustic musical instruments, the presence of the piano is evoked through the use of the keyboard. As such, we experience a confluence of pianistic technique and complex sonic and visual results.

Laplace Tiger (2009) – Alexander Schubert

1) For drum kit, arm-sensors, live electronics and live film.
2) One performer.
3) Microphones on the drumkit to route the sound to the laptop.
4) Laptop with Max patch, output routed to the P.A.
5) P.A. system to route the sound processed by the live electronics.
6) Projector and screen for the live film.
7) Spotlight for the drumkit and performer.
8) Camera facing the performer and connected to the laptop.

This composition is the combination of four components: the acoustic sounds from the drumkit and performer; the processed sounds of the drumkit; the gestures of the performer on and around the drumkit illuminated by a spotlight; and the visuals on the screen behind. Schubert has constructed the set-up so that the actions of the performer control the electronic sounds and live film. This is enacted through the arm sensors worn by the performer and the camera directed at the performer. The musical language of the percussionist is from the jazz tradition, and an improvisational quality exists within the musical material. Although the techniques of the percussionist are conventional, their gestures have secondary effects and there are moments during the piece where the actions of the performer produce sounds without having to strike the drums.

This work presents the most complex set-up of all the eight examples. The many and varied components offer numerous possible compositional avenues and, in this sense, don't suggest the same circumscribed environments that typify most of the other compositions reviewed here. This work, however, does provide a clear example of electronic technology engaging the relationship between the performer and instrument. The use of gesture to create and modify sound is based on the actions of drummers. At moments during the piece, the gestures are decoupled from the drumkit but still produce percussive sounds. The electronic technology allows the drumkit to be presented across multiple domains: gestural, sonic, technological, and visual. These domains are presented in different combinations or individually.

In each of the eight examples briefly explored, there is an engagement with the instrument in some way to produce a more complex set-up. This is key to the idea of composing the set-up. We couldn't, for example, consider a composed set-up as simply choosing the instruments for a work. In the Steen-Andersen, the sound of the string instrument is processed to produce a combination of whammy pedal qualities and string instrument qualities, and in the Iannotta, the application of paper clips changes the performance area for the string players. These adaptations are not incidental; they become a focus for exploration and experimentation. Part of the compositional process is finding strategies for the musical material to engage the adaptations or modifications made to the musical instruments.

Chapter 3 Case Study One

3.1 Introduction to the Two Case Studies

The next two chapters provide case studies on two compositions: Stockhausen's *Mikrophonie I* (chapter three) and Nemstov's *Drummed Variation* (chapter four).

Mikrophonie I can be understood as a prototypical composition for this research project due to the highly specific set-up that is required. Additionally, the exploration of the set-up by Stockhausen to produce the musical material helps contextualise my own compositional methods (see Chapter 5). The second case study*, Drummed Variation*, is a recent example of this compositional approach and exemplifies a work that engages a relational conceptualisation of musical instruments. Both works make extensive use of electronic technology in their set-ups. Each case study begins with an overview of the components that comprise the set-ups followed by an exploration of how the musical material exploits the qualities afforded by the set-up.

As *Mikrophonie I* has been previously analysed from different perspectives, this case study also features a literature review summarising the key ideas from these analyses. The purpose of both case studies is to explore the bespoke set-ups for each work; consider the relationship between the set-up and the musical material; and to reflect on how we experience these works. The discussion of my works in part two is, in part, contextualised through these case studies, as they provide useful models for analysis; establish frameworks and language; and consider the audience's perception of the set-up.

3.2 Stockhausen's *Mikrophonie I*

Mikrophonie I is a work for tam-tam, six performers, microphones, and audio signal processing effects. The performers 'explore' the tam-tam by sounding it through a variety of tools and through the movement of microphones across the body of the instrument. The composition recontextualises the tam-tam through the application of altered playing techniques and electronic audio signal processing effects. As a result of this involved set-up, the tam-tam is relocated from its normalised position in Western classical music (large) ensembles to the producer of modernist electro-acoustic sounds. In this case study, the relationship between the compositional set-up and the musical material is considered.

In general terms, Stockhausen's approach reflects certain values of high modernism: the technological focus; rational or systematic approach to creativity; pursuit of abstraction (i.e., seeking the absence of associations to other musics); and uncompromising pursuit of innovation. Or, as Georgina Born puts it:

> the impulse of the avant-garde was to find a new underlying compositional rationality or system to replace the overthrown and dying tonal system. This search for new systems has been deterministic, rationalistic and scientistic. Leading composers such as Pierre Boulez, Karlheinz Stockhausen and Milton Babbitt have drawn on mathematics, statistics, information theory, acoustics, linguistics, structuralism as theories to inform their compositional practice. In parallel, they have indulged in a love affair with technology: the modernist desire for new means to match new systems, which has also been an end in itself.[67]

3.3 Literature Review on *Mikrophonie I*

Scholarship on Stockhausen's 1964 work *Mikrophonie I* has largely focussed on formal, perceptual, and technological aspects of this important work. Robin Maconie argues that this is the first piece to offer a perceptual integration between content and form.[68] G. W. Hopkins discusses Stockhausen's approach to form in the early 1960s. [69] Justyna Humięcka-Jakubowska's considers the electroacoustic context.[70] The challenges of staging the piece are documented by Christopher Burns.[71] Gaël Tissot considers the work's aesthetic, arguing that it can be seen as a

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[67] Georgina Born, "Modern Music Culture: On Shock, Pop and Synthesis," *New Formations*, no. 2 (1987): 52.

[68] Robin Maconie, "Stockhausen's Mikrophonie I: Perception in Action," *Perspectives of New Music* 10, no. 2 (1972): 92.

[69] G. W. Hopkins, "Stockhausen, Form, and Sound," *The Musical Times* 109, no. 1499 (1968): 60 – 62.

[70] Justyna Humięcka-Jakubowska, "Mikrophonie I (1964) by Karlheinz Stockhausen – Between Idea and Auditory Image," *International Journal of Humanities and Social Sciences* 9, no.7 (2015): 2359 – 2368.

[71] Christopher Burns, "Realizing Lucier and Stockhausen: Case Studies in the Performance Practice of Electroacoustic Music," *Journal of New Music Research* 31, no. 1 (2002): 59 – 68.

synthesis of the two schools of musique concrète and elektronishe Musik.[72] Xenia Pestova, Mark T. Marshall and Jacob Sudol consider matters of authenticity surrounding recreating twentieth century electroacoustic pieces with twenty-first century technology.[73]

There are also primary texts, such as Stockhausen's introduction to the Universal Edition score, where he articulates his desire to integrate electronic studio processing techniques into live performance, including the treatment of the microphone as an instrument;[74] and a lecture at the Institute of Contemporary Arts in London, which focusses on methods for scoring sounds.[75]

3.4 Defining the Set-up of *Mikrophonie I*

The elements of the set-up are:

1) Six performers.
2) Prepared tam-tam.
3) Non-standard beaters made from contrasting materials of unspecified shape or size.
4) Two microphones, each one routed to a
5) Bandpass filter, each one routed to
6) Two potentiometers, each routed to a
7) Loudspeaker. Each microphone accounts for one side of the stereo field. The two potentiometers further split the microphone signal into front and rear speakers. The set-up includes at least four loudspeakers (but up to any amount) positioned symmetrically in the auditorium and treated quadrophonically (a stereo image at the front of the stage and replicated at the other end of the performance space behind the audience).

<u>Placement</u>

The tam-tam is placed between the six performers, who are split into two groups of three. Figure 3.1 shows how the performers are positioned: group one is comprised of performers 1, 3 and 5;

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[72] Gaël Tissot, "The First Electroacoustic Pieces by Karlheinz Stockhausen: Technologies and Aesthetics," *Organised Sound* 13, no. 3 (2008): 167 – 175.

[73] Xenia Pestova, Mark T. Marshall, and Jacob Sudol, "Analogue to Digital: Authenticity Vs. Sustainability in Stockhausen's *Mantra (1970)*," (paper presented at the International Computer Music Conference, Belfast, August 24-29, 2008, http://hdl.handle.net/2027/spo.bbp2372.2008.057)

[74] Karlheinz Stockhausen, *Mikrophonie I* (London: Universal Edition, 1964).

[75] Tomás Olano, *Lecture 2 - Karlheinz Stockhausen - The British Lectures - Live Electronic Music (MIKROPHONIE 1)*, February 5, 2013, www.youtube.com/watch?v=ylHYqtU5slQ.

group two is performers 2, 4 and 6. The first performer in each group (performers 1 and 2) interacts only with the tam-tam. The second performer (performers 3 and 4) in each group mainly uses the microphone to capture the sound produced by performer one but have moments during which they replicate the role of performer one. The third performer (performers 5 and 6) in each group sits in the auditorium and operates the filters and potentiometers.

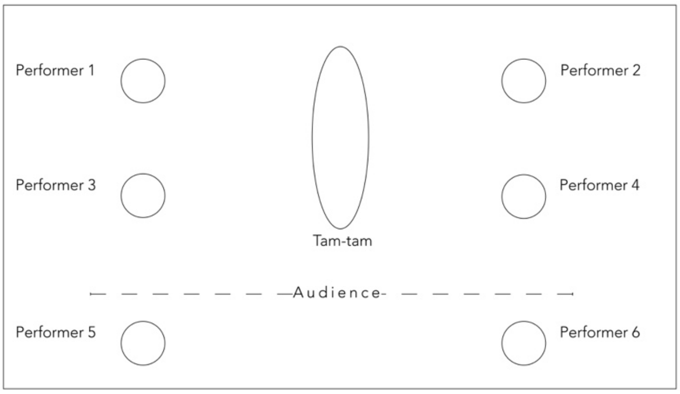

Figure 3.1: Performers & tam-tam positions in *Mikrophonie I*

<u>The material of the tam-tam</u>

The choice of the tam-tam as the sound-producing object is significant, but Stockhausen has shown conflicting opinions about its necessity to the realisation of the composition. In his London lecture he suggested that anything could be examined, including 'found' non-musical objects like a Volkswagen.[76] This view altered in later years as exemplified by consequences of change to the specifications of the tam-tam's construction. The company who made the tam-tam, Paiste, started to produce bigger thicker tam-tams of which Stockhausen disapproved:

> They were too thick and thus could not react to treatment using special instruments and objects. In February 1994, after years of experimenting, Robert Paiste came up from Switzerland with a truck full of new tam-tams after having been here with his technicians to measure the characteristics and specifications of the original tam-tam… Luckily, Stockhausen found that all of them were again similar to his original one.[77]

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[76] Tomás Olano, *Lecture 2 - Karlheinz Stockhausen - The British Lectures - Live Electronic Music (MIKROPHONIE 1),* February 5, 2013, www.youtube.com/watch?v=ylHYqtU5slQ.

[77] "October 1997 Report From Suzanne Stephens," Susanne Stephens, accessed December 12th, 2017, https://web.archive.org/web/20140404172630/http://www.stockhausen.org/suzee_10_97.html.

Preparations

The tam-tam is prepared with chalk and melted rosin applied to specific parts of its surface. (See pic. 3.1 for an example from the score of the placement of the preparations applied to one surface, with the chalk clearly visible on the top left of the tam-tam.) Traditional mallets, sticks and beaters are not employed; rather, the choice of implements with which to excite the tam-tam is not specified (i.e., left open to performers' choice), but typically 'found' and homemade objects such as "glass, hard cardboard, polystyrene (or other plastics)" are employed.[78]

Picture 3.1: Prepared tam-tam in *Mikrophonie I*[79]

Sounding Objects/Tools

Quoted in Christopher Burns, "Realizing Lucier and Stockhausen: Case Studies in the Performance Practice of Electroacoustic Music," *Journal of New Music Research* 31, no. 1 (2002): 63.

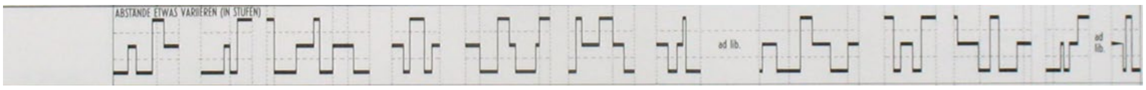
[78] Karlheinz Stockhausen, *Mikrophonie I* (London: Universal Edition, 1964).

[79] Ibid.

The objects are chosen in order to produce the sounds that Stockhausen describes in the score. The focus is on specific sonic characteristics rather than detailing performance techniques or ways in which to interact with the tam-tam; the emphasis is on the resulting sound not the means with which the sound is produced. Elaborating on this in his London lecture, Stockhausen identifies a "scale of timbres" organised into a quantised set of thirty-six steps from "rumbling" in the lowest frequencies to "hissing – fizzing" in the highest.[80] During the first performance the objects were chosen by the performers through a period of conversation and experimentation with the composer present.[81]

Electronic Technology

Each point in the audio signal processing is clearly and specifically scored. The first point in the process relates to where performers place the microphones, with the score detailing two variable continua: (1) proximity to the tam-tam, from very close to the surface to away at an ambient distance; and (2) how close or far the microphones should be placed to the actions used to sound the tam-tam. The score shows the proximity to the tam-tam through the thickness of the line and the proximity to the actions separated into three levels of closeness (from the top): "direct, more distant, indirect". (See ex. 3.1). As Stockhausen states, "The microphone is no longer a passive tool for high-fidelity reproduction of something that we know, like a voice, but it becomes an active instrument and it influences what it is recording."[82]



Example 3.1: Microphone placements (score excerpt from Mikrophonie I)[83]

The sound picked-up through one microphone (accounting for one side of the stereo field) is fed to a combination of a low-pass and high-pass filters (a band-pass filter) which manipulates the

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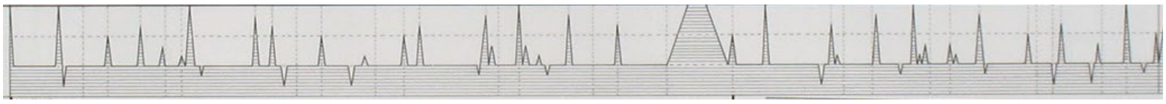
[80] Tomás Olano, *Lecture 2 - Karlheinz Stockhausen - The British Lectures - Live Electronic Music (MIKROPHONIE 1)*, February 5, 2013, www.youtube.com/watch?v=ylHYqtU5slQ.

[81] Ibid.

[82] Ibid.

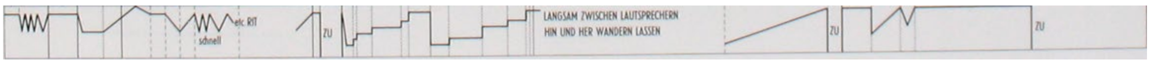
[83] Karlheinz Stockhausen, *Mikrophonie I* (London: Universal Edition, 1964).

frequency range of the sound at the lower (down to 30Hz) and upper frequency ranges (up to 10KHz)[84]. The high pass filter only allows high frequencies to pass through the filter with the same process inverted for the low pass filter. The shaded areas relating to the filter in the score indicate frequencies that are allowed to pass through the filter. The high frequencies are at the top and the low frequencies are at the bottom, mapped over time (see ex. 3.2).



Example 3.2: Filter movements (score excerpt from *Mikrophonie I*)[85]

The output of the filter is then split into two potentiometers which manipulate the amplitude of the signal before being routed to a loudspeaker. These loudspeakers are one side of the stereo field (in front of and behind the audience). The line drawings of the score indicate volume; high amplitude at the top and low at the bottom, mapped over time (see ex. 3.3). This circuit (microphone to filter to potentiometer to loudspeakers) is replicated for the other side of the stereo field and starts from the second microphone.



Example 3.3: Potentiometer movements (score excerpt from *Mikrophonie I*)[86]

The sound projected into the auditorium includes both the acoustic vibrations of the agitated tam-tam and simultaneously the processed sounds emitted from the loudspeakers. As the balance between the dry and processed sounds is largely blurred, the causal relationship of action/object to resulting sound is deliberately disrupted. Due to the spatialised positioning of the speakers in the four corners of the room, however, the discrete sound sources are more recognisable.

The processed sound is the sum-value of three points of electronic interpolation in the route of the captured acoustic sound to diffusion through the loudspeaker system. Each point of effect is individual and separate; the three processes are not designed combinatorily to produce an

[84] Karlheinz Stockhausen, *Mikrophonie I* (London: Universal Edition, 1964).

[85] Ibid.

[86] Ibid.

intended sonic result, rather they are designed to disrupt control over the overall sound by a single performer: "No single player can assume complete authority over a particular sound event".[87] The three levels of control afforded by the electronic manipulation sequence is presented as a parametrical control of musical elements: the movement and/or placement of the microphones create rhythmic, timbral, and pitch qualities, as well as affecting volume and the impression of space. The movement and/or placement of the filter levels create rhythmic, timbral, and pitch qualities, as well as affecting the volume. The movement and/or placement of the potentiometer levels create rhythmic qualities and affects the volume.[88] Therefore, as Stockhausen writes in the preface to the score: "In this way three mutually dependent, mutually interacting and simultaneously autonomous processes of sound-structuring are connected with each other. These were composed to be synchronous or temporally independent, homophonic or in up to six polyphonic layers."[89]

Performers in the Set-up

The medium includes the six performers, split into two groups of three. This is a defining characteristic of the medium as the number of performers in each group is equal to the number of layers from which the piece is constructed:

1) the physical interaction with the tam-tam,

2) the placement and movement of the microphones and,

3) the manipulation of sound through the filters and potentiometers.

An increase or decrease in the numbers of performers would alter the realm of possibility. The performers are arranged into two groups of three but there is additionally a symmetrical element between the groups: the first players of each group have the same role (i.e., performers 1 and 2), as do the second players (i.e., performers 3 and 4) and so on, which adds a further dimension to the structure (see fig. 3.1). This is a distinctive aspect of the set-up. Unlike the loudspeaker

[87] Christopher Burns, "Realizing Lucier and Stockhausen: Case Studies in the Performance Practice of Electroacoustic Music," *Journal of New Music Research* 31, no. 1 (2002): 63.

[88] Karlheinz Stockhausen, *Mikrophonie I* (London: Universal Edition, 1964).

[89] Ibid.

system, the number of performers is important, not just the symmetry between the groups.[90] The first two players of each group (performers 1 and 2 (see fig. 3.1)), who physically interact with the tam-tam, stand on opposite sides of it. This tension adds to the challenge of creating the required sounds, although this was helpful in creating a 'trill' sound, as Burns documents: "The sometimes unpredictable and challenging motion of the instrument between the two players proved a considerable advantage in this case."[91] The in-built opposition visually presented by the performers is analogous to the relationship between the different layers of electronic manipulation of the acoustic sound. The processes of sound creation/manipulation are separated out; the labour is divided between three people so there is no overall singular control of the sound. As previously discussed, each person in the group of three cannot determine the sound of the combination of all three elements and each group cannot work as a whole to support or undermine the other. These dimensions are important to the set-up and highlight its layered approach to construction; each component is unique in a network of relations.

3.5 Musical Material as Exploration of the Set-up in *Mikrophonie I*

Stockhausen developed the piece first through an exploration of the acoustic tam-tam excited with different materials and then later as a more complex set-up with the microphones and filters added. The final version of the piece retains this quality of exploration. In fact, even though the piece is organised into moments of contrasting or complementary sonic content, the structure is bound together through the logic of exploration of the physical object, the tam-tam. As Maconie writes, listeners "expect the composer not merely to provide an excuse to show off a musical instrument, but to make a statement which is appropriate to, and most effectively realizable by it."[92]

More specifically, the work reflects the mentality of total serialism, where sound is explicitly categorised into measurable and manipulable parameters. Almost all the musical variables are

[90] Although, some performances have used an increased number of performers for an easier realisation of the score.

[91] Christopher Burns, "Realizing Lucier and Stockhausen: Case Studies in the Performance Practice of Electroacoustic Music," *Journal of New Music Research* 31, no. 1 (2002): 66.

[92] Robin Maconie, "Stockhausen's Mikrophonie I: Perception in Action," *Perspectives of New Music* 10, no. 2 (1972): 92, https://doi.org/10.2307/832334.

treated parametrically, with even timbre organised into quantised scales. This treatment comes from a desire, outlined by Georgina Born (see 3.2), to create a new system to replace tonality, in which the previous hierarchy of pitch over all other variables is abolished: a democratisation of music.

Previous Stockhausen works approach the use of parameters differently. *Kreuzspiel*, for example, formalises musical parameters, such as pitch and duration, in pre-compositional mathematical relationships: “each note, duration and dynamic follows an overall separate set of instructions, is *individually* organised, as opposed to its being a lesser or greater *member* of some hierarchy which is dominated by some ‘goal’.”[93] The content is derived from a highly formalised compositional frame. This frame is constructed from a set of serialist principles, which engage individual and independent parameters to produce the musical material. This comparison highlights one of the most interesting aspects in *Mikrophonie I*: each parameter is physically enacted and staged, which is totally different to *Kreuzspiel*, in which the parametric aspect is a pre-compositional decision; a ‘scaffolding’ not made explicit to the audience. Furthermore, *Mikrophonie I* has a particular quality of industry where each performer engages with one ‘link’ in the signal chain of audio production. This reduces the autonomy of each performer into collective action, limiting the ability for one performer to have overall control over the sound.

Some of the qualities of exploration are visually reinforced in early video recordings of the piece in which the performers, formally dressed, solemnly interact with, or test the central object, almost alien-like, in the middle of the room surrounded by various electronic and physical devices (see pic. 3.2). The visual domain reinforces the sense of exploration that underpins the work.

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[93] Jonathan Harvey, *The Music of Stockhausen: An Introduction* (Great Britain: University of California Press, 1975), 16.

Picture 3.2: Clip from *Mikrophonie I*[94]

3.6 *Mikrophonie I*: Conclusion

In *Mikrophonie I*, the musical material is focussed on the exploration of this bespoke set-up. This inward-looking approach to the producible sounds from the physical object is enforced through the preparations to the body of the tam-tam and the use of unusual materials to excite it, coupled with the layers of electronic interference that occur after the sounding of the tam-tam. Without sound being captured by the microphone, the filter, potentiometers, and loudspeaker system is rendered obsolete. Ignoring the preparations and use of unusual beaters would result in a simpler sound world. The creation and subsequent exploration of the set-up is a fundamental part of the composition, made clear in Stockhausen's account of the process of writing the piece:

> Some years previously I had bought myself a large tamtam for my composition MOMENTE, and set it up in my garden. I now made some experiments, exciting the tamtam with a great variety of implements – of glass, cardboard, metal, wood, rubber, plastic – that I collected from around the house, and connected a microphone (with strong directional sensitivity) that I held in my hand and moved around, to an electrical filter, whose output led to a potentiometer and was then made audible over a loudspeaker. My collaborator Spek was in the house, and changed the filter settings and the dynamic levels, improvising.[95]

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[94] Zoy Winterstein, *Karlheinz Stockhausen – Mikrophonie I – Film 1966*, August 17, 2012, https://www.youtube.com/watch?v=EhXU7wQCU0Y.

[95] Karlheinz Stockhausen, *Mikrophonie I* (London: Universal Edition, 1964).

The approach that Stockhausen used in the creation of *Mikrophonie I* provides a methodological blueprint for the compositional processes used in the creation of all submitted works in the portfolio (see 5.1). *Mikrophonie I*, therefore, is an early example of a work for a composed set-up in which the creation of a bespoke environment is the preliminary, and defining, act in the creative process. This is an example of what Gordon Mumma describes when he declares: "I consider that my designing and building of circuits is really 'composing'."[96] Additionally, the set-up is the combination of both an acoustic instrument and electronic technology. As with the eight examples in chapter two, the electronic technology is used to alter our perception of the instrument. Although this Stockhausen work typifies a modernist approach to exploration by systematically and parametrically exploring the affordances of the set-up, the work exemplifies an approach to composition in which the qualities of a bespoke set-up become the focus of the musical material.

[96] Gordon Mumma, "Creative Aspects of Live Electronic Music Technology" (paper presented at Audio Engineering Society, Papers of 33rd National Convention, New York, October, 1967, URL: https://brainwashed.com/mumma/creative.htm) **quoted in** Michael Nyman, *Experimental Music: Cage and Beyond* (Cambridge: Cambridge University Press, 1999), 91.

Chapter 4 Case Study Two

4.1 Nemtsov's *Drummed Variation*

Playing a musical instrument has become an increasingly diverse practice within New Music. Performers are often asked to interact with new, modified, or adapted objects or instruments in conjunction with, or substituting, their primary instrument. Among the first instrumentalists to work in this expanded field were percussionists, who have long been accustomed to playing a wide range of objects absorbed into percussion practice: it "has become possible to operate under the label percussionist without using any instruments commonly regarded as percussion and without using traditional percussive techniques."[97] This expansive approach is somewhat explained by the relational definition of musical instruments discussed in chapter one.

The following case study considers the 2014 composition *Drummed Variation* by Sarah Nemtsov, focussing in particular on the implication of the material absence of the drumkit and its non-material presence. The first part examines the individual components that comprise the set-up. This includes a consideration of the drumkit as an object, drumkit practice, and related traditions. The second part considers the implications of composing for this set-up. *Drummed Variation* is a contemporary example of this approach to composition, in which composing the set-up is a fundamental part of the creative process.

4.2 Defining the Set-up of *Drummed Variation*

1) For two performers.
2) One performer is a skilled percussionist who plays a collection of objects that form the 'no drumset' (described below).
3) The other performer plays Kaosspad. This part can be performed by any musician.
4) P.A. system.

<u>Drumkit</u>

[97] Häkon Stene, "'This Is Not a Drum': Towards a Post-Instrumental Practice," (PhD diss., The Norwegian Academy of Music, 2014), 11.

The work is scored for no drumset and Kaosspad. The no drumset, which I will refer to as a pseudo-kit[98], is a combination of ‘found’ objects arranged to form an unusual composite drumkit. The composition engages drumkit practice through a variety of modalities: from the work’s name and the provocative instrument name “no drumset”, to the sounds and techniques made and employed by the performers. Drumkits, however, are complex musical instruments and standardisation for a drumkit is problematic, as the instrument has the potential to sound vastly different across recordings, live performances, and musical traditions (see 1.5). The drumkit, therefore, could be described as always existing as a *particular* rather than a *universal*: individual drummers within different idioms produce their own sounds; the drumkit can be altered through the use of different models of the same object (i.e., a particular make, size, or manufacturing-material of snare drum or cymbal); drums and cymbals are easily modifiable through customisation and personalisation, in the form of organisation, placement, and tuning; and they are also modular, as different set-ups from two-piece to thirty-piece kits would still be considered a drumkit. Nonetheless, even with all these differences, there is a meta sense of the drumkit, which this piece points to. Therefore, that the pseudo-kit signifies as a DIY device doesn’t preclude our experience of it as a drumkit.

Pseudo-Kit

The pseudo-kit comprises of ‘found’ objects that are assembled so that each object takes the place of one of the normative components of the drum-kit. The objects that the pseudo-kit consists of are itemised in table 4.1.

[98] Nemtsov alternately uses “pseudo-drumset”, and “no drumset” and I will refer to it as a pseudo-kit.

NORMATIVE DRUM KIT COMPONENT	FOUND OBJECT SUBSTITUTION
Hi-hat	2 Saw Blades or also 1 Saw Blade and 1 Metal Bin below. Resulting sonority is an extreme harsh clatter or rattle.
Snare	Zinc Bucket. Cutting complex tone.
Bass drum	Big Carboard Box. Moving box or similar. With a kick pedal. Also, to be played on top and on the side.
Crash cymbal	Hanging metal piece. Rather high-pitched cutting tone. Uncomfortable.
Floor tom	Rubber Bucket. Deep dampened tone. Instead of a deep tom-tom.
Auxiliary percussion	Beer Crate (plastic) with 24 empty glass beer bottles in it.
Drum stool	Wooden stool. Simple, without arm rests but, if possible, with back rest slats or something similar. [99]

Table 4.1: Set-up components of *Drummed Variation*

Standard drumsticks and a single jazz brush are employed to strike these objects, as well as two non-standard metal sticks.

The objects comprising the pseudo-kit can be grouped into three categories. In this discussion, each component of the drumkit is referred to as an object (i.e., snare drum) rather than an instrument, as the term 'instrument' is reserved for the entire configuration (see fig. 4.1).

[99] From the score. Sarah Nemtsov, *Drummed Variation* (unpublished, 2014). Translation by Nadine O'Farrell and Dominic O'Farrell.

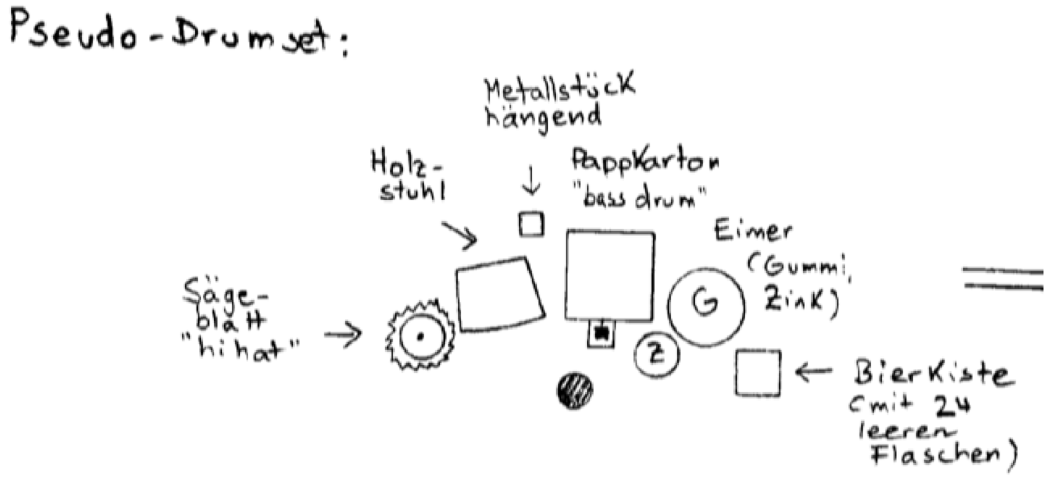

Figure 4.1: Pseudo-kit set-up (score excerpt from *Drummed Variation*)[100]

The first category is objects associated with the standard drumkit (e.g., the hi-hat). However, these objects are adapted so are not straight duplicates. Secondly, objects that are not associated with the drum kit (e.g., zinc bucket) but share sonic properties with a given component of the traditional kit (e.g., zinc bucket as snare) and used functionally in that role. Thirdly, auxiliary instruments (e.g., beer crate) that extend the drum-kit much in the same way as auxiliary percussion, although here there is no function or sound being recreated (e.g., the beer crate is used for its own qualities and doesn't refer to any other percussion instrument).

In an interview with percussionist Serge Vuille (who has performed the piece), Nemtsov explains that her conception of the pseudo-kit draws on watching her young son play percussively with household objects and watching street drummers. She says of the latter:

> I also really like street drummers, both for the way they build their instruments, and for the wild creativity they display when playing. It's almost as if the fact that the drums are made of found objects gives an incentive to find crazier rhythms to play on. And as a result, the player is sitting in the middle of some junk, but playing and feeling like the biggest drummer in the world.[101]

<u>Kaosspad</u>

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[100] Sarah Nemtsov, *Drummed Variation*. (Unpublished, 2014).

[101] Serge Vuille, "Composer to Composer: Serge Vuille interviews Sarah Nemtsov," *London Symphony Orchestra* (blog), September 22, 2017, https://lso.co.uk/more/blog/719-composer-to-composer-serge-vuille-interviews-sarah-nemtsov.html.

The sound from the pseudo-kit is routed via microphones to the Kaosspad (see fig. 4.2), which modulates the sound but is also used as amplification. The Korg Kaosspad first came out in 1999[102] and was quickly followed by second and third versions. As a device it has predominately been used in electronic, pop, and experimental rock genres and was notably used to create the distinctive vocal effects on the opening track of the 2000 album *Kid A* by Radiohead.[103] The Kaosspad has an interactive interface that allows the performer to use sliders, knobs, buttons, and a trackpad to manipulate sounds passed through it. It can also produce its own sounds like a drum machine. The trackpad is perhaps the defining feature of the Kaosspad and offers two axes which are manipulated simultaneously through touching the screen with one's finger. Choosing different settings on the Kaosspad will load different parameters onto the trackpad. When used as a signal processor, the Kaosspad receives a dry input sound, which is then processed by the operator through interacting with the various elements of the interface, before outputting the wet sound. Although the interface is the same, it affects different parameters depending on the "FX Type" that is loaded. The Kaosspad KP3 has a range of FX Types, including delays, distortion, filters, and modulation. Audio signal processing can be applied to live sound or live sound can be sampled and then processed.

[102] David McNamee, "Hey, what's that sound: Kaoss Pad," *The Guardian*, March 9, 2011, https://www.theguardian.com/music/2011/mar/09/whats-that-sound-kaoss-pad.

[103] Radiohead, *Kid A* (UK: Polydor, 2000), CD.

Picture 4.1: Korg Kaosspad[104]

In *Drummed Variation*, the Kaosspad is used as both an electronic drumkit and as an electronic signal processor. This addition of digital electronics is a fundamental part of the complexity of the set-up, as it affects both the causative relationship of sound-source and sound (the input → output audio signal chain) as well as providing a distinctly electronic palette of sounds outside the scope of a standard drumkit. Demers observes how this affects our listening:

> No matter the genre, listening situation (whether live or recorded), or audience, all forms of electronic music make manifest the strangeness of sounds that have only recently become imaginable and executable. All electronic music is a meditation on the act of listening to sounds both old and new, therefore a meditation on the cognitive processes that accompany listening.[105]

Nemtsov's score asks for specific presets on the KP3 Korg Kaosspad. (See table 4.2 for a list of all the requested presets, what they do and what parameters the trackpad affects.)

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[104] "Korg.com," Korg, accessed September 18, 2021, https://www.korg.com/jp/common/php/extendedimg.php?url=https%3A%2F%2Fcdn.korg.com%2Fuk%2Fproducts%2Fupload%2F28c84bb79b7bb861f77a3108c80e1653.png

[105] Joanna Demers, *Listening Through the Noise: The Aesthetics of Experimental Electronic Music* (Oxford: Oxford University Press, 2010), 22.

Preset Name	Fx Type	Name	X axis	Y axis
dlY.2	Delay	Echo Break	Delay Time	Feedback
FL.12	Filter	Radio Filter	Bandwidth	Noise Level
Mod.10	Modulation	Fuzz Distortion	Low Boost – Low Cut	Distortion
Grn.1	Granulation	Grain Shifter	Cycle Speed	Length
Grn.2	Granulation	Mid Grain Shifter	Cycle Speed	Length
Grn.4	Granulation	Grain & HPF	Cycle Speed & Length	HPF Cutoff & Resonance
Grn.5	Granulation	Grain & HPF+	Cycle Speed	HPF Cutoff & Resonance
Mod.7	Modulation	Pitch Shifter	Pitch Shift	Mix balance (Dry-Wet)
LP.13	Looper	Looper & Noise	Looper Beat	Noise Level, etc.
dL.15	Delay	Delay & Reverb	Delay Time	Delay Tone

Table 4.2: KP3 Korg Kaosspad Effects[106]

Additionally, the Kaosspad is used as an electronic drum pad itself. (See table 4.3 for the different sounds that the score asks for).

[106] “cdn.korg.com,” Korg, accessed September 18, 2021, https://cdn.korg.com/us/support/download/files/726ac90553ba506f7380ba12cc185692.pdf?response-content-disposition=inline%3Bfilename%2A%3DUTF-8%27%27KP3_MIDI_Eff_EFGJ1.pdf&response-content-type=application%2Fpdf%3B

Preset Name	Fx Type	Name	X axis	Y axis
dr.M3	Drumpad	Tribal Beat	Percussion Tone	Percussion Noise, Delay Depth
dr.M4	Drumpad	Electro Beat	Snare Drum Tone	Snare Drum Decay, Bass Drum Decay, Delay Depth
dr.M5	Drumpad	Pad Drum 1	Bass Drum & Hi Hat – (mix) – Snare Drum & Hi Hat	Decay
dr.M6	Drumpad	Pad Drum 2	Bass Drum – (mix) – Snare Drum	Decay

Table 4.3: Kaosspad Drum Sounds of *Drummed Variation*[107]

Operating the Kaosspad's small interface requires little physical movement. While, there is a clear cause and sonic effect from the pseudo-kit, the actions of the Kaosspad are perceptually hard for an audience to link to the sound. This is a feature of digital systems in which the model "physical interface, the mapping engine, and the sound engine"[108] is fluid and dynamic; interactions with the interface can produce completely different results depending on the digital mapping. This is evident in this piece as the performer switches between different presets, changing the sounds each time without too much variety of gesture. One of the issues with performing on digital music interfaces is interpreting the sonic effect of physical actions; these are *ergotic* instrumental gestures[109] but with a dislocation in immediate sound response that performers get from playing

[107] "cdn.korg.com," Korg, accessed September 18, 2021, https://cdn.korg.com/us/support/download/files/726ac90553ba506f7380ba12cc185692.pdf?response-content-disposition=inline%3Bfilename%2A%3DUTF-8%27%27KP3_MIDI_Eff_EFGJ1.pdf&response-content-type=application%2Fpdf%3B

[108] Thor Magnusson, *Sonic Writing: Technologies of Material, Symbolic and Signal Inscriptions*, (London: Bloomsbury Publishing, 2019), 36.

[109] Ergotic gestures are physical interactions between a human and an object. See Claude Cadoz, "Supra-Instrumental Interactions and Gestures," *Journal of New Music Research* 38, no.3 (2009): 217.

an acoustic instrument (the auditory feedback loop). However, the Kaosspad's trackpad is perhaps better than some other digital technologies in this regard:

> Eno described Kaoss Pads as "a way of taking sounds into the domain of muscular control ... you can really start playing with sound itself, with its physical character. It's immediately obvious what you do, and it takes you into a completely different place, because when working with computers you normally don't use your muscles in that way. You're focused on your head, and the three million years of evolution that resulted in incredible muscular skill doesn't get a look in."[110]

Throughout the work, the score directs the performer of the Kaosspad to trace their finger across the Kaosspad's trackpad. As each preset loads different parameters for the X axis and Y axis (see table 4.2), the score can be presented in a similar way throughout; the movements of the finger on the trackpad of the Kaosspad produce different sounds according to each preset. For example, the first audio effect is the "echo break" in which moving the finger along the X axis increases the delay time (the time gap between the delayed sonic events) of the input signal and moving the finger upwards in the Y axis increases the amount of feedback (the amount of signal to repeat).

4.3 Key Points from *Drummed Variation*

The drumkit is key to our understanding of *Drummed Variation*. The subsequent discussion focusses on a relational understanding of drumkit practices; electronic technology; and the simultaneous presence and absence of the drumkit within the work.

A Relational Understanding of the Drumkit and Drumkit Practices

The relational conceptualisation of musical instruments presented in chapter one, helps to frame our experiences of both the Kaosspad and the pseudo-kit in *Drummed Variation*. Both the pseudo-kit and the Kaosspad engage with drumkit practice, from the sonorities of the sounds produced, to the techniques employed by the pseudo-kit performer, and the context provided by the visual signification of the set-up.

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[110] David McNamee, "Hey, what's that sound: Kaoss Pad," *The Guardian*, March 9, 2011, https://www.theguardian.com/music/2011/mar/09/whats-that-sound-kaoss-pad.

The pseudo-kit produces percussive sounds that emulate, replace, or mimic specific parts of the drumkit. Although the drumkit sound is stretched even further with the Kaosspad, there are distinct moments in which the Kaosspad produces electronic drumkit sounds. If we consider that instrumental sounds become stabilised according to instrumental practice and musical idioms (see 1.5), then in these moments the Kaosspad clearly signifies as a drumkit; the drumkit provides a frame for our experience of these divergent sonic worlds.

The relationship to drumkit practice is also evident in the techniques that we see the performer use on the pseudo-kit; these ergotic instrument gestures are distinctly part of drum practice. These techniques are divergent ergomimetic techniques, as the actions and gestures of the performer are adapted to respond to the different physical surfaces of the 'found' objects.

Furthermore, the context in which we experience the 'found' objects of the pseudo-kit is in a configuration emulating the drumkit. A zinc bucket would rarely be used as a snare drum as the sound is too dissimilar, it looks unalike, and the object behaves differently. However, when arranged in this way these distinctions are mediated; we start to hear the bucket as a snare. Similarly, the large cardboard box becomes the kick drum from its position in the pseudo-kit: the use of the kick pedal, the subsequent technique from the performer to sound it, and its idiomatic role in the music.

Electronic Technology and Drumkits

Blurring the sounds of the pseudo-kit and the Kaosspad into one sonic composite is key to listeners' experience of *Drummed Variation*. The audio signal processing makes the separation of the two instruments into discrete entities harder to perceive, as it shapes the relationship between visual cause and sonic effect; the sound we hear is the combination of both pseudo-kit and Kaosspad (this is similar to the string instrument and whammy pedal in the Steen-Andersen piece discussed at 2.2). This is not evident in some set-ups that combine acoustic musical instruments and electronic technology, as the electronic technology is routed to loudspeakers that amplify or reinforce sound diffusion away from the gestures of the acoustic instrumentalist:

> Most often, even in more 'interactive' contexts, the live instrumentalist's sound is amplified and drawn into the general stereo or multi-channel field of sound reinforcement creating a sonic 'plane-of-separation' between the performer's location and their physical gesture. In contexts with multiple live performers, general sound reinforcement schemes dislocate the

> identities of sonic production and their location—this separation often subverts the intimacy of musical performance and prioritizes presentation over process.[111]

In this sense, the set-up for *Drummed Variation* is similar to other works that treat multiple instruments or electronic devices as one entity or gestalt. (See *Alias States* (5.7) and *Nara* (5.3)).

Additionally, the combination of 'found' objects (low-end 'junk') and hi-end digital technology means we experience this practice across various modalities: the pseudo-kit and the drum pads of the Kaosspad function mimetically, as they both replicate the sounds of an object-typical drumkit, while simultaneously the 'strange' electronic audio effects enhance the range of possible sounds.

The Kaosspad has a dual role within the work, as an electronic drumkit and as an electronic signal processor. As an electronic drumkit, the relationship to drumkit practice is more direct. When processing the sound of the pseudo-kit, the Kaosspad is applying real-time audio signal processing to the pseudo-kit sound, similar to processes more commonly found in recording studios.

Absence and Presence of the Drumkit

Part of our experience of the piece is that we simultaneously read the pseudo-kit as a drumkit and are aware of the absence of the 'real' instrument. The drumkit becomes "visible" [112] through the actions of the performers; through the mimetic qualities of the pseudo-kit's objects; through context; and through the electronic manipulations of the acoustic sound. There are similarities here to the absent piano in Beil's *Key Jack* (see 2.2) and the electronic drumkit/piano assemblage of *Alias States* (see 5.7). These works demonstrate that the identity of an acoustic instrument is not entirely dependent on the physical presence of the instrument itself.

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[111] Curtis Bahn, Tomie Hahn, Dan Trueman, "Physicality and Feedback: A Focus on the Body in the Performance of Electronic Music," *International Computer Music Conference Proceedings* (2001): 1, http://hdl.handle.net/2027/spo.bbp2372.2001.058.

[112] Samuel Wilson, "Building an Instrument, Building an Instrumentalist: Helmut Lachenmann's Serynade," *Contemporary Music Review* 32, no. 5 (2013): 430.

4.4 *Drummed Variation*: Conclusion

This reading of *Drummed Variation*, in which the work is analysed using a relational conceptualisation of musical instruments to describe the set-up, demonstrates how we experience a composed set-up of an electronically enhanced acoustic musical instrument. As discussed, the drumkit is not a standardised technological instrument, as it is customisable and modifiable by performers according to idiom, style, or preference. This is an example of an instrument going through technological opening and closing (see 1.2) without consequent changes to its identity. The drumkit, instead, is evoked through the divergent and transduced ergomimetic gestures of the pseudo-kit and Kaosspad performers, respectively. The use of electronics impacts how we listen and ‘blurs’ the two distinct sound worlds of the two instruments of the set-up. Even without a standardised drumkit, its presence shapes our experience of the work; the presence of drumkit technology, technique and context informs how we listen. As such, the identity of the drumkit, even in its absence, is retained.

The analysis of *Drummed Variation* exemplifies an approach for discussing my works in the next chapter. Firstly, the components of the set-up, their placement in the performance space, and how they connect is described and illustrated. Then discussion points from the works are considered, focussed on the key areas of acoustic musical instruments; electronic technology; composed set-ups; and composing the musical material to explore the qualities of these bespoke set-ups.

Additionally, *Drummed Variation* also connects more specifically to four of the seven submitted works. The use of electronic audio signal processing effects to ‘blur’ distinct sound worlds is discussed further in the analysis of *Alias States* (see 5.7). The ‘plane-of-separation’ theorised by Bahn et al, to describe how performers engage with electronic technology is used in the analysis of *Mikrophonie III* (see 5.5). The modular identity of the drumkit shares a similarity to the integration of audio effect pedals into electric guitar practice, which features in the sections on *Partial Arenas* (see 5.4) and *Nara* (see 5.3)

Part 2: Analysis

Chapter 5 Piece Commentaries

This chapter looks at each of the seven submitted works in isolation. An additional work, *Kolmanskop*, which was composed in the early stages of the PhD (see Appendix A), is also presented as it serves as an early reference point for issues contended with in later works. The chapter begins with a section on my methodology to provide a general overview of my compositional process. The following eight sections successively consider *Kolmanskop* and the seven submitted compositions in chronological order of completion. Each of these sections has the same bi-partite format: set-up defined, followed by a discussion of key points. This discussion includes an account of the compositional strategies employed to negotiate the set-up through the production of musical material for the work; and how the given set-up utilises electronic technology; engages a relational conceptualisation of musical instruments; and provides new listening perspectives for audiences.

5.1 Methodology

This practice-as-research project is focussed on the creation of compositions that incorporate electronic technology into instrumental works for live performance in order to engage with conventional instruments in new ways. This approach centralises the concept of the set-up, which refers to all the human and non-human components used for the realisation of a work (see 2.1). Underpinning the production of the portfolio of compositions are three key research areas:

1. Firstly, how electronic technology can be used to extend the established relationship between a performer and their instrument. Key to this is using the existing embodied techniques of performers without significant disruption.
2. Secondly, how electronic technology can be used to alter the established relationship audiences have with performers playing conventional musical instruments. Here, technology is used to offer new listening modes to familiar instruments.
3. And thirdly, to develop strategies for the creation of musical material that explores the individual qualities of composed set-ups.

The practice-as-research methodology employed in the production of the accompanying works engages phases of development; composition of musical material; and rehearsal and performance. Although these phases aren't unfamiliar to practitioners working in this field, they are briefly considered here to show that composition of the musical material is consequent on the composition of the set-up.

These phases can be summarised as a five-step method (see fig. 5.1):

1) Developing the components of the set-up.
2) Exploring the qualities of the set-up. This often necessitates a return to step one.
3) Documenting the output of this exploration.
4) Developing musical material in a digital audio workstation (DAW).
5) Workshop, recording and reflection. This often necessitates a return to step four.

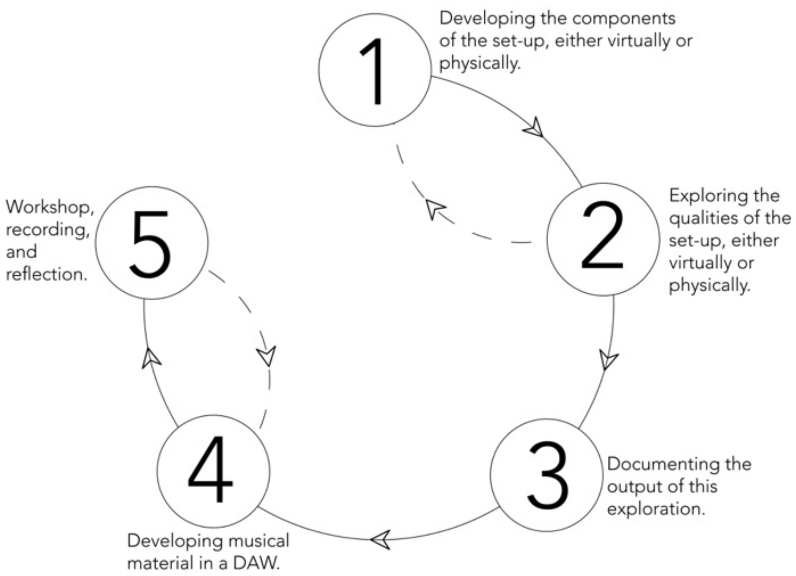


Figure 5.1: Compositional process

Organising this five-step method into different phases highlights the creation of the set-up as a central compositional concern.

Composition Phase One: Set-up Development

During the development phase, the components of the set-up are constructed and explored. Often this involves building sections of the set-up, borrowing musical instruments, and talking to performers. Engaging with the physicality of musical instruments is important when exploring possible applications of electronic technology within the set-up. Working in this way also centres the presence of the performer in the set-up, including the extent and limitations of possible actions.

After trying out the set-up and adjusting the components, it becomes a largely fixed set of human and non-human elements in a particular arrangement. Picture 5.1 shows a photo of a set-up in the development phase. As all works are for a bespoke set-up, discovering the affordances of these set-ups is a process of trial and error. Therefore, each change is documented with video, audio, or photographs. This also allows the physical set-up to be catalogued and moved onto the computer.

Picture 5.1: A set-up for the solo percussion piece *Fabbriche* (not included in the portfolio) in the development phase

<u>Composition Phase Two: Creating and Organising Musical Material</u>

Creating the musical material for a composed set-up represents a more traditional composition phase. The qualities afforded by the particular characteristics of a set-up direct the focus of the musical material. In order to engage with these qualities, in each case it is important to produce a computer mock-up of the composition. This provides a method for hearing, editing, and developing the electronic technology in the work. Producing the mock-up is a precursor to writing the score, as writing the notation often functions as an important editing process.

Composition Phase Three: Rehearsal/Performance

Recreating the set-up in a performance space with the ensemble as a workshop highlights any issues with the electronic technology, how the performers experience playing the music, and how the audience experiences the blend between acoustic and electronic sound sources. As the musical material and mock-up is digitally produced, the return to the physicality of the set-up in a performance space may change how the acoustic instruments interact with the electronic processing. The mechanisms and function of the technology need development through dialogue with the performers. Then further review of the success of the composition can be made before the work is performed.

Review and reflection are important at all stages of the compositional process and often necessitate a return to an earlier phase.

The three phases of development, composition of musical material, and rehearsal/performance provide an overview of the compositional approach to all seven submitted works. While the final two phases of writing musical material and rehearsing with musicians is common across many compositional practices, the first phase of development is distinctive to this project. This phase highlights the twin creative acts involved in this project: composing the set-up and composing for the set-up.

In the following discussions of each work in the portfolio, these compositional phases are referred to in one of two ways. Either, by considering how the set-up developed through the composition of each work (see *Nara*, *Mikrophonie III*, and *Alias States*) or alternatively, how earlier works informed the composition of subsequent set-ups (see *Partial Arenas* and *Piano Nudes*).[113]

[113] Both *Candela* and *Charlene from Big Data*, were more straightforward in the set-up composition, so reference to methodological issues is limited.

5.2 *Kolmanskop* (2017)

Kolmanskop for tuba and electronics was composed in the early stages of my doctoral studies. The composition is not included in the submission, as I am not satisfied with it. Nonetheless, I discuss the work in this chapter as the piece exemplifies compositional approaches and problems encountered that were developed and contended with in later works.

<u>Set-up</u>

The components of *Kolmanskop* are:

1) One performer:
    - Tuba player.
2) Four MIDI switch pedals (outputs momentary messages).[114]
3) Laptop and interface.
4) Four P.A. loudspeakers placed in each corner of the performance space.

Figure 5.2 shows how these components are arranged and connected.

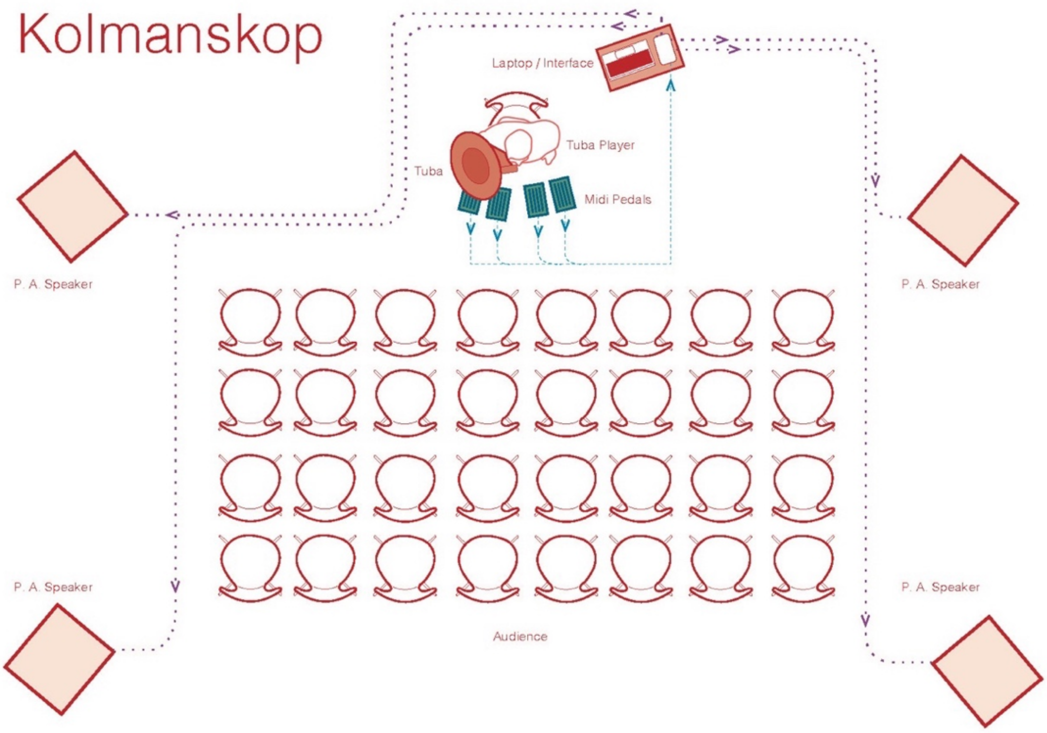


Figure 5.2: *Kolmanskop* Set-up

[114] This is different from a MIDI toggle pedal, which doesn't send an 'off' message when released. Each activation of the pedal will alternate between sending an 'on' and 'off' message.

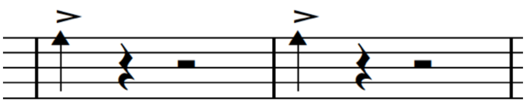
Musical Material

Kolmanskop is formed from the combinations of four musical phrases, four audio signal processing techniques that affect the acoustic sound of the tuba, four samples, and four loudspeakers placed in a quadrophonic set-up. The performer activates the audio signal processing units and triggers the samples through the depression of MIDI switch pedals. There are four pedals: each pedal produces a fixed combination of one audio effect and one sample, routed to one of the loudspeakers. Even when a pedal is depressed, we hear the acoustic sound of the tuba. Without the acoustic sound of the tuba, the audio effect is unheard.

1. The musical phrases played by the tuba contrast stylistically, as well as through more conventional playing techniques, including dynamics, articulation, rhythm, and pitch. The first phrase connotes a light, carnival-style idea (see ex. 5.1).[115]

Example 5.1: Musical material - first phrase (*Kolmanskop*)

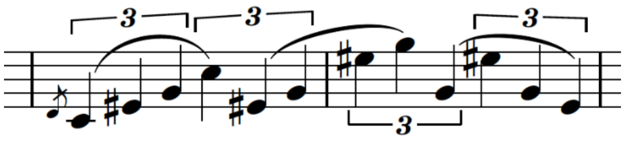
The second phrase requires the tuba player to produce loud, high-pitched, overblown notes (see ex. 5.2)



Example 5.2: Musical material - second phrase (*Kolmanskop*)

The third phrase is an ascending and descending arpeggio figure (see ex. 5.3).

[115] Note: all score examples are in the bass clef.



Example 5.3: Musical material - third phrase (*Kolmanskop*)

The fourth phrase features Phrygian mode motivic references to rock music (see ex. 5.4).

Example 5.4: Musical material - fourth phrase (*Kolmanskop*)

2. The four audio signal processing effects are:
    a. Modulated delay – the acoustic sound of the tuba is repeated, with additional audio effects affecting pitch and speed of playback applied to the repeated sounds.
    b. Delay – providing a direct repeat of the acoustic sound at regular intervals progressively reducing in volume.
    c. Harmoniser – adding additional pitches to the acoustic sound of the tuba in real time.
    d. Distortion – degrading the acoustic sound.

With the application of the third and fourth audio effects, we hear a blend of the original sound with the affected sound. The audio effects are provided to the performer through a pre-made software programme. The specific parameters of each audio effect are fixed, and the natural variations caused by the acoustic environments of different performance spaces is unimportant.

3. The four samples are recordings of different environments, musical phrases played by other instruments, or a combination of both.
    a. Carnival ambience.
    b. Jungle ambience.
    c. A brass band warming up.
    d. A rock drum beat.

At the depression of the pedal, the sample always plays from the beginning and plays for the duration of the depression of the pedal.

4. Each of the four loudspeakers is set-up in a standard quadrophonic arrangement; each loudspeaker is placed in one ‘corner’ of the performance space (see fig. 5.2). Hereby creating an artificial square in which the performer is positioned.

The combinations of samples, audio effects and loudspeakers remain the same throughout the piece, and each pedal activates the same combination.

Discussion points

There are some stylistically connotative relationships between the choice of sample and the audio signal processing effects. For example, a distortion audio effect associated with rock music is coupled with the rock-drum-beat sample to support the reference to rock music styles. Additionally, this type of relationship extends to the musical material: the rock-drum-beat sample and distortion effect is coupled with a ‘rock’ motif (see ex. 5.4). Each pedal has a similar corresponding relationship with the musical material. We could consider these relationships the default combinations, as they are the groupings of musical phrases, samples, and audio effects established during the opening of the work.

The first default combination (see table 5.1) is the light, carnival-style phrase played by the tuba, affected by the modulated delay, with the carnival ambience sample. The second default combination is the high, overblown pitches played by the tuba, affected by a delay, with the jungle ambience sample. The third default combination is the major arpeggio figure played by the tuba, with the harmoniser audio effect and the brass band sample. The fourth default combination is the Phrygian mode rock motif played on the tuba, distorted through audio signal processing and combined with a sample of a rock drum beat.

The length of each of the constituent elements of these default combinations is from a semi-quaver (at 100 BPM) to two minutes and fifty seconds. This longer phrase is an outlier, however, with most of the elements lasting for seconds rather than minutes.

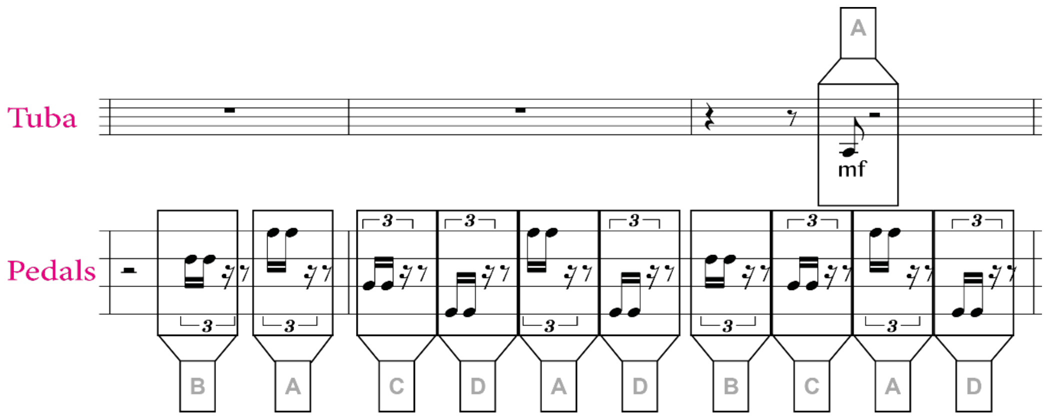
	A	B	C	D
Pedal	Loudspeaker position: front left Audio effect: modulated delay Sample: carnival ambience	Loudspeaker position: front right Audio effect: delay Sample: jungle ambience	Loudspeaker position: rear right Audio effect: harmoniser Sample: brass band warming up	Loudspeaker position: rear left Audio effect: distortion Sample: rock drum beat
Musical Material	Light, carnival-style tuba phrase	High-pitched, overblown notes	Ascending and descending major arpeggio figure	Phrygian mode rock motifs

Table 5.1: Default combinations of materials in *Kolmanskop*

Throughout the work, these default settings are established and then decoupled; some of the possible, different combinations are explored. These combinations include the samples and tuba phrases heard individually. Furthermore, multiple pedals are also depressed simultaneously, producing many more possible combinations.

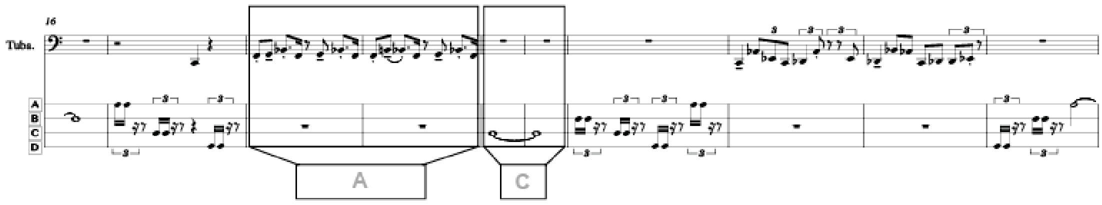
The opening to the piece presents each sound event (i.e., tuba phrase, sample, etc.) individually, forming a sequence. This could be considered a didactic approach to presenting the material: first we are ‘taught’ what each pedal triggers and then the default combinations are revealed. This sequence of sounds events is presented as an exposition and exposes particular orderings.

In the opening to the piece, in which there is no combinatorial development, the interest is in the ordering of the sound events rather than the manipulation of the combinations. From b.1 – 33 (see ex. 5.5), the tuba part is interpolated between the samples, creating a hocket between two types of material. This gradual and incremental exploration of the different sounds within the piece aims to clarify the individual components that correspond to each pedal/loudspeaker.



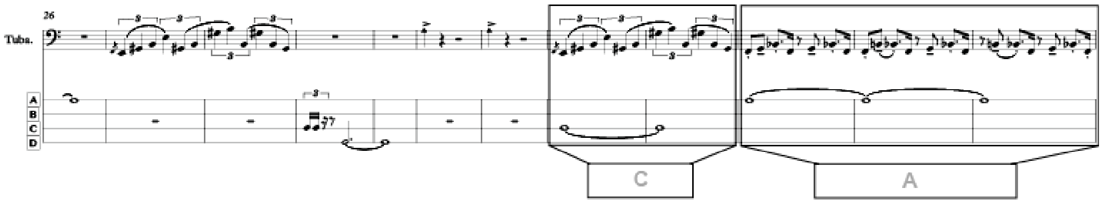
Example 5.5: Opening sequence (*Kolmanskop*)

The composition develops by increasing the length of the musical phrases and/or samples. For example, in b.18 – 19 the full two-bar phrase of musical material ‘A’ is played and in b.20 – 21 sample ‘C’ is played for two bars (see ex. 5.6). At first, the sounds are short, almost percussive, and mainly differentiated by slight pitch and timbre differences. As more of the phrase is heard (both in the tuba part and the sample part), the stylistic references are revealed, as well as other sonic information.



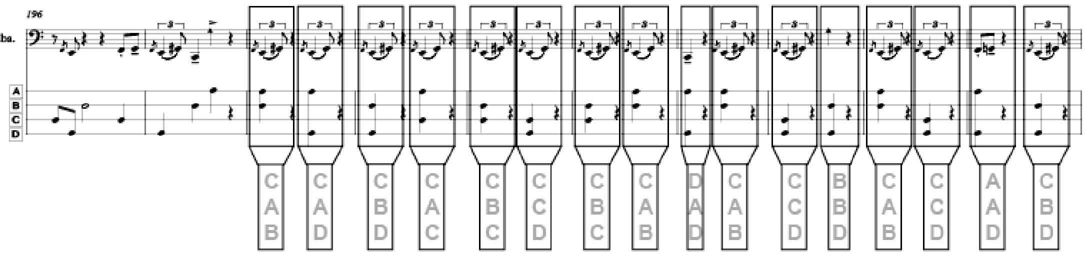
Example 5.6: b.16 – 25 (*Kolmanskop*)

The first moment in which a musical phrase is heard with the depressed pedal is at b.33, in which we hear the combination of musical material ‘C’ with sample ‘C’ and audio effect ‘C’ (see ex. 5.7). This establishes the first of the default combinations, the others are heard during the subsequent bars.



Example 5.7: b.33 – 37 (*Kolmanskop*)

Aside from a section in which other material is explored, this process of establishing the default combinations continues until b.176 where the combinations become decoupled in increasingly complex ways. Short iterations of the samples, the tuba phrases (both processed and unprocessed) are heard in random sequences of decoupled combinations. Eventually, all four pedals are depressed and the tuba phrase, played at the same time, is a composite phrase comprised of elements from all four initial musical ideas (see ex. 5.8).



Example 5.8: b.196 – 205 (*Kolmanskop*)

This highly structured exploration of the different elements is interrupted once during the composition; between b.107 and 176 we hear one combination for far longer. This section of 69 bars acts like a solo, moving away from the constraints set by the combinatorial approach. This compositional strategy provides relief from the limitations created from such an ordered approach; the extended sample reveals a more completely arranged rock song, including keys, guitar, and bass, stylistically and affectively contrasting to the rest of the piece (see ex. 5.9).

Example 5.9: b.107 – 147 (*Kolmanskop*)

<u>Critical Reflection</u>

The composition demonstrates some emerging strategies in my approach to incorporating live audio signal processing into works for acoustic instruments. These strategies, however, are limited and have outcomes that reflect early steps toward more complex compositional processes that explore possible relationships between acoustic instruments and electronics.

I have one primary misgiving with this work which relates to instrumental practice. The instrumental practice of *Kolmanskop* uses the four pedals to enable the coupling of acoustic sound with audio signal processing effects. This changes our perception of the tuba phrases through stylistic, rhythmic and timbral alterations. This pedal-use is an extension of the integration of electric guitar foot-pedal effects into electric guitar practice; I consider these processes as normalised electric guitar techniques. As such, *Kolmanskop* simply resituates these practices within the context of the tuba; the function, use, and sonic output of these effect pedals operates in the same way as in electric guitar practice. As this is unconventional in tuba practice, however, this presents a considerable and negative disturbance to the established techniques of the performer and requires a significant change in the relationship between instrument and instrumentalist. Switching between multiple pedals forced the tuba player into performing a choreographed dance. This extravagant puppeteering of the performer was a result of the mechanism involved in activating the samples and was an unintended by-product of the technical set-up. Due to pedal-use being unconventional in tuba practice, the performer's interactions with the pedals draws attention to this cultural aspect of the work (i.e., the dance) and distracts from the intended sonic aspects of the work. For this project, it is important that the musical material explores the qualities of the set-up, which was not the case here. As this possible site for compositional activity was not considered, it is an unplanned outcome of the work. In future works, such as *Nara*, *Partial Arenas*, *Piano Nudes*, and *Charlene from Big Data* pedal-use is further integrated into the set-up; the pedals become additional sites of performance, sound-producing objects, or synthesised into the techniques of instrumentalists. Additionally, subsequent pieces, including *Candela* and *Mikrophonie III*, offer potential solutions to activating audio effects away from pedal-use.

Kolmanskop, for tuba and live electronics, was completed at an early stage of the PhD. The work was an exploratory attempt to electronically enhance an acoustic instrument through extending the timbral and spatial qualities of the tuba. *Kolmanskop* provides a useful reference point for subsequent works, which extend emergent ideas and compositional processes found in this piece.

5.3 *Nara* (2017)

Nara is a work for solo hexaphonic electronic guitar. The technological mechanism central to the work is an analogue hexaphonic passive pick-up which replaces the mono pick-up (standardised across all electric guitars). The composition presents a spatialised experience of the six strings of the guitar, as they are routed to amplifiers placed around the performance space, positioning the audience in an unusual listening perspective.

<u>Set-up</u>

The components of the set-up in *Nara* are:

1) One performer:
   - Guitarist.
2) Adapted electric guitar containing a hexaphonic pickup, in which the guitar produces six discrete outputs rather than one mono output.
3) Scordatura tuning: 6th string = E2, 5th string = B2, 4th string = D#3, 3rd string = E3, 2nd string = C4, 1st string = F4.
4) Static delay effects on the fifth and second strings. The fifth-string delay time should be slower than the second string's and both delay times should be between 100ms and 500ms.
5) Static reverb effects on the fourth and first strings. The fourth string reverb amount should be smaller than the first string's and both reverb lengths should be between 1s and 5s.
6) Two guitar effect pedals, one each on the signal chain flowing from the sixth and third strings to the amp, applying 'freeze' effects to the sound.
7) Six guitar amplifiers spaced around the audience, each receiving one string's signal.

Figure 5.3 shows the components of the set-up (listed above), the connections and their positioning in the performance space. The output of all the strings is routed through a 'string splitter' box. Each string is now routed to an individual amplifier, positioned around the audience, with either an effect or foot pedal added to the signal chain.[116] There are two symmetries presented in the set-up: each amplifier that shares an audio effect type faces the other one, and the bottom three strings' effects are replicated in the top three strings' effects. Considering the set-up symmetrically means that there are a limited number of effects that contributes to a sense of sonic cohesion in the piece. The work was finalised through a process of experimentation with the set-up in various performance spaces: moving between composition phases two and three produced a loop of exploration and documentation (see 5.1). The positioning of the performer

[116] The delay and reverb effects can either be produced by the addition of pedals or, if possible, through built-in effect units on the amplifiers.

outside the circle of amplifiers allowed the placement of the audience within the optimal listening space.

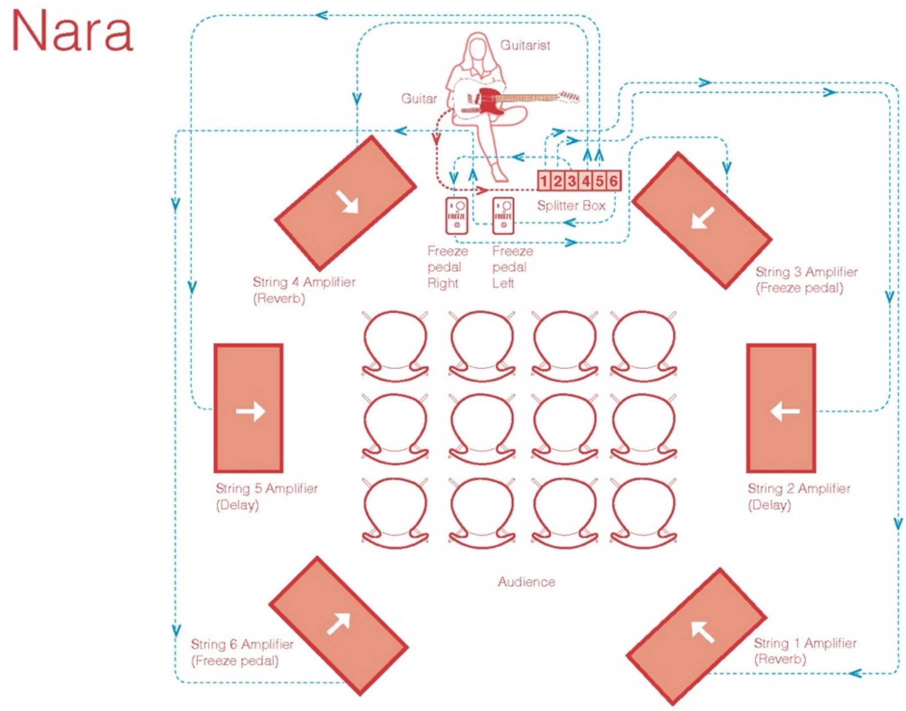


Figure 5.3: *Nara* Set-up

<u>The Pick-ups</u>

There are various types of pick-up available, often with more than one (and more than one type) on a guitar. The most common types include the single coil and humbucker, generally located between the neck and the bridge. The types of pick-up and their placement on the guitar vastly change the tonal qualities of the signal. Single coils tend to have a thinner sound than humbuckers and the pick-up locations affect what frequencies are most audible. For example, the guitar used in the recording of *Nara* is a modified Epiphone Les Paul Studio. It originally had two sets of humbucker pick-ups positioned at the neck and the bridge, with four tone controls to isolate one pick-up or to produce a blend. Regardless of pick-up type or position, the usual configuration produces a mono signal; the guitar sends the sounds of all strings blended together. In this piece I replaced the existing pick-up with a specially made hexaphonic pick-up, which allows each individual string to be routed through its own discrete output.[117] The installation of the hexaphonic pick-up renders all other pick-ups and tone controls on the guitar defunct.

Spatialisation

The six discrete string outputs are routed to six different guitar amplifiers which are positioned in a circle around the audience/performer (see fig. 5.3). The six individual strings with the six individual amplifiers afford the possibility of an expanded sonic diffusion in the performance space. The types of amplifiers are unimportant as any resulting tonal quality variations help sonically differentiate the strings, although they should be of similar output power.

Guitar Effects

Although the delay and reverb effect pedals are standard guitar effect units often found in-built on amplifiers, the Freeze pedal isn't (see pic. 5.2).

Picture 5.2: The Electro-Harmonix Freeze pedal

The Electro-Harmonix Freeze pedal, when engaged, captures the signal from the guitar and is able to extend sound indefinitely through looping a segment of the 'middle' of the sound envelope (i.e., without the attack or decay). It is not possible to control the segment length, but the fluctuating sound waves (moving from their peak to their trough) become audibly prominent over time, due to this cyclical loop effect. When the pedal is engaged again there are three possible

[117] These pick-ups are made in the USA by Paul Rubenstein: http://www.ubertar.com/hexaphonic/. For the recording, I have used humbucker pickups.

outcomes: if signal is passing through the pedal the application of the pedal switch will freeze the sound. If sound is already frozen and no signal passes through the pedal, then the application of the pedal switch will stop the frozen sound. If no signal is passing through the pedal and there is no frozen sound, the application of the pedal switch will not do anything apart from produce the acoustic mechanism sound (a click). Unlike the strings with the Freeze pedal, the delay and reverb effects do not change during the piece and are always on.

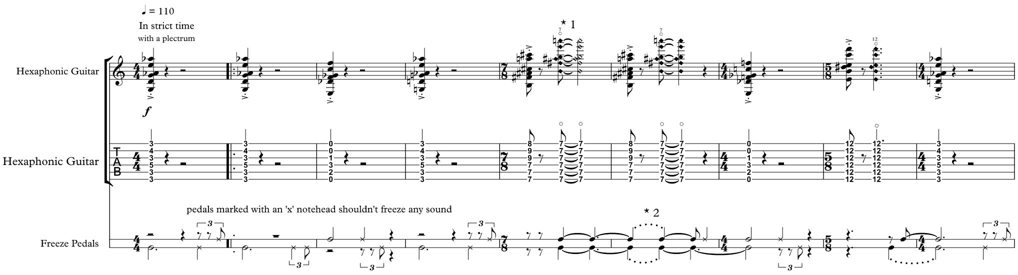
Giving each string a particular sonority further differentiates and emphasises separation between strings. The result of separating the strings in this fashion can be regarded as 'unnatural', given that the convention in guitar practice of presenting the strings as a blended whole is so ubiquitous as to be the 'natural' electric guitar state. Separating the strings also allows scope to create unusual timbral composites in chordal passages and spatial polyphony.

Key points

The Hexaphonic Environment

Nara is a piece for electric guitar in a conventional sense and it engages with familiar conventions and techniques of the instrument. These sonorities and techniques, however, are perceived differently due to the mediation of the musical material through the attributes of the constructed, circumscribed set-up. We hear these sonorities decontextualised. The instrument is 'twisted' so that conventions appear unconventional, which is evident throughout but specifically in the following places.

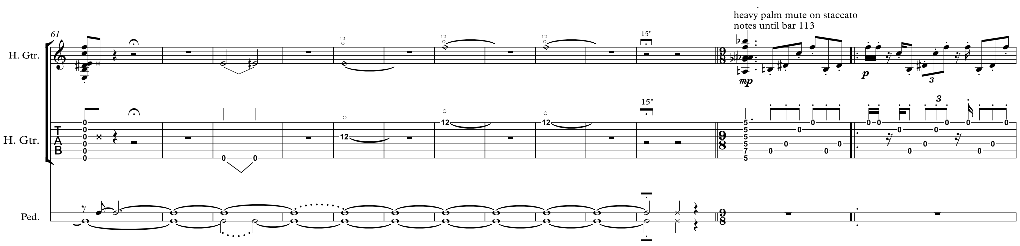
At the beginning of the piece, we hear loud strummed chords across all six strings. The *forte* dynamic marking increases the amount of audio effect: the delays and reverbs have a more vibrant character in these moments. As a result, we don't experience those opening chords as a whole, highlighting harmonic or rhythmic elements, but as a collection of distinct sounds from discrete radiation points (see ex. 5.10). The rests after each chord allow the sonic effects to disperse without disruption from new sounds, focussing our attention on the different speeds of delay, amounts of reverb and combinations of dry and wet sounds. We see the action of the guitarist but hear a far more complex result. Instead of experiencing the chord as a singular whole, we hear the individuality of the strings contrapuntally. The unusual set-up allows the sonorities to connote in an ambiguous way.



Example 5.10: Opening bars of *Nara*

(time reference: 00:00 – 00:18)[118]

One of the uses of the Freeze pedal, for example at b.61 – 73, is to highlight the natural intonation incongruities that exist when playing the guitar that are normally lost in the homogenised whole of a chord. By extending two notes longer than the natural decay of a guitar note, we hear the combinations of two sets of similar frequencies (see ex. 5.11). Due to the manner in which the Freeze pedal processes the loop (discussed above) these sounds cycle at different lengths and produce a timbre that evolves in an unendingly varying way.

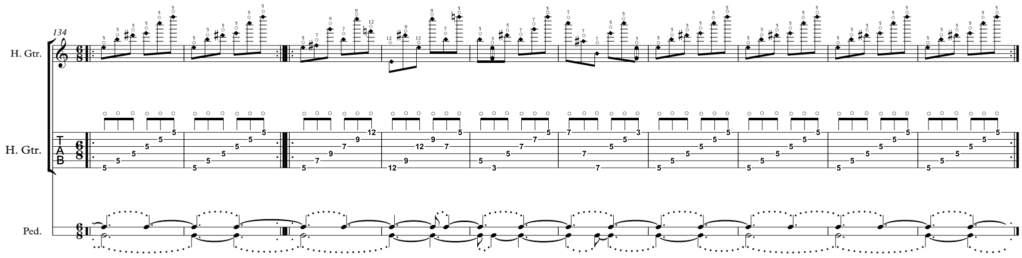


Example 5.11: b.61 - 73 (*Nara*)

(time reference: 03:54 – 04:50)

The acoustic, mechanical application sound of the pedals is treated as part of the musical material (see ex. 5.12). They are scored as rhythmic devices in their own right and either exist independently from the electric guitar or are used in conjunction with it. The sound of pedal application is not normally heard (and largely ignored if it is) due to the context of louder, amplified, popular music in which they are normally used.

[118] Time references refer to the recordings included in the portfolio.



Example 5.12: b.134 - 143 (*Nara*)

(time reference: 09:25 – 10:33)

Throughout the piece we attend to the materiality of sounds in a decontextualised setting. An example of this is the ascending arpeggios at b.134 and 135 (see ex. 5.12). This is a moment that features a highly conventional musical passage for the guitar. Yet, heard through the effected, hexaphonic set-up the music becomes complex and multivalent; it can be understood in many different ways. At this moment this difference is unmissable; nowhere in the piece is this more evident than here. Heard without the effected hexaphonic set-up, and depending on the context, the ascending arpeggios would convey harmonic information in a rather basic and even naïve manner.

Without its mediation through this hexaphonic environment we would try and understand the musical material in terms of its formal properties and perhaps what it expresses. In *Nara*, however, because of the spatialisation and use of different effects on each string, we attend to the sonic and spatial properties of the phrase. There is a change from a homogenous to heterogenous texture, highlighting independent voices, as we hear the movement enacted around us. The change becomes the focus: without the space the arpeggio is a naïve reproduction of an uncritically used convention.

Nara recomposes the relationship between the instrumentalist and instrument, through the alterations to the physical and sound environment:

1) The activation of the pedals becomes another site of performance. The piece requires the performer to use both feet, as well as hands, in a larger rhythmic whole, much like a drummer uses both arms and both legs when playing a drum kit. In comparison with the four pedals used by the tuba player in *Kolmanskop*, the pedal actions are less disturbing here, as effect pedal practice has already become part of the established techniques of electric guitarists.

2) The separation of the strings provides a different causal relationship between the actions of the performer and the resulting sound. This draws attention to the adapted and (re)constructed attributes of the set-up; we hear this meta-instrument as a gestalt in which different elements are fused.

In both cases we experience the relationship between instrumentalist and instrument more prominently than in other conventional pieces for electric guitar. Slightly changing the manner of interaction between performer and instrument alters our perception of convention, techniques, and approaches. As previously discussed, Wilson's concept of entanglement between *pedagogy* and technology explains this: in an unadapted relationship, the physical relationship between instrument and instrumentalist is relegated to the background. "For the audience, because of naturalised processes of playing the piano, the player's inputs appear as *becoming*, rather than causing, sonic outcomes."[119] In *Nara*, the instrument adaption highlights the previously habitualised relationship between the audience and the instrument.

[119] Samuel Wilson, "Building an Instrument, Building an Instrumentalist: Helmut Lachenmann's Serynade," *Contemporary Music Review* 32, no. 5 (2013): 426.

5.4 *Partial Arenas* (2018)

Partial Arenas, written for the Zwerm guitar quartet, explores a constructed environment of four electric guitars in scordatura, four Freeze pedals, live electronics and amplification.

Set-up

The components of the set-up in *Partial Arenas* are:

1) Four performers:
    - All guitarists.
2) Four electric guitars, one for each performer, all played with plectrums.
3) Four Freeze pedals, one for each performer.
4) Four volume pedals, one for each performer.
5) Four amplifiers, with a slight overdrive, at a high volume.
6) Four contact microphones (such as Piezo), each one placed onto the volume knob of the Freeze pedal.
7) The possibility of the strings of each guitar amplified via microphones.
8) A laptop (running Ableton) and audio interface, routed into a
9) P.A. system set up in stereo with the string sound, the wet and the dry sound of the pedals. The stereo image replicates the physical position of the guitarists on stage. For example, if the first guitarist is viewed by the audience as being on the left, then the string sound and the pedal sounds should be panned to the left.

Figure 5.4 shows the components of the set-up and how they are connected. The set-up for *Partial Arenas* was informed by the earlier composition *Nara* (see 5.3) and, as such, the additional components for this work (e.g., the volume pedals and the use of contact microphones on the Freeze pedals) were adjustments to limitations found in the older work. In particular, the microphones on the Freeze pedal, transformed the guitar pedals from (largely hidden) signal processors, into a (more visible) site of performance.

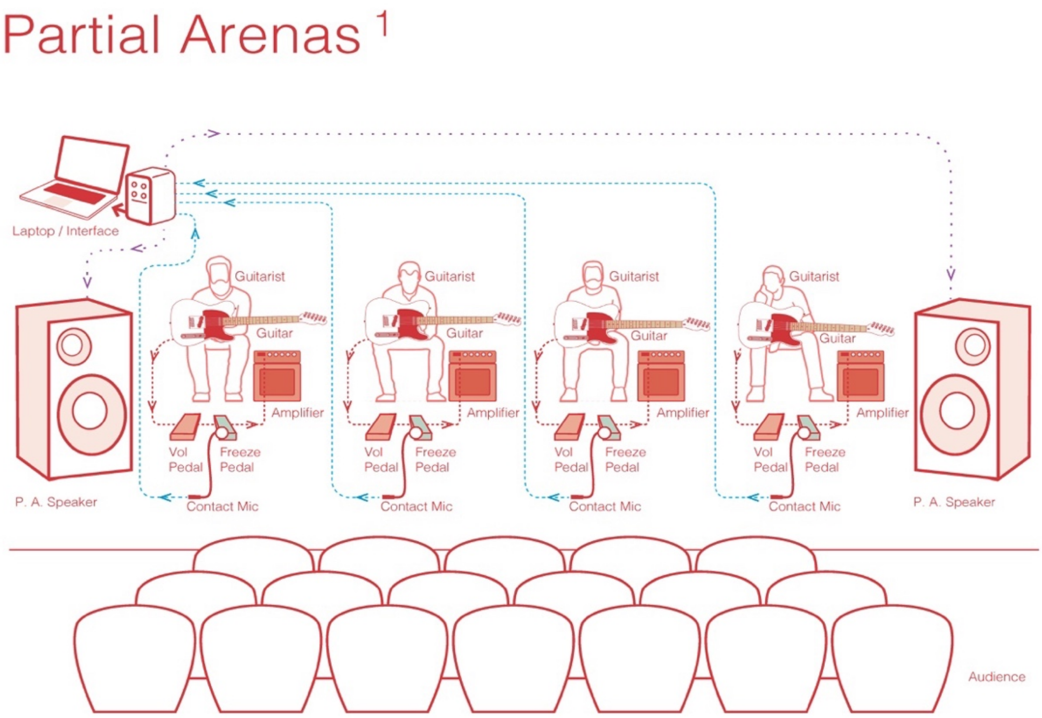


Figure 5.4: *Partial Arenas* Set-up

Each guitar is set up in the same way, with the following signal chain (see fig. 5.5).

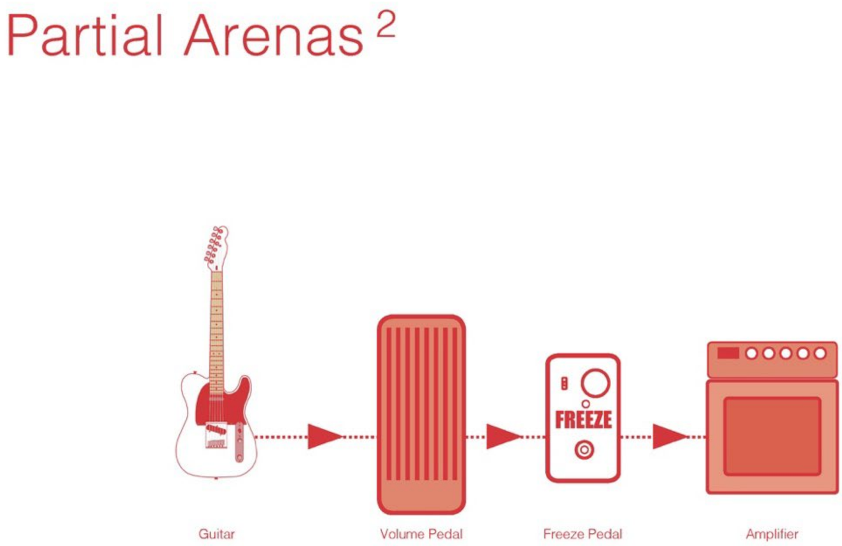


Figure 5.5: Signal chain for each guitar in *Partial Arenas*

The contact microphones amplify the sound of the Freeze pedal as it is depressed, which happens anytime it is activated or deactivated. The amplified sound is routed to Ableton Live where each of the four pedals has a different audio effect applied to it (see table 5.2).[120] These audio effects respond dynamically to the initial sound; the louder the sound from the Freeze pedal switch, the more energy (sound) is generated. Additionally, as with *Nara*, we hear the acoustic mechanical click of the pedal as it is operated.

Pedal	Audio Signal Processing	Audio Signal Processing Description	Example
Pedal 1	Reverb	This reverb is designed with an echo effect so that distinct repetitions of the initial sound are heard.	(hyperlink)
Pedal 2	Stutter	This effect stores the sound in a short buffer and then replicates the sound in a repeated, stuttering way. In this configuration the delay effect is routed into the buffer and then a filter.	(hyperlink)
Pedal 3	Reverse echo	This effect provides repetition of the initial sound but in reverse. Additionally, the speed of the repeated sound is modified by a low-frequency oscillator (LFO).	(hyperlink)
Pedal 4	Filter delay	This effect repeats the inputted sound through a filter, stutter and delay.	(hyperlink)

Table 5.2: Pedal audio signal processing in *Partial Arenas*

Key points

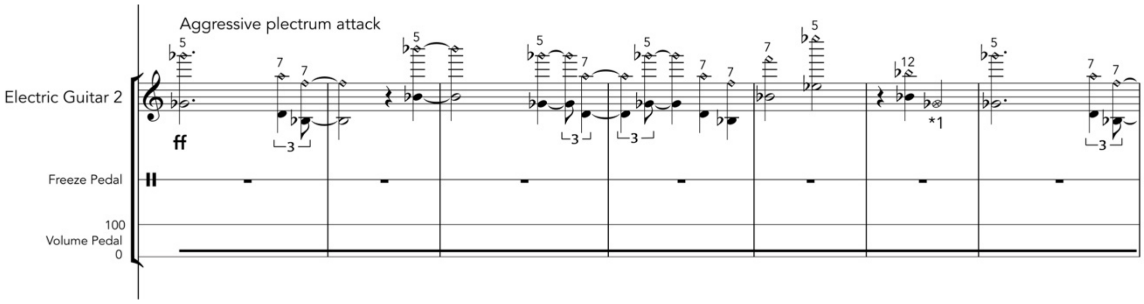
Volume

During the piece, the guitars affect volume change in different ways, as the relationship between input energy (from the performers' plectrums onto the guitar strings) and the output sound (from the amplifier) is changed through the addition of a volume pedal in the signal chain. This enables quiet sounds, such as harmonics, to be heard at loud volumes, and louder sounds, such as full

[120] In each case, a brief description of the audio effect is provided. Please click on hyperlinks for audio examples.

chords, to be heard at quieter volumes. Furthermore, the volume pedal enables control over the amplitude envelope of the guitar sounds, artificially altering the attack time of struck notes.

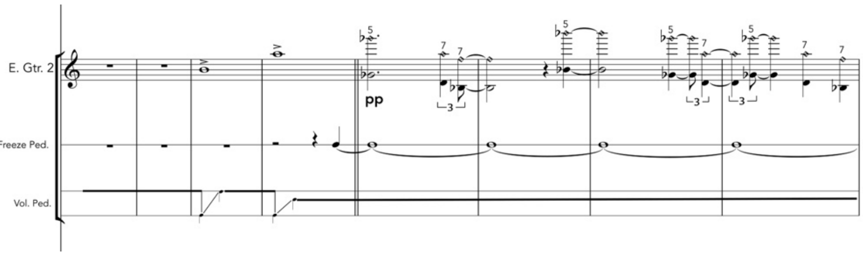
At the opening of the piece, the instruction is to play the music at a *fortissimo* dynamic with an aggressive attack sound produced from using a plectrum on the strings. As the volume pedal attenuates the output sound to the amplifier significantly, we hear the acoustic sound of the plectrum on the strings equally as present as the notes from the guitar (see ex. 5.13).



Example 5.13: Second guitar part of the opening to *Partial Arenas*

(time reference: 00:00 – 00:25)

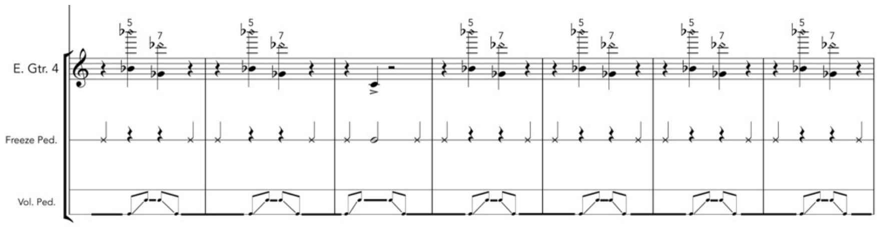
The end of the piece reverses this relationship; the dynamic instruction is *pianissimo* and the volume pedal allows all the signal to pass to the amplifier. This timbral effect provides contrast between the beginning and ending musical material, which is otherwise largely the same (see ex. 5.14).



Example 5.14: Second guitar part of *Partial Arenas* b.160 – 167

(time reference: 10:56 – 11:24)

The volume pedal is also used to shape the amplitude envelope of the note. With the note struck and the volume pedal down (no signal passes), we don’t hear the attack of the note and therefore the volume pedal can provide an artificial slow attack to the notes. Conversely, the note could be struck with the volume pedal up (full signal passes) and then quickly lowered to produce an artificial decay, similar to muting a note after sounding it. These techniques are used across the guitar parts, but the fourth guitar part uses both (see ex. 5.15).



Example 5.15: Fourth guitar part of *Partial Arenas* b.73 – 79

(time reference: 05:29 – 05:53)

The work opens up the possibility of engaging with the acoustic properties of physical actions often sonically hidden by electronic amplification. Firstly, through the sound of electric guitar strings being plucked. Secondly, through amplifying the acoustic sound of the Freeze pedal mechanisms into the set-up. This provides an assemblage of sounds, comprised of the electric guitar output (both clean and affected with a Freeze pedal), the strings of the electric guitar, and the toggle switch on the Freeze pedal (both clean and affected with audio effects).

Freeze Pedal

The Freeze pedal (as discussed in the analysis of *Nara*) takes the routed signal from the guitar and effectively loops a short segment of it producing a constant 'frozen' sound. The score details the application of the pedals and, when the pedal is activated at the same time as a sound is made from the guitar, we hear the sound from the Freeze pedal until the next activation. Example 5.16 highlights (through the addition of arrows to the score) the continuity of sound from the Freeze pedals, which is an important part of the texture of the composition.

Example 5.16: b.30 – 35 *Partial Arenas* (with annotations)

(time reference: 01:47 – 02:08)

Another way the pedals are used is without signal from the guitar entering the Freeze pedal. In this case, the pedal is used only to activate the contact microphones and produce sound to activate the audio signal processing effects from Ableton Live (see ex. 5.17). This effect is used quasi-cadentially and is used throughout the piece to create moments of closure.

Example 5.17: b.15 - 22 *Partial Arenas* (with annotations)

(time reference: 00:52 – 01:22)

There are some similarities between the set-up for Bailie's *Last Song for Charleroi* and *Partial Arenas*, not least because the works are scored for the same ensemble. Both compositions take each guitar set-up as an individual signal chain, involving performer, guitar, audio effect pedals and amplifier. These guitar set-ups are the same across all four instrumentalists, providing a sense of symmetry within the ensemble. This approach provides a sonic unity to the ensemble, perceptible in both works. Whereas the tape part in Bailie's work sits 'outside' of the set-up (see

2.2) and runs independent of the performers, all the components in *Partial Arenas* are integrated. The acoustic sounds of the strings are important to our experience of the musical material; the acoustic sound of the Freeze pedal being activated is incorporated into the musical material; and the long, sustained notes are made by the Freeze pedals.

5.5 *Mikrophonie III* (2018)

Among the submitted works, *Mikrophonie III* has the most elaborate set-up. As the title makes clear, the piece references Stockhausen's *Mikrophonie I* (discussed in Chapter 3) in name, material, and structure.

<u>Set-up</u>

The set-up for this work is complex and includes:

1) Three performers:
   - All percussionists.
2) A range of beaters: soft mallet, metal brushes, drumsticks, soft beaters, cloths, and two sections of coarse sandpaper.
3) One splash cymbal, suspended between two cymbal stands using string (imitating the set-up of the tam-tam in Stockhausen's *Mikrophonie I*).
4) One ride cymbal, set up similarly.
5) A stand-mounted snare drum.
6) MIDI drum pad with (at least) seven pads.
7) Two hand-held switches that trigger audio samples.
8) A MIDI switch foot pedal to switch the functioning SM57 on or off.
9) Two SM57 microphones (or similar). One is a prop and does not need to be plugged into the soundcard but should be attached to a cable.
10) A laptop running Max/MSP with an audio soundcard that has three inputs and a stereo output.
11) A stereo P.A. system.
12) A USB camera.
13) A projector, screen, and lead to connect to the laptop.

The components should be placed in front of the projector screen with enough distance between the suspended ride cymbal and the suspended splash cymbal for a performer to require around three seconds to walk purposively between the two cymbals (see fig. 5.6).

Finalising this set-up was a more complex process of development. Initially, instead of hand-held switches triggering the audio samples, I used Piezo contact microphones attached to the ride and splash cymbals. These microphones were connected to Max/MSP where an amplitude detector would recognise any hits to the cymbal and trigger an audio sample. The first performance used this method, but the performers and I found this unreliable and overly complicated to calibrate. Using hand-held switches removed the uncertainty without altering the audience's perception of how the underlying mechanism functions; hits on the cymbal still appear to produce the audio sample.

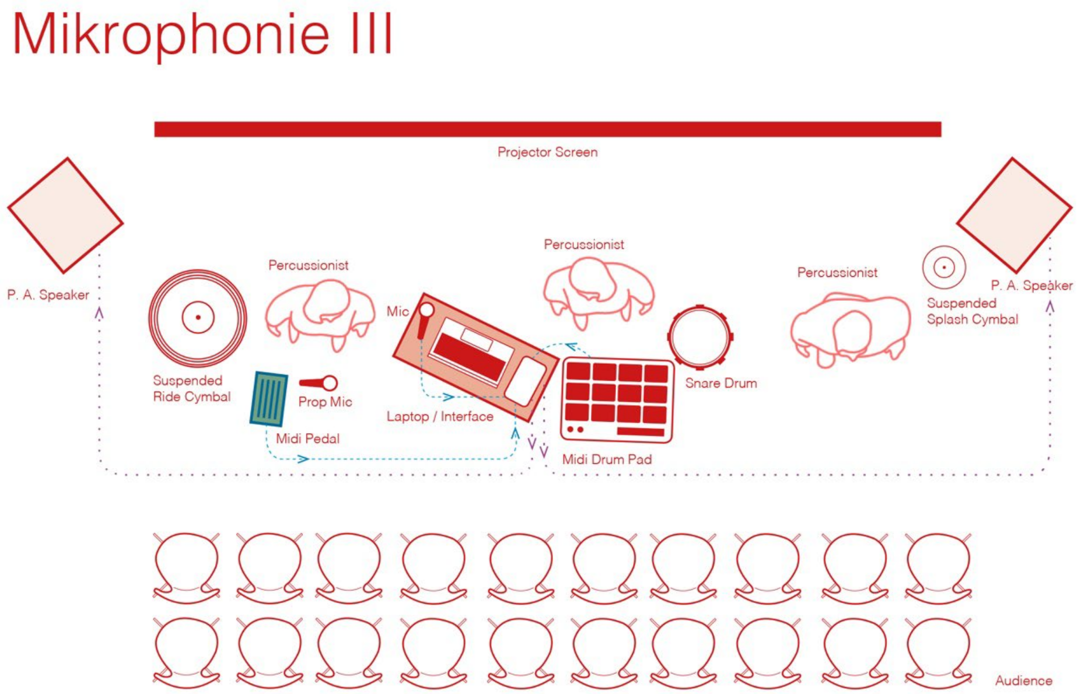


Figure 5.6: *Mikrophonie III* set-up

The projector, placed above and behind the performers, shows three types of visual information during the performance.

1. Film clips triggered by the MIDI drum pad.
2. Film clips triggered by the ride cymbal performer.
3. The output of the USB camera.

Key points

In this commentary I will focus on two core features of the work. Firstly, the work extends the set-up to include film: building on the discussion of mediatised images (see 1.5), this work integrates the recorded visual domain with the live visual domain. Secondly, I will discuss the development and exploration of the relationship with Stockhausen's *Mikrophonie I* through the construction of the set-up and with the musical material.

Extending the Set-up

Taking Stockhausen's initial claim that anything (not just a tam-tam) could be examined in the realisation of *Mikrophonie I* (see Chapter 3), I have placed the *Mikrophonie I* as the object of examination in *Mikrophonie III*. This approach necessitated a more complex set-up than other submitted works and required the negotiation of different domains: the sonic and the visual; the acoustic and the electronic; the analogue and the digital; and the live and the pre-recorded.

Central to this piece is the integration of live performers and mediatised images projected behind and above the performers. *Mikrophonie III* integrates film into the compositional process: the third of Beil's identified three relationships between film and live performance (see 1.5). This is the only submitted work that includes film and produced challenges when finding strategies to allow for film to be an integrated component of the set-up. Additionally, in line with the rest of the research, I wanted the film to build on the performers' techniques, incorporating performative actions into the recorded visual domain. This is enacted in the following ways:

1. All film clips are triggered by performers. The use of the MIDI drum pad relocates drumkit technique onto an interface that can be customised to produce any type of output (e.g., sound, film, control of light). DMIs (such as the Kaosspad in *Drummed Variation* and the MIDI drum pad in this piece) require a performative engagement with an interface that doesn't have a fixed output. The transduced ergomimetic gestures used by the percussionist when playing the MIDI drum pad continue a long tradition of percussionists engaging with unconventional instruments using adapted techniques (see Chapter 4).

2. The opacity of one bank of film clips is linked to the ride cymbal's volume, captured, and amplified by a microphone. The microphone functions similarly to the microphones in Stockhausen's piece; the microphone amplifies the acoustic sound of the struck ride cymbal and is moved around the body of the cymbal, changing proximity and location. The output sound is used to affect the opacity of a randomly selected clip of a bank of performances of *Mikrophonie I*. The louder the sound captured by the microphone, the more opaque the image. The film provides a visualisation of the changing proximity of the microphone to the ride cymbal, as well as the changing sounds produced by the ride cymbal performer. Creating and disrupting links between the gestures, sounds, and film is a recurring theme in this work.

3. For one film clip, the live performers replace the missing audio from a performance of *Mikrophonie I*. Replicating the gestures of other performers is a more direct engagement with percussion practice, even if the objects used to produce the sound are unconventional.

This moment privileges the gestures of performers over the sounds they produce. By focussing so much on these gestures alone, they become decontextualised and are re-presented as choreographed movements. This provides a far more considered approach to the movements made by performers when engaging with technology than the tuba player negotiating four MIDI switch pedals in *Kolmanskop* (see 5.2).

4. Reproduction of recorded film clips switch over to a live stream of the performers through the use of an on-stage camera. After the MIDI drum pad performer hits pad one, the USB camera is switched on. This enables the capturing of real-time footage from the performance and is used to provide an in-depth view of the ride cymbal and the performers interacting with it. This occurs in the final rehearsal mark of the piece only. As the microphone provides the audience with a mobile ear, the camera replicates this with an unusual visual perspective; the audience is placed within the group of closely positioned performers surrounding the ride cymbal.

In each of these situations, the film is controlled by, adapted by, or accentuates the actions of the performers. The integration of the film component into the set-up is central to this compositional approach.

<u>Relationship to Mikrophonie I</u>

Mikrophonie I 'explores' the physical object of a tam-tam through a variety of tools, such as beaters and sticks; amplification from microphones moved across the tam-tam's surface; and from electronic audio signal processing of the sounds. *Mikrophonie III* takes a similar explorative approach but substitutes the object of the tam-tam with the work *Mikrophonie I*, which becomes the object of study. This is realised through:

1. MATERIAL: film and audio recordings from a range of documented performances of *Mikrophonie I* are used as material in *Mikrophonie III*.
2. COMPOSITIONAL MODEL: like *Mikrophonie I*, *Mikrophonie III* involves the methodical exploration of a set-up created prior to the performance.
3. PERFORMANCE MODEL: the actions of the performers within the set-up are also replicated. Performers recreate gestures made by performers in realisations of *Mikrophonie I*. This is either done in a general and generic sense (i.e., using microphones to amplify a sound,

working in pairs or groups of three, etc.) or in a specific manner (i.e., the performers mirroring the idiosyncratic gestures from a film of a specific live performance of *Mikrophonie I*.)

1. Material

The musical material comes from a variety of sources and engages *Mikrophonie I* across audio and visual modalities. Short audio clips from different recorded performances of *Mikrophonie I* are triggered by hand-held switches. These clips are played synchronously with the same performer striking their cymbal; the audience should hear the cymbal sound and the sample together without seeing the switch mechanism. There are 152 samples, each one is around one second in length and is always played in full.

The film clips are activated by the MIDI drum pad, configured to use seven pads in this arrangement (see table 5.3). The performer engages with the MIDI pad in two ways. Pad three and pad six require the performer to produce different rhythmic patterns; the short film clips become the 'output' of the performer's 'input' actions. Pads two, four, and five produce longer clips: the performer uses the pad to simply trigger the film or audio clip.

Pad One	Switches on the USB camera	(hyperlink)
Pad Two	Launches one of two audio samples of Stockhausen speaking about *Mikrophonie I* in London in 1972. Both samples are heard in the piece.	(hyperlink)
Pad Three	Plays a short film clip of Stockhausen moving a potentiometer from the 1966 performance of *Mikrophonie I.*	(hyperlink)
Pad Four	Plays an extended clip of a section of a performance of *Mikrophonie I*. The clip starts in silence and eventually the sound of the performance is heard after a long fade.	(hyperlink)
Pad Five	Plays a short clip of the Gongman from the Rank Organisation. Each clip is paired with a different sounding gong.	(hyperlink)
Pad Six	Triggers film clips of performances of *Mikrophonie I* from a bank of 53 clips.[121] Some of these clips have been altered to accentuate the movement of the performers in the films. The clips are triggered randomly.	(hyperlink)

Table 5.3: MIDI pad configuration (*Mikrophonie III*)

2. Compositional Model

The ethos of *Mikrophonie I* is one of exploration of the physical qualities of an adapted tam-tam. Exploration is enacted in *Mikrophonie III* across different objects and domains. The splash cymbal, when struck by the soft mallet and 'amplified' by the prop microphone, produces one of many gong samples heard in synchronicity with a clip of the Rank Organisation Gong Man (see pic. 5.3). When struck with a drumstick we experience a splash cymbal, and one of a large array of audio clips reproducing short moments of the sound world from *Mikrophonie I*. This exploration is replicated on the ride cymbal, producing a hocket between these two sound sources. The ride cymbal is further explored: while one performer sounds the cymbal with different objects, another amplifies the sound via a hand-held microphone. We hear the amplification (directly mimicking actions in *Mikrophonie I*) but the amplification also affects the opacity of the accompanying film clip. Here the exploration has sonic and visual consequences. At the end of the

[121] The film and audio samples of *Mikrophonie I* are taken from performances by The Switch Ensemble, Ensemble Linea, Ensemble Sillages, DePaul Contemporary Ensemble, The Black Page Orchestra, The Chimera Ensemble, Amp Music, and Percupasion.

piece, all three performers move to the ride cymbal. The camera and microphone move around the cymbal following the performer agitating it and providing new sonic and visual perspectives on these actions.

Picture 5.3: Rank gong man (*Mikrophonie III*)

3. Performance Model

The performers work together as a whole group, in smaller groups and individually, mimicking the group structure of performers in *Mikrophonie I* (see Chapter 3). The work requires the performers to move across the performance space in the following ways: the ride cymbal performer moves to the splash cymbal and then back to the ride cymbal; the drum pad performer moves to the ride cymbal and then back to MIDI drum pad; all performers turn to face the projector at two moments in the piece; and the splash cymbal performer and drum pad performer move to the ride cymbal at the end of the piece (see figure 5.7). At these moments where groups are formed, the actions of the performers reproduce the concatenated output that is a feature of *Mikrophonie I*. For example, the ride cymbal performer moves to the splash cymbal in order to amplify the sound of the splash cymbal being struck.

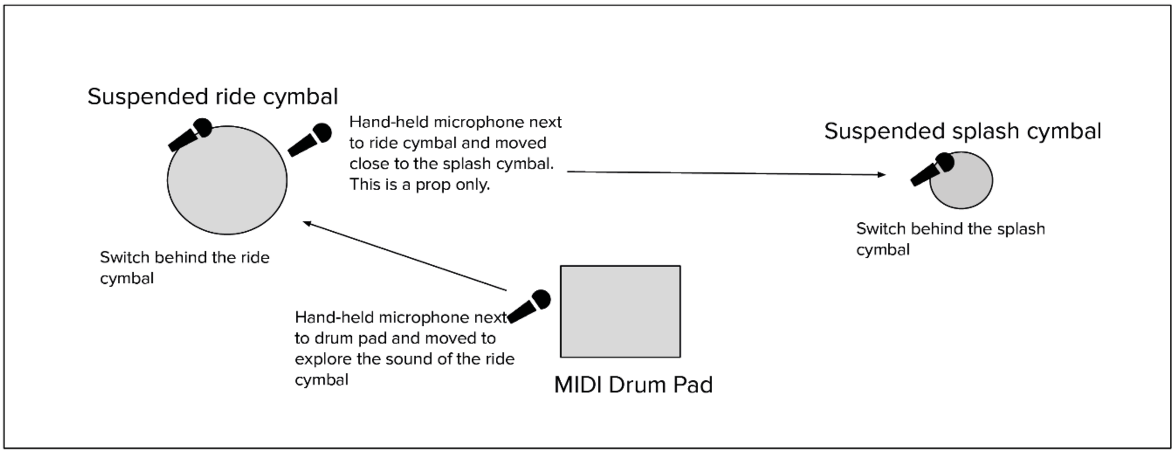


Figure 5.7: Movement of performers (*Mikrophonie III*)

The gestures of the performers are a central component to both works. In rehearsal mark 5 and rehearsal mark 9[122], the performers interact with a longer film excerpt of *Mikrophonie I*. The film begins in silence before the original audio from the film fades in. The live performers mimic the movements of the film performer on the right-hand side with sound-producing materials (sandpaper and cloths rubbed on the cymbals). The two live performers on either side of the stage directly mimic the actions of the film performer, while the live performer in the middle provides the missing sound to the opening of the film before eventually becoming a composite part of the soundtrack as the film sound fades in (see pics. 5.4, 5.5, and 5.6). This type of interaction between film, sound, and performers is reminiscent of Foley artists in film.

[122] Rehearsal marks within my works are presented as a box in square parentheses. I.e., rehearsal mark nine is shown as [9].

Picture 5.4: [4] from *Mikrophonie III* (image 1 from film)

Picture 5.5: [4] from *Mikrophonie III* (image 2 from film)

Picture 5.6: [4] from *Mikrophonie III* (image 3 from film)

Mikrophonie III has the most complex set-up of the submitted works; the range and number of components exceeds that of the others. All the components are controlled by the performers, from the application of the microphones to the activation of the film clips. This integration is explored by the performers through their movement across the performance space; the performative gestures used with the microphones and hand-held cameras to capture audio and visuals; and across the different domains of live performance and film.

5.6 *Candela* (2019)

In *Candela*, the violin is presented as part of a super instrument (see 1.6). Formed from live violin, sampled violin, live electronics, tape, and light. The different elements of the set-up initially function as one instrument and then dissolve revealing previously hidden characteristics of the assemblage.

<u>Set-up</u>

The set-up for *Candela* is formed from:

1) One performer:
   - Violinist.
2) Microphone on the violin.
3) Samples of ASMR voice audio recordings.
4) A pre-recorded violin part for playback[123].
5) Audio signal processing that maps audio amplitude to light.
6) Laptop (running Ableton Live 9) and an audio interface.
7) P.A. system forming a stereo field facing the audience.
8) One red DMX (Digital Multiplex) light.
9) Digital score reader (such as an iPad) or a music-stand light.

Table 5.4 sets out the components of *Candela*, the additional equipment needed for the performance, and how the components are connected. Figure 5.8 shows the arrangement of the components on stage.

[123] In the discussion of *Candela,* I use the term ‘playback’ instead of ‘tape’ to refer to the act of sound reproduction rather than the medium for sound reproduction. In the discussion of other works, the term ‘tape’ is retained.

Component	Additional equipment	Function	Connection
Violin	Microphone	To route the acoustic sound into the laptop	To laptop
Performer	Headphones	Headphones to hear the click track	Laptop to headphones
	iPad	iPad to view the score	N/A
DMX Light	DMX light-to-laptop convertor	Controlled by pre-sets or sound from violin.	Laptop to light
Laptop	Soundcard, Ableton patch	Pre-recorded playback controls the light, processes the acoustic violin sound	Interfaces between all other components, apart from the iPad.
P.A. system	Stands	Pre-recorded playback	Laptop to P.A. system

Table 5.4: Components of *Candela*

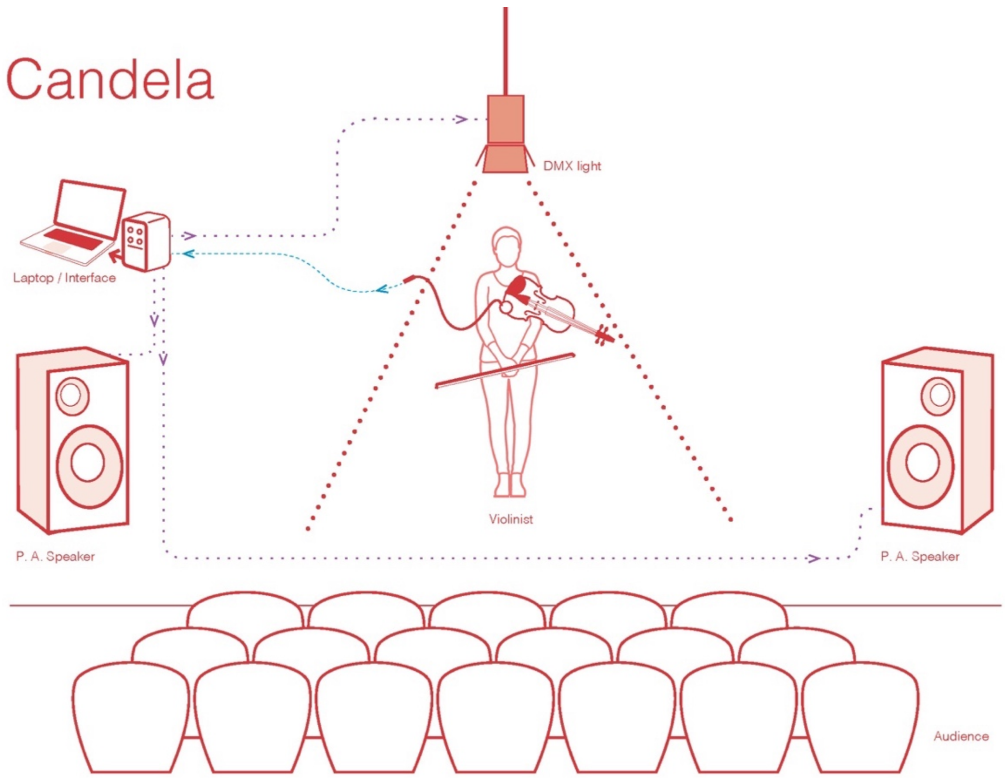


Figure 5.8: *Candela* Set-up

The acoustic sound of the violin is amplified in order to blend the sounds of the playback part and the acoustic violin, as well as enabling volume control; all the sounds are diffused through the same stereo P.A. system.

Playback

The pre-recorded violin part is synchronised with the live violin part through the use of a click track routed to the performer through headphones. The content of the playback is comprised of pre-recorded and processed sounds of violins, as well as an ASMR[124] sample. For this composition, I took violin samples from a good quality sample library (rather than asking the performer to make samples prior to the performance, as in *Charlene from Big Data* (see 5.9)). Each violin sample is a single note for a short duration (around two to three seconds) at different dynamics. As a result,

[124] ASMR is the initialism for autonomous sensory meridian response. This is commonly understood as a genre of audio recording in which quiet sounds are amplified producing a profound physical response in the listener.

the playback part is constructed from discrete elements of musical material, layered, and processed in different ways and combinations.

To produce the ASMR voice sounds, I took various ASMR videos from YouTube and cut between different voices. This retained the ASMR aesthetic without conferring any semantic meaning. During the louder passages of the opening of the composition, the ASMR samples exist within the mix at barely perceptible levels, but as the texture thins, the ASMR samples start to become more prominent.

Light

The playback part also controls the number of lumens generated by the DMX light, until this function is assumed[125] by the live electronics at b.143. This allows for an exact synchronicity between sound and light and works to craft the differences between the individual moments of musical material from which the piece is composed. As the live sound of the violin takes over control of the brightness of the light, we see a more complex relationship between sound and light emerge. The light illuminates the performer and violin from above, which necessitates a digital score reader with its own light source or a light for the score on a music stand.

Discussion Points

Super Instruments

In *Candela*, the assemblage of sounds and light can be thought of as a 'super instrument'. For Kallionpää, super instruments are instruments that have had technological adaptation to produce a range of effects beyond the normal physical capabilities of the instrument or performer (see 1.6). I argue this conceptualisation is a recurring element of my works for solo instruments (see *Nara* and *Piano Nudes*) but is most obvious here. In *Candela*, the super instrument consists of the following:

[125] The live electronics in the piece take the amplitude signal from the violin and uses this to affect the number of lumens produced by the light.

1) Amplification: acoustically quiet sounds (e.g., pizzicato) are artificially amplified through doubling the live violin part with the recorded violin part.
2) Audio effects: including, reverbs, tremolos, delays, pitch-shifts, freezes, granular synthesis, bit-rate reduction, and ring modulation.
3) Doubling: parts from the live violin are replicated in the playback part, either providing rhythmic, harmonic, or textural effects.
4) Light: the light accentuates the cuts between longer phrases, as well as quicker cuts between the eighteen identified sound events (see fig. 5.9). These dynamic and textural changes elevate the sonic dynamic range into the visual domain. The use of light in *Candela* extends Kallionpää's definition of super instruments, which tends to focus on sonic properties only.

The super instrument is made possible through the use of a click track and a DAW (in this case, Ableton); the violinist plays along to a pre-made accompaniment. This approach supports a more complex engagement with audio signal processing. For comparison, in *Kolmanskop* (see 5.2), the MIDI switch pedals activate one audio effect applied to the acoustic sound of the instrument and the sound is processed in real time. In *Candela*, part of the construction of the super instrument is the application of audio effects to the violin samples, rather than to the live violin. The 'blend' of sounds means we experience the effect on the acoustic violin without this process actually happening, allowing for the use of more complex and predictable audio effects.

The violinist is presented as controlling the different components of the set-up (i.e., the playback sounds and light). Similar to live audio signal processing, we see a gestural cause and hear a sonic or visual effect. Even though the processing isn't live and exists on a playback part, our perception of what is live and what is recorded is challenged by the close link between gesture and sound; the technology creates a plane-of-separation (see 4.3). This differs from other works that include tape, where the distinction between live and recorded parts is clearer. For example, Luigi Nono's *sofferte onde serene* (1976) also uses an acoustic instrument (a piano) and a tape part. The sounds of the tape part are of the piano and provides, what has been described as, "shadow" sounds.[126] This is a clear hierarchical relationship absent from *Candela*, where the playback part and the live sounds are more integrated and experienced more equally. In this sense, *Candela* isn't a

[126] Paulo de Assis, "Revisiting Luigi Nono's Suffered, Serene Waves," in *Artistic Experimentation in Music: An Anthology*, eds. Darla Crispin, Bob Gilmore (Leuven: Leuven University Press, 2014), 206.

performer-controlled set-up like Steen-Andersen's *Study for String Instrument #2* and is more similar to set-ups with fixed components, such as Iannotta's *dead wasps in the jam jar (iii)* and Bailie's *Last Song for Charleroi* (see 2.2). In *Candela*, however, the relationship between performer gesture and sonic/visual output suggests that the performer is controlling all components we experience in the performance, even though the underlying mechanism doesn't operate as such.

Sound Events and Sequences

The majority of the work is comprised of different orderings of eighteen live violin sound events into fourteen sequences. The identity of each sound event is formed from a distinct pitch, dynamic, articulation, and/or timbral difference. Figure 5.9 shows these live violin sound events, all presented in the first sequence of the composition.

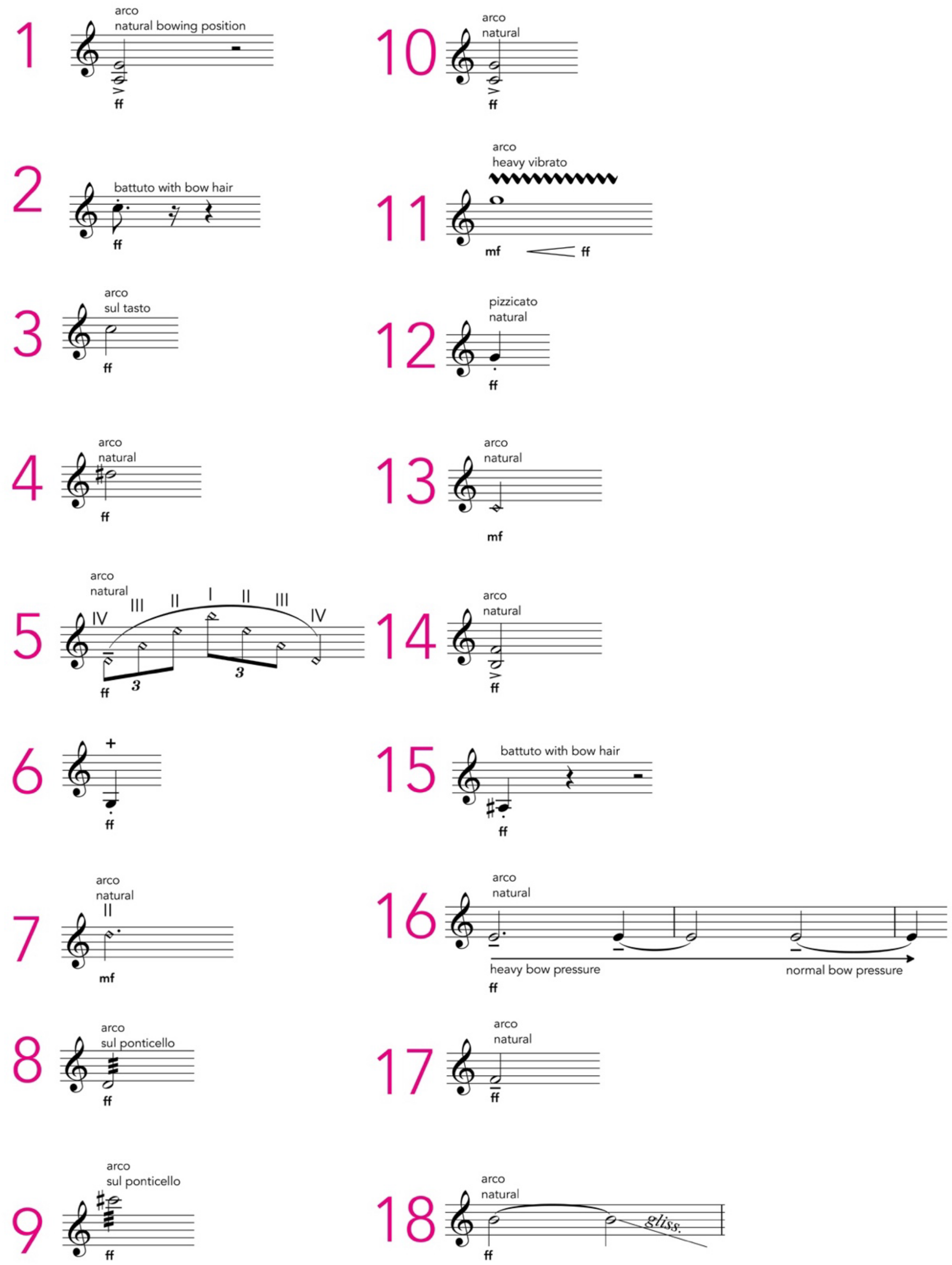


Figure 5.9: The eighteen sound events of *Candela*

The fifteenth, and final, rehearsal mark in the work moves beyond this 'sample-based' approach to composition. Aside from the fifteenth, there are fourteen sequences of sound events each one labelled with a rehearsal mark (see table 5.5). Each sequence varies in length: some sequences contain more sound events, some sequences are repeated, and most sequences are performed at different tempos (see fig. 5.10). The arrangement of the sound events within the sequences is limited in scope. In all but [4] the sequences start with sound event one: a bowed low-pitched dyad separated by an interval of a fifth (see fig. 5.9). In the first set of sequences (i.e., rehearsal marks earlier on in the piece), this event is followed by sound event two, and in the later sequences sound event one is followed by sound event six. Most sound events in the early sequences are ascending numerical patterns (i.e., 1 – 2 – 3 – 4 – etc.). Returning to some sound events, or omission of others, extends or reduces the total number of sound events within a sequence. The majority of sequences end with the formation of sound events 12 – 13 – 14 – 15 – 18. This sub-sequence signposts the conclusion of the sequence. Sound event eighteen in particular, a rhetorical portamento fall, is clearly identifiable across all tempo iterations.

R.M. 1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	6	8	16	9	7	17	15	18				
R.M. 2	1	2	7	14	15	18																					
R.M. 3	1	2	3	4	5	6	12	2	7	8	9	10	11	12	13	14	15	6	8	14	16	9	7	17	15	11	7
(cont.)	8	6	7	5	10	6	10	6	10	10	6	10	6	10	9	9	9	15	4	5	15	15	15	15	18		
R.M. 4	14	15	18																								
R.M. 5	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	18											
R.M. 6	1	2	3	4	6	12	7	14	15	18																	
R.M. 7	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	18											
R.M. 8	1	6	7	8	9	10	11	12	13	14	15	18															
R.M. 9	1	6	7	8	9	12	13	14	15	18																	
R.M. 10	1	6	7	12	13	14	15	18																			
R.M. 11	1	6	7	12	13	14	15	18																			
R.M. 12	1	6	7	12	13	14	15	18																			
R.M. 13	1	6	7	12	13	14	15	18																			
R.M. 14	1	6	7	12																							

Table 5.5: Sequences of musical events across *Candela* (rehearsal marks 1 to 14)

This ‘sample-based’ approach to composition, in which sound events are formed into sequences, is distinct from the construction of musical phrases (see 6.3). Aside from the limited underpinning logic of the sequence construction discussed above, the sounds events are individual ‘moments’ of pitch, register, dynamic, timbre, duration, rhythm and articulation. These ‘moments’ are further complicated by the playback part which helps erase the stop/start nature of the live violin part by providing continuous sound during moments in which the violinist physically changes hand/bow position between sound events. Furthermore, the sonic differences between each sound event of the live part are supported by the playback part. The playback part supports the changes of identity between the sonic events but also provides changes between the sequences; there is a gradual reduction of the pre-recorded violin on the playback part which changes how each sound event is heard across the different sequences. Towards the final sequences, the acoustic sound of the live violin part becomes dominant as the pre-recorded violin on the playback part is reduced.

Working with sequences of discrete sound events is a development of a similar process in *Kolmanskop*. In *Candela*, however, these sound events are layered in more complex ways. In *Kolmanskop* the samples are static and unchanging; the compositional process is in the arrangement of combinations and sequences. In *Candela* each sample is treated differently; the sound event has the possibility of variation across each iteration. Through the use of a click track linked to a DAW, the samples are modified throughout the piece. Additionally, the samples which comprise the playback part are also of violin, rather than other sound sources, extending the sonic possibilities of the violin; the familiar sounds of the violin are heard in an unfamiliar context (see the discussion of the 'uncanny' in Chapter 1).

This dynamic approach to constructing the sound events is significant and is the underlying mechanism that supports the structure of the piece. There are fourteen phrases which, through a gradual diminuendo over the course of the piece, move from louder, complex and multi-layered musical material to a softer and simpler texture.

Formal Shape

The shape of this movement toward a simpler texture isn't a continuous diminuendo or rallentando, as exemplified by the metronome markings at each rehearsal mark (see fig. 5.10). [1] starts at 100 BPM and abruptly changes at [2] to 76 BPM. These changes of tempo at each rehearsal mark continue until [7], which stays at the same tempo until [15]. Tempo changes are also coupled with changes to the output volume of the super instrument and complexity of texture: the fast tempos occur with louder dynamics and more voices, while the slower tempos are matched with softer dynamics and smaller numbers of voices. The sound events in each sequence are altered by the tempo and additional changes to articulation and dynamic are made to support these differences.

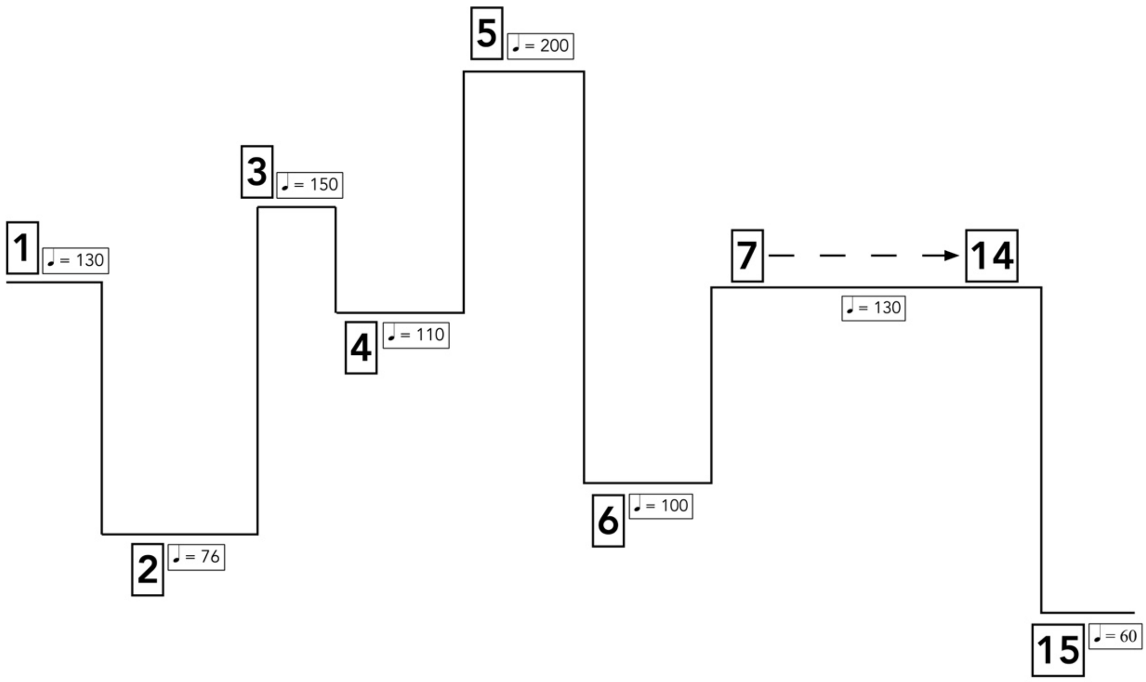


Figure 5.10: Tempo changes in *Candela*

The quiet ASMR material becomes gradually more perceptible toward the end of the work. This shifts the compositional focus from sample-based sonic interplay toward a more complex assemblage in which the live violin, light and ASMR samples establish a perceptible sensitive and responsive relationship. During the decrescendo, layers of sound are removed, revealing more ‘hidden’ sounds within the live and recorded parts; quieter sounds (i.e., pizzicato) become audible within the reducing morass of multiple, layered sound events. Part of the consequence of this shaping of material is that the range of sound events becomes reduced through the piece, as the focus moves onto the ASMR samples.

5.7 *Alias States* (2019)

Alias States, written for the piano and percussion duo of George Barton and Siwan Rhys (GBSR Duo), is a work for acoustic piano and electronic drumkit. The drumkit is customised to produce samples of piano notes instead of drum sounds. This modification to the instrument presents the drumkit as an alias piano, creating a set-up that evokes the medium of a piano duo.

<u>Set-up</u>

The physical set-up for *Alias States* is formed from:

1) Two performers:
   - Pianist,
   - Percussionist.
2) A grand piano amplified through the placement of a microphone routed to a P.A. system.
3) Two additional MIDI continuous controller foot pedals that trigger audio samples, activated by the piano player. The MIDI continuous controller pedals additionally control the audio sample's volume.
4) An electronic drumkit, consisting of kick; snare, including separate rimshot function; high rack tom; low rack tom; floor tom; hi-hat, including foot pedal; crash cymbal; ride cymbal; and one additional MIDI continuous controller foot pedal that triggers an audio sample.
5) Laptop (running Ableton Live, with some additional free plug-ins downloaded and installed) and an audio interface.
6) All sound routed through a P.A. system set out in a stereo field on either side of the performers and facing the audience.

Figure 5.11 shows the formation of the different physical components of the set-up in relation to the audience, as well as the routing between the different components.

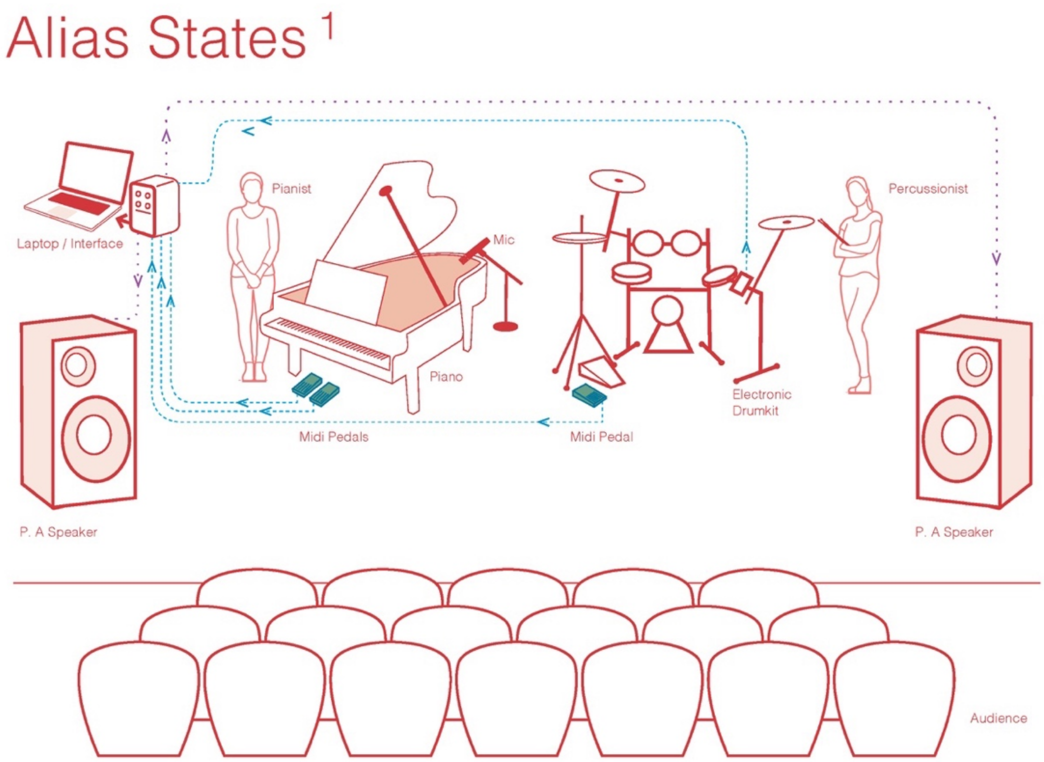


Figure 5.11: *Alias States* set-up

Each pad and pedal (i.e., kick pedal, hi-hat pedal) of the electronic drumkit triggers a distinct piano note (see table 5.6). Additionally, each pad is assigned with a different audio effect which we hear with the piano pitch. The harder the pad is struck, the more pronounced the audio signal processing effect (e.g., the louder the dynamic, the longer the reverb tail).

The two MIDI continuous pedals that the piano player operates produce arpeggiated notes through MIDI data processing, each pedal producing one pitch (see table 5.7). These two arpeggiated notes are slightly different in quality. One is affected by an LFO (low frequency oscillator) which changes the rate of arpeggiation and the other is fixed. The more each pedal is depressed, the louder the sound of the arpeggiation. There is also a concomitant timbral change which mimics the effect on a piano; frequency responses therefore change with amplitude.

As with the arpeggiation pedals, the piano samples triggered by the drumkit are dynamically responsive; the velocity is linked to dynamic, and therefore, timbral difference. Due to the digital nature of the drumkit, however, the continuous analogue dynamic spectrum heard on an acoustic piano is quantised into discrete steps.

Drum component	Pitch	Audio Effect	Example
Kick	A#0	pitch shift, reverb, distortion	(hyperlink)
Snare	C#4	affected delay	(hyperlink)
Snare Rim	G#3	pitch-affected delay	(hyperlink)
High Rack Tom	F5	reverse reverb	(hyperlink)
Low Rack Tom	D5	sample	(hyperlink)
Floor Tom	G#4	microtonal delay	(hyperlink)
Hi-hat Cymbal	A1	timbral delay	(hyperlink)
Hi-hat Foot Pedal	C5	filter delay, ring modulator	(hyperlink)
Crash Cymbal	G#6	gated reverb	(hyperlink)
Ride Cymbal	Piano chord	sample and reverb	(hyperlink)

Table 5.6: Electronic drumkit sounds for *Alias States*

The MIDI continuous foot pedal operated by the percussionist produces a longer one-shot sample that can be dynamically shaped by the performer through depressing the pedal by different amounts.

MIDI Pedal	Sample	Audio Effect	Example
1 (Played by pianist)	C#3	Arpeggiator	(hyperlink)
2 (Played by pianist)	E5	Arpeggiator & LFO changing the rate	(hyperlink)
3 (Played by percussionist)	Long piano sample which descends in pitch and slows down	N/A	(hyperlink)

Table 5.7: Foot pedals that trigger audio samples via MIDI in *Alias States*

The electronic drumkit and piano are positioned opposite each other in the performance space, in the manner of a piano duo (see fig. 5.12).

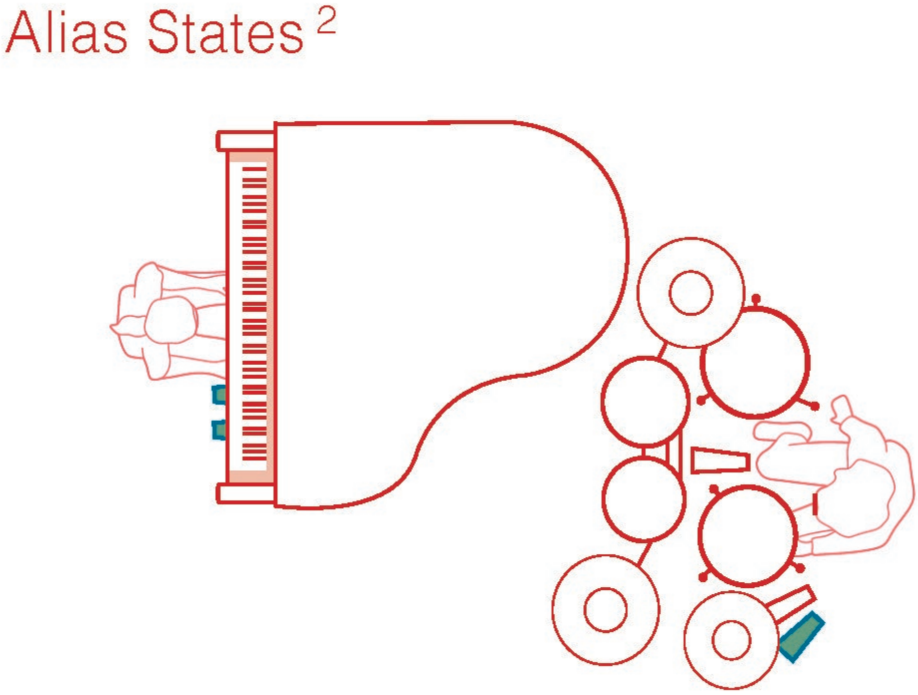


Figure 5.12: *Alias States* set-up (plan view)

The key area of development when finalising this set-up was crafting the types of sounds produced by the electronic drumkit and exploring ways of blending these sounds with the acoustic piano. The notes of the electronic drumkit and their accompanying audio effects were composed in Ableton Live, which was also the mechanism used to perform the work. The sound worlds of the acoustic piano and the sampled piano, however, blended differently in the virtual space of the computer when compared with the physical space of a live performance and required part of the sound design process to happen with all components arranged in physical space. This necessitated a return to the creation and manipulation of musical material: compositional phase two (see 5.1). The use of microphones on the acoustic piano ensured that the sound diffusion points of the set-up were combined into a stereo field, therefore helping create a sonic blend between the two instruments.

<u>Discussion Points</u>

<u>The Set-up as a Single Entity</u>

The set-up offers the opportunity to see both instruments as one entity or gestalt. The audio signal processing effects help to generate this blurring between the electronic drumkit and the acoustic piano, as the samples of the piano will always be acoustically different to the live piano. This separation is due to piano sampling methods, in which each pitch is a discrete entity rather than part of a continuous acoustic sound. This is particularly important for the piano, as the sound qualities of individual notes are impacted on by preceding note(s). Therefore, the audio effects enable a blending between these two distinct but related sound worlds.

An example of this can be found in the opening of the piece (see ex. 5.18). The role of the electronic drumkit is similar to the uses of drums in many styles of popular music; the drums here provide regular accents (a rhythmic pattern), in this case on the quarter-note pulse. The rhythms in the piano part play off this pulse and provide more complex rhythms that disrupt the dominance of this pulse. Additionally, most of the audio signal processing effects use a type of delay or reverb which adds an unmetered additional layer of rhythmic interest. Traditionally, in many forms of popular music, the kick drum is used to accent the beginning of a bar or short phrase. We hear this, but mediated through the sound of the piano, in this case a low A#. As the kick drum pitch is lower than the other pitches played by either instrument, perhaps we hear the kick as both piano and drum. If so, then some of the function of the kick is retained.

Example 5.18: The opening of *Alias States*

(time reference: 00:00 – 00:32)

The effect of focussing on the more commonly used elements of a drum kit (kick, snare, crash) produces three more frequently heard pitches (A#0, C#4 and G#6), additionally replicated in the arpeggiator and the piano part, that form part of the harmonic identity of the opening. As the piece progresses, more parts of the drumkit are explored, shifting this focus slightly.

Another type of blend between the drumkit and piano is explored at [6] (see ex. 5.19). The percussionist plays a tremolo effect across the different pads of the drum kit. The audio effects react differently to this technique so produce new timbral and rhythmic effects. The LFO on the second arpeggiator slows down and speeds up the rate of arpeggiation. These different rhythms become more and less present within the texture.

Example 5.19: [6] from *Alias States*

(time reference: 05:54 – 06:14)

<u>The Ergomimetic Qualities of the Drumkit</u>

Magnusson's notion of ergomimesis (see 1.3) provides a framework to consider the electronic drumkit. The electronic drumkit is modelled on acoustic drumkits, in fact, the mesh pads are designed to provide a similar playing response to drum skins. As such, the gestures performed by the percussionist could be considered *divergent* (similar techniques are used on a slightly different instrument) but the radically different sound produced by the drumkit is important here and is therefore best described in that final classification of transduced ergomimesis. This is interesting when considering the challenges of performing *Alias States*. The similarity of sound between the piano and the electronic drumkit piano samples is sufficient to cause disruption to the auditory feedback loop of the percussionist (see 4.2). In one concert, the percussionist programmed the drumkit to produce drum samples which he listened to in his headphones. When we recorded it, the percussionist played without listening to the samples; the striking of the mesh pads were heard acoustically (more like a traditional chamber music piece) in order for both parts to be played together. The outcome of both interventions ameliorates the uncanny properties of the drumkit-as-piano (for the performer) to the more familiar territory of drumkit-as-drumkit.

Both Wilson's *pedagogy* (see 1.3) and Magnusson's ergomimesis provide theoretical frameworks that may shed light on how the drumkit and piano become blurred in this work. We simultaneously experience the drumkit as a drumkit, due to the drumkit technique employed in sounding the instrument and the presence of drumkit technology, and as a piano due to the sounds produced. The acoustic piano furthers this blending in a similar way; the piano-as-technology and the piano techniques of the performer establish its presence within the set-up. As in Nemstov's *Drummed Variation* (see Chapter 4), the presence of the drumkit is clear but not because of the sounds of a drumkit. In both instances, the instrument is decoupled from the sound of the drumkit while retaining the presence of the drumkit.

5.8 *Piano Nudes* (2020-21)

The three movements that comprise *Piano Nudes* all make use of piano samples which are triggered by the pianist and diffused via a loudspeaker underneath the soundboard of the piano. Through the depression of the sustain pedal, the sampled piano sounds and the live piano sounds are blended by the resonance of the soundboard.

The title of the work draws on the trope of the 'nude' within historical art practices of Europe, and this notion of an unadorned body is used as a lens to view the piano. 'Nude', distinct from 'naked', highlights the differences in the power relationship between subject and object. "The vague image (the nude) projects into the mind is not of a huddled and defenceless body, but of a balanced, prosperous and confident body; the body reformed."[127] In *Piano Nudes*, the piano 'reads' in a familiar and conventional way, continuing the tradition of Western classical piano music. Through concealing the electronic technology, the piano is displayed 'whole' in its role as a vehicle for the presentation of musical material: "in a classical piano sonata, for example…the piano is a *medium* for the expression of meaning".[128]

The absence of visible electronic technology means the piano isn't framed as an object of study. This differs from the approach of *Mikrophonie I* in which the tam-tam is examined, explored, and probed by the performers; the instrument is presented as an object of scrutiny. This framing disrupts the tradition of the instrument, its cultural associations, and how we listen to it. *Piano Nudes* presents the piano as a "body reformed" with technology, rather than as an object to be examined.

<u>Set-up</u>

The components of each movement of the work are:

1) One performer:
   - Pianist.
2) Acoustic grand piano.
3) MIDI switch pedal, connected to the laptop.
4) Laptop and interface, running Max/MSP with Max patch, routed to a loudspeaker.
5) Loudspeaker positioned under the body of the piano.

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127 Kenneth Clark, *The Nude: A Study in Ideal Form*, (United Kingdom: Pantheon Books, 1956), 3.

128 Samuel Wilson, "Building an Instrument, Building an Instrumentalist: Helmut Lachenmann's Serynade," *Contemporary Music Review* 32, no. 5 (2013): 426.

Figure 5.13 shows the components of the set-up and how they are connected. The set-up uses a similar pedal mechanism for the pianist as in the earlier work, *Alias States*. The function of the pedal, however, is different because of the role it plays within the composition. In *Alias States*, the pedal produces a single arpeggiated note that can be dynamically shaped by the amount the pedal is depressed. As these sounds are used infrequently and in limited ways, the position of the pedal can be arranged by the pianist according to preference. In *Piano Nudes* the pedal is more frequently used, often in conjunction with the sustain pedal. As such, the operation of the pedal is designed to mimic the sustain pedal more closely: the pedal triggers the sample when at the top of the pedal arc rather than when depressed.

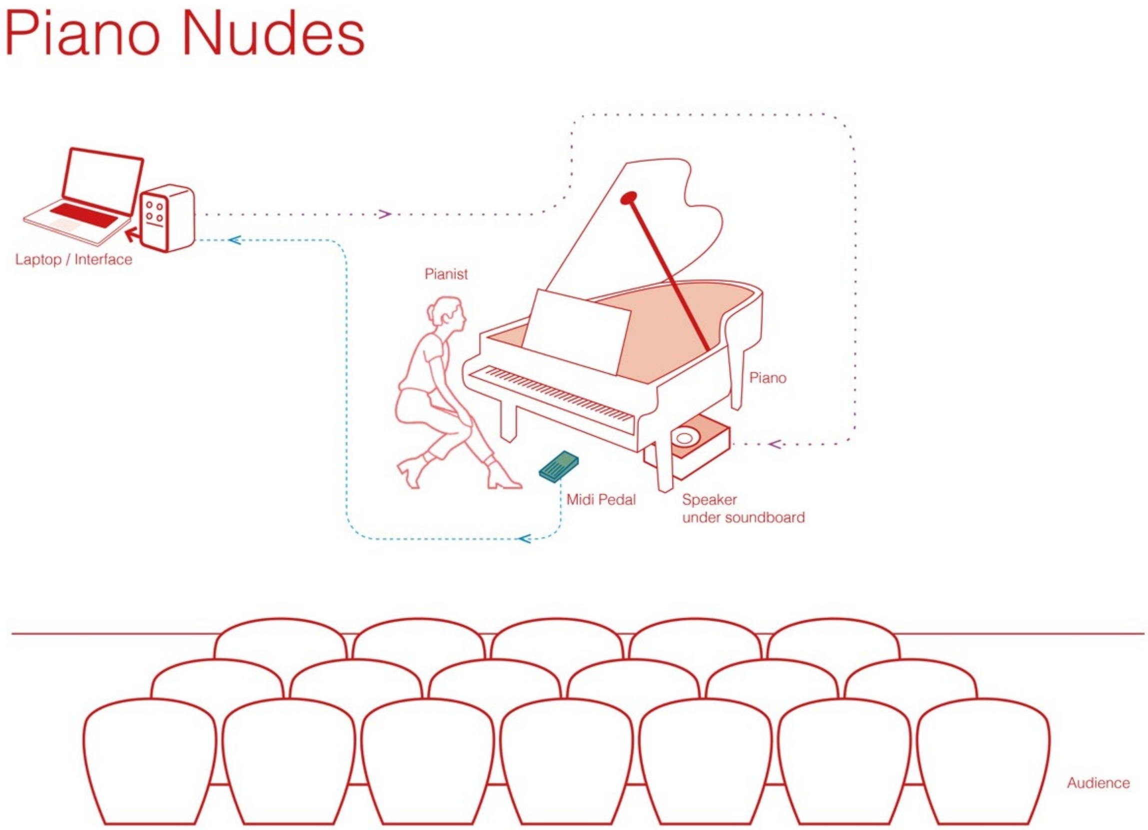


Figure 5.13: *Piano Nudes* Set-up

Routing and Placement

A MIDI piano sustain pedal (switch) is placed next to the other pedals of the piano and this is routed to a laptop running Max/MSP. The Max patch houses a simple mechanism; movement of the MIDI pedal triggers the playback of a sample (always played in full) through MIDI data processing. The output of the laptop is routed to a loudspeaker placed underneath the body of the piano. This is for two reasons, firstly, the loudspeaker is relatively hidden from view, which helps the perceptual blurring of the acoustic piano and the sampled piano. Secondly, as previously discussed, the loudspeaker resonates the soundboard of the piano, which is important to the blending process of these different sound worlds.

Key points

Samples

The samples extend the possible sonic properties of the piano, functioning in a similar way to the samples in *Charlene from Big Data.* Although, rather than sampling the exact instrument, as with *Alias States* the samples come from a stock piano sample library in Ableton Live. Through positioning the loudspeaker under the soundboard of the piano, the samples blend with the resonance of the acoustic piano, especially when the sustain pedal is depressed. The samples add changes to the sonority of the piano, as well as enabling microtonal deviations. This sonic, but not visual, modification to the piano produces an uncanny experience of a familiar instrument producing both familiar and unfamiliar sounds.

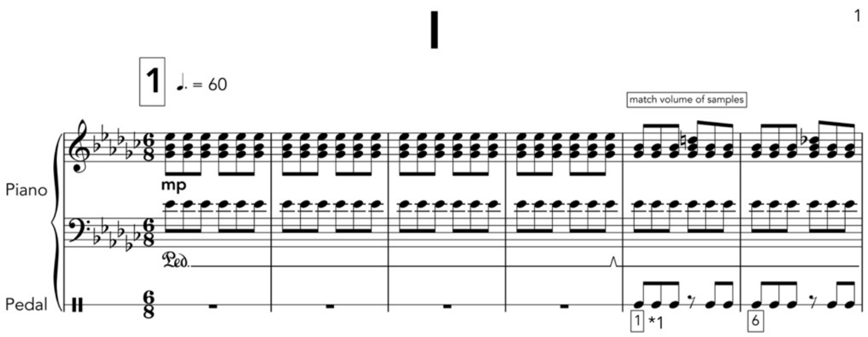
The majority of samples across all three movements of *Piano Nudes* are short in length (between one and two seconds), as they substitute discrete parts of musical phrases. This includes individual notes within a chord, or single notes in a phrase, and other discrete sound events. Some samples are much longer and provide entire phrases or long audio tails which artificially add larger reverberation times to notes. Additionally, some samples add audio signal processing effects to notes, functioning like the switching on and off of analogue guitar pedals in electric guitar practice (see table 5.8 for a list of categories of samples). Finally, the pedal triggers are mainly synchronised with the live piano part but sometimes the samples provide phrases which contrast with the live piano part.

Movement 1	Examples	Movement 2	Examples	Movement 3	Examples
Arpeggiated single notes	(hyperlink)	Artificial reverb	(hyperlink)	Altered resonance	(hyperlink)
Artificial reverb	(hyperlink)	Artificially sustained notes	(hyperlink)	Arpeggiated notes	(hyperlink)
Autotuned notes	(hyperlink)	Autotuned notes	(hyperlink)	'Doubled' phrases	(hyperlink)
'Doubled' phrases	(hyperlink)	'Doubled' phrases	(hyperlink)	Microtones	(hyperlink)
Microtones	(hyperlink)	Harmonics	(hyperlink)	Portamento notes	(hyperlink)
Portamento notes	(hyperlink)	Microtones	(hyperlink)	Short phrases	(hyperlink)
		Portamento notes	(hyperlink)	Timbrally-altered notes	(hyperlink)
		Short phrases	(hyperlink)		
		Timbrally-altered notes	(hyperlink)		

Table 5.8: Sample types in *Piano Nudes*

The samples shift the piano away from its conventional spectrum of producible sounds with no clear changes to the pianist's technique (e.g., the pianist doesn't 'play inside the piano' or use different objects to sound the strings). The pairings with the 'real' piano notes, however, ensure that the sound world is centred on the acoustic properties of the instrument. For the shorter samples, individual notes are simply replaced with processed notes (i.e., microtones, auto-tuned notes, etc.). The longer samples that add artificial reverb to the piano function differently within the work: the changes to the amount of reverb place the piano in different spaces. This type of effect expands the dimensions where we experience this blend of the familiar and unfamiliar. The microtones engage this across tuning systems; changes to reverb across space; timbre changes across different types of pianos; and, doubled phrases across number of performers. In this sense, the uncanny is constructed over a range of domains.

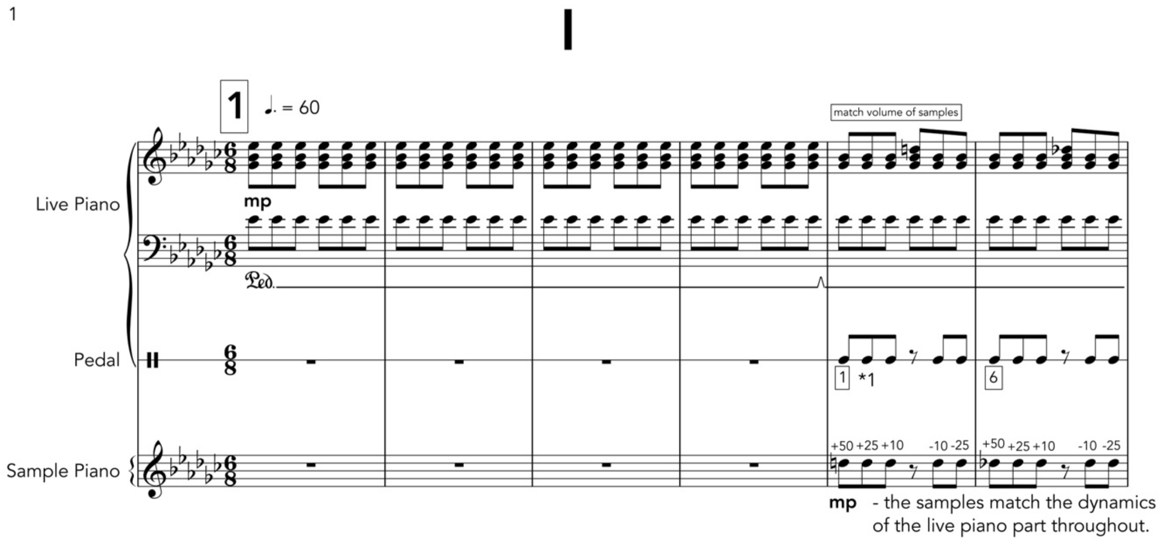
An example of the relationship between the live piano and samples can be found in the opening bars of the first movement, in which the samples sound microtones between the quantised equal-tempered notes of the piano. These microtones provide notes +/- 50 cents, +/- 25 cents and +/- 10 cents. The score shows the action of the performer (see ex. 5.20) but we hear a blend of acoustic piano and samples (see ex. 5.21). This opening to the first movement produces an uncanny effect. The opening repeated Ebm chords heard over the first four bars produce a simplistic and naïve harmony and rhythm. These chords, however, become a locus for the microtonal slide from bar 5, and function as an anchor with which to hear the changes in tuning. In this sense, they lose their harmonic or rhythmic function and provide a heightened experience of the slow downward pitch slide. This is similar to the arpeggiated harmonics at the end of *Nara* which are elevated from simplistic, conventional musical material by the hexaphonic environment (see 5.3).



Example 5.20: Opening to *Piano Nudes* Movement 1 (score)

(time reference: 00:00 – 00:14)[129]

[129] The balance between the acoustic piano and the piano samples in the accompanying recording of *Piano Nudes* slightly favours the live instrument, instead of both sound sources being equal.



Example 5.21: Opening to *Piano Nudes* Movement 1 (resulting sound)

(time reference: 00:00 – 00:14)

This effect is enacted in a more sophisticated manner at the opening to the second movement (see ex. 5.22). The repeated quavers of the first movement are replaced with a more rhythmically complex figure that embeds the microtones from the start. As the pitch material of the live piano and the samples is limited and repeated, the microtonal effect is evident (as with the first movement's opening). Yet, these qualities are treated more equally with other musical parameters; the rhythm, harmony, and tuning are all significant.

Example 5.22: Opening to *Piano Nudes* Movement 2 (resulting sound)

(time reference: 00:00 – 00:15)

The samples are triggered by the pianist during the performance. This differentiates the mechanism from a traditional tape part (such as in *Candela*), as the samples provide a dynamic additional part or voice controlled by the performer (the different mechanisms for sample playback are discussed at 7.1)

Super Instrument

As with other works for solo instrument in the portfolio, the piano in *Piano Nudes* could be described as a super instrument. Super instruments (see 1.6) are bespoke set-ups that enhance the possibilities afforded by conventional instruments and expand the abilities of a performer.[130] Yet, there are some important differences that locate this work outside of this approach. Kallionpää argues that super instruments are part of the search for new sounds that occupies the thinking of composers drawn to this method of music-making.[131] This is part of a tradition which I would argue includes extended techniques and instrument building; new sounds and new techniques are central to this pursuit of the 'new', even if "extended instrumental techniques are never an end to themselves"[132]. The works in this portfolio and *Piano Nudes* in particular are not about the search for new techniques to produce new sounds but instead about reproducing conventional musical instrumental technique in new contexts.

Kallionpää defines eight different possibilities afforded by super instruments.[133] Seven of these eight examples can be mapped onto techniques seen in these three movements:

"1. Managing very fast tempi otherwise unplayable by a human performer".[134] In this example from movement three b.43 – 54, the tempo is a quaver equals 300. The samples supply the musical material impossible to include at this speed (see ex. 5.23).

[130] Maria Kallionpää, "Performing the Super Instrument: Reaching Beyond Technical and Expressive Capabilities," (paper presented at the Electronic Visualisation and the Arts Conference, London, July 12-14, 2016): 28.

[131] Ibid., 29.

[132] Ibid., 29.

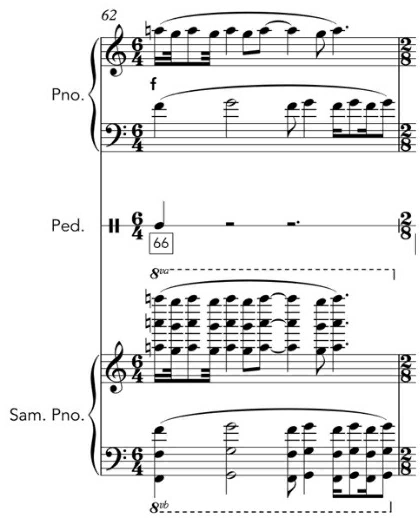
[133] Although I had not read the article prior to writing *Piano Nudes*.

[134] Maria Kallionpää, "Performing the Super Instrument: Reaching Beyond Technical and Expressive Capabilities," (paper presented at the Electronic Visualisation and the Arts Conference, London, July 12-14, 2016): 28.

Example 5.23: *Piano Nudes* Movement 3 b.43 – 54 (resulting sound)

(time reference: 00:43 – 00:49)

"2. Playing in multiple octave ranges". [135] In this extract from movement three, the right hand of the piano is duplicated in three extra octaves above the live piano part and the left hand of the piano is duplicated in three octaves below the live piano part (see ex. 5.24).



Example 5.24: *Piano Nudes* Movement 3 b.62 (resulting sound)

(time reference: 00:54 – 00:56)

[135] Maria Kallionpää, "Performing the Super Instrument: Reaching Beyond Technical and Expressive Capabilities," (paper presented at the Electronic Visualisation and the Arts Conference, London, July 12-14, 2016): 28.

"3. Timbral transformation of the solo instrument so as to create a wider range of sonorities".[136] In this example from movement two, the diamond noteheads indicate a timbral change in the piano sample. Here the piano sample has less high frequency presence and a warmer, softer sound overall (see ex. 5.25).

Example 5.25: *Piano Nudes* Movement 2 b.92 – 96 (resulting sound)

(time reference: 05:52 – 06:15)

"4. Controlling larger sound masses than otherwise acoustically possible".[137] There are five distinct voices in this example from movement two (see ex. 5.26). This is made possible by the samples containing melodic fragments, rather than individual notes. This is notated in the top line of the piano samples.

[136] Maria Kallionpää, "Performing the Super Instrument: Reaching Beyond Technical and Expressive Capabilities," (paper presented at the Electronic Visualisation and the Arts Conference, London, July 12-14, 2016): 28.

[137] Ibid., 28.

Example 5.26: *Piano Nudes* Movement 2 b.39 – 41 (resulting sound)

(time reference: 02:21 – 02:36)

“5. Enabling different tuning systems”.[138] This is a core effect throughout all three movements. We experience the piano as both being in equal temperament and also in different microtonal tunings. In this example from movement one, the descending semi-quaver motif moves between different quarter-tone tunings (see ex. 5.27).

Example 5.27: *Piano Nudes* Movement 1 b.107 – 108 (resulting sound)

(time reference: 04:15 – 04:20)

[138] Maria Kallionpää, “Performing the Super Instrument: Reaching Beyond Technical and Expressive Capabilities,” (paper presented at the Electronic Visualisation and the Arts Conference, London, July 12-14, 2016): 28.

"6. Extending the range of dynamics".[139] This moment in movement one, multiplies the fortissimo volume of the live piano in the samples. This combination produces a far louder sound than is conventionally possible (see ex. 5.28).

Example 5.28: *Piano Nudes* Movement 1 b.87 – 92 (resulting sound)

(time reference: 03:34 – 03:46)

"7. Altering the acoustic space (reverberation, sense of the 'room')".[140] [141] Before the ending of movement two, which places all of the piano in a larger acoustic space, there are occasional notes with a larger amount of reverb (marked in the score as a boxed 'R') (see ex. 5.29).

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139 Maria Kallionpää, "Performing the Super Instrument: Reaching Beyond Technical and Expressive Capabilities," (paper presented at the Electronic Visualisation and the Arts Conference, London, July 12-14, 2016): 28.

140 Ibid., 28.

141 The eighth possibility identified by Kallionpää, not relevant here, is: "8. Achieving increased flexibility with regard to musical form." Ibid., 28.

Example 5.29: *Piano Nudes* Movement 2 b.81 – 86 (resulting sound)

(time reference: 04:58 – 05:27)

Central to our perception of the piece is how the piano and performer are visually presented, as in Armstrong's *Making One Leaf Transparent and then Another* the piano technology appears unaltered. Set-ups without electronic technology, or with it hidden, invite a different listening experience. Works that visually reinforce the inclusion of electronic technology connote differently from those that do not.

Additionally, the techniques used by the pianist are conventional. Even the mechanism used to trigger the samples mirrors the mechanism of a frequently used sustain pedal; the depressed MIDI pedal is the default position and a return to the top of the pedal arc triggers the sample. Therefore, the piano connotes as a standard acoustic instrument and is played conventionally. As the sounds of the piano present an instrument both in standard tuning and with microtonal divisions of the octave, the blend between the familiar and unfamiliar is highly evident.

Across the three movements, this blend is further challenged through extensions of the sonic possibilities of the instrument outlined above. The acoustic piano remains the central component of the set-up, however; the samples embellish the musical material of the piano, rather than acting as replacements to it. Additionally, the samples only blend with the piano when the piano notes are sounded and the sustain pedal is depressed. In this sense, the samples are an extension of the musical instrument, like an audio effect pedal in the signal chain of an electric guitar.

5.9 *Charlene from Big Data* (2021)

Charlene from Big Data is the only piece in the portfolio which includes a part for vocalist. Many of the adaptations, interventions, and extensions for acoustic musical instruments are transferrable to the voice, and similar technologies used in other compositions are implemented in this piece. Samples are used to extend the number of voices in the ensemble producing multiple versions of each instrument, which allows for a more complex polyphony.

<u>Set-up</u>

The components of *Charlene from Big Data* are:

1) Three performers:
   - Vocalist,
   - Accordionist,
   - Clarinettist.
2) Laptop running Max/MSP and audio interface.
3) Audio samples.
4) Two MIDI switch pedals.
5) A microphone for the vocalist processed with auto-tune.
6) P.A. system.
7) Two additional loudspeakers.

The vocalist sings and speaks into a microphone routed into the laptop and then onto the P.A. system. The accordionist and clarinettist perform seated with one loudspeaker placed under each chair. The loudspeakers play back the samples corresponding to their instrument (i.e., the clarinettist and the clarinet samples). Figure 5.14 shows how these components are set-up on stage and how they are connected.

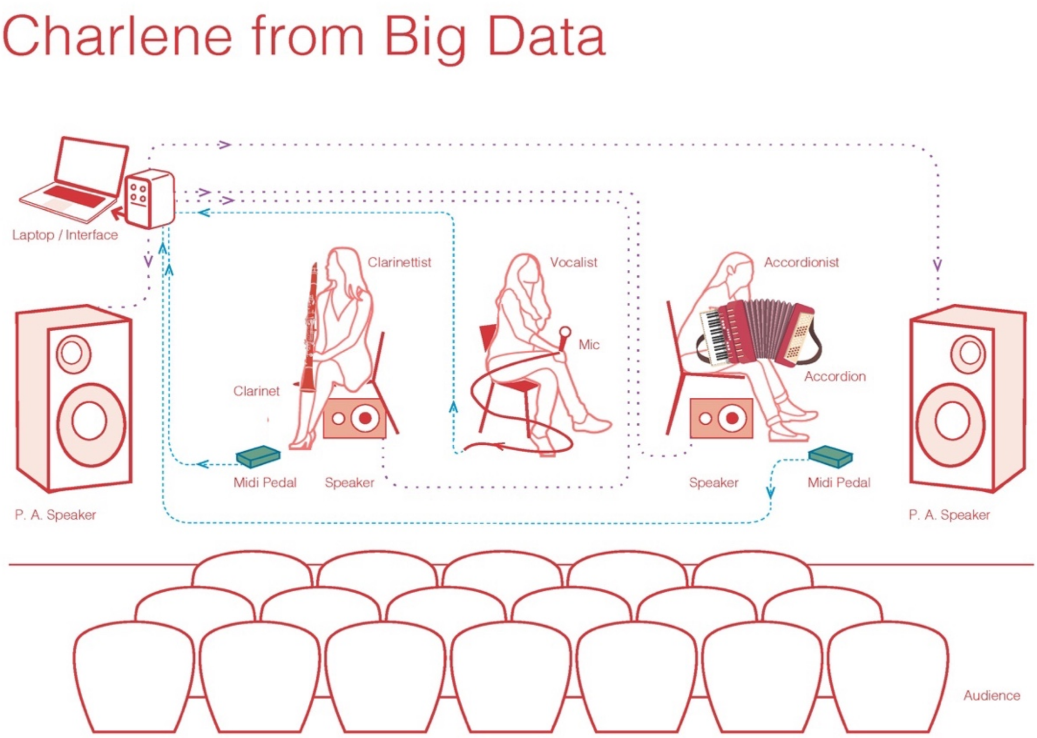

Figure 5.14: Charlene from Big Data set-up

Discussion Points

Auto-tune and the voice

The vocalist sings or speaks and (when singing) is routed through an auto-tune device. Auto-tune is electronic technology that exemplifies the focus of this research: this type of audio signal processing provides us with a clear example of technology used in conjunction with an acoustic source that can provide minimal disruption to the techniques of the performer whilst transforming the audience's experience of the voice.

Sung passages are auto-tuned, which quantises tuning deviating from specified equal tempered pitches. Through altering the tuning, the auto-tune confers an extra 'processed' quality to the voice. In *Charlene from Big Data*, any pitches outside the notes of a C natural minor scale (minus 6th degree) or any deviation from the exact frequency of each of these pitches, activates the auto-tune. There are two attractions to scoring the work for untrained voice. Firstly, the sonority of the voice is important to the storytelling folk element of the microfiction. These idiomatic qualities move away from conventional concert music, focussing the work on the narrative of the words. Secondly, an untrained voice will likely produce more tuning inconsistencies, activating the auto-tune more often. This adds another stylistic layer to the sound, referencing popular music styles, such as contemporary R&B and melodic hip-hop.[142] Auto-tune has a rich recent history of use with the human voice. Initially a post-production process used to correct pitch irregularities in vocal performances on pop records, it is now also used in live contexts. As such, it has developed a performative tradition in some styles of music. Auto-tuned voice has an identifiable sound and, through a process of use and exploration from the 1990s, the meaning of this sound has stabilised (see 1.5) and connotes cultural associations. These associations offer an unexpected change of direction as the work unfolds.

Samples

Samples, used in different ways, feature in many of the submitted works. The approach here is similar to the use of samples in *Piano Nudes* (see 5.8), in that the samples are activated by the performer and are of their acoustic instrument. The samples are used to extend the sonic possibilities of the acoustic instrument beyond the physical limitations of the object, the technology, or how the performer engages with it. The mechanism to activate the samples is also like that of *Piano Nudes*: the use of a MIDI pedal triggering samples from a bank or library offers an alternative to the click-track and playback set-up of *Candela* and the fixed single sample-triggering devices of the electronic drumkit of *Alias States*.

There are thirteen accordion samples and fourteen clarinet samples which are pre-recorded by the performers. Using samples created by the performers ensures a greater consistency of sound between the live and sample parts. This is especially important here as the manipulation of these samples is generally limited to pitch alterations, rather than timbre alterations, as in the piano samples of *Alias States* and the violin samples of *Candela*. The homogeneity of sound is important here, as the timbre of the individual performer is retained in the samples; instrumentalists are identified by their timbral qualities rather than pitch qualities. These samples extend the possibilities afforded by the acoustic instruments, allowing the accordion to produce microtones and the clarinet to produce polyphony. These adaptations provide uncanny qualities, as we hear unfamiliar sounds produced by familiar instruments.

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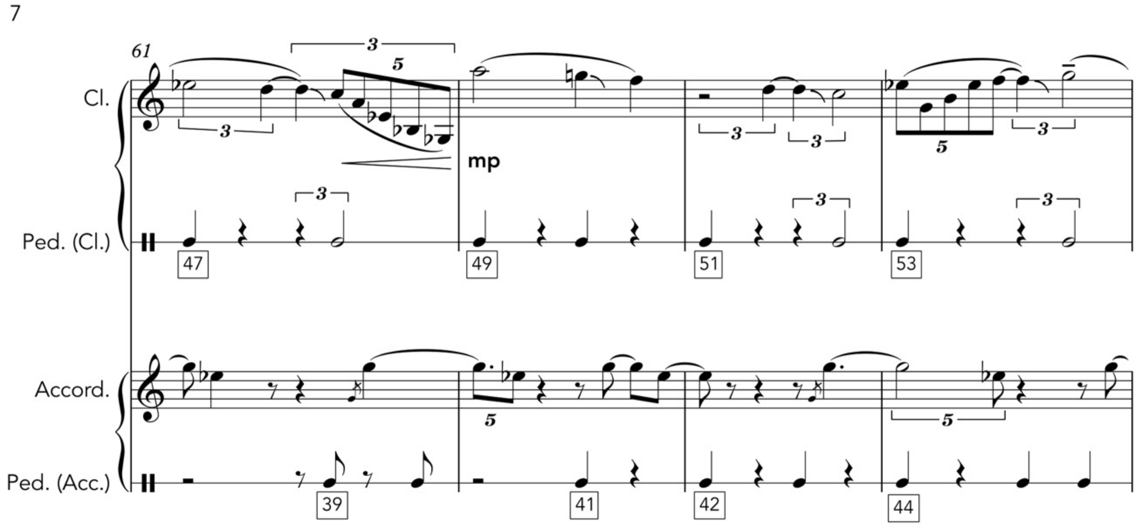
[142] See Catherine Provenzano, "Auto-Tune, Labor, and the Pop-Music Voice," in *The Relentless Pursuit of Tone: Timbre in Popular Music*, eds. Robert Fink, Melinda Latour, Zachary Wallmark (Oxford: Oxford University Press, 2018).

Like other of my compositions that use similar sample-based mechanisms (e.g., *Piano Nudes*), each performer activates the samples through depressing a MIDI pedal connected to a Max patch that triggers playback of the sample through MIDI data processing. The sounds are routed to loudspeakers placed underneath the performers. The inclusion of a P.A. system to amplify the voice means that the electronic technology is more visible here than in *Piano Nudes*.[143]

The types of samples are more limited than in other works (see 5.8) and are either microtonal, add portamento pitch bends to notes or add artificial reverb. The final type of sample is an extended ('frozen') accordion note, which underpins the sections of voice. The samples in this work provide additional instrumental lines in the ensemble: the accordion player activates an ensemble of accordions, and the clarinettist, an ensemble of clarinets. In most cases, each sample is a single note. Example 5.30 shows the clarinet and accordion parts in the score and example 5.31 includes the sounds of the samples in the score. In example 5.31, there are two points highlighted which require further discussion. Firstly, in the clarinet part (highlighted with squares in ex. 5.31), the clarinet sample replaces the note that would be played by the live clarinettist. This is for breathing purposes, as the clarinettist is capable of producing an E quarter flat, and allows continuity of sound. Secondly, in the accordion part (highlighted with circles in ex. 5.31), there are two samples triggered from the same pedal. This is primarily to avoid too many quick activations of the pedal, but also adds in an uncontrolled rhythmic quality; the application of the second note (circled) is fixed in time after the first note.

[143] The commingling of live and sampled sounds of clarinet and accordion is key to the composition. This is achieved by positioning the points of sound diffusion in a similar place (i.e., the instrument and the loudspeaker under the instrumentalist's chair) and through similarity of sound (i.e., the samples are of the performer). In comparison, the signal processing of the voice is unambiguous; there is no attempt at a blurring of identities here, made clear through the use of a P.A. system.



Example 5.30: b.61 - 64 (Charlene from Big Data)

(time reference: 02:50 – 02:59)

Example 5.31: b.61 - 64 (Charlene from Big Data (sample sounds shown in score))

(time reference: 02:50 – 02:59)

A performer playing in an ensemble of their own pre-recorded parts is not uncommon in modern music making. This has traditionally been possible through the use of a tape part. The most notable example here is Reich's *Electric Counterpoint* (1987), in which a live electric guitarist plays to a tape part comprised of twelve other electric guitars and two electric basses. As with *Candela*, this process produces a static tape part to which the live performer is bound. This way of working is now quite common in live popular music performances of many styles, in which a backing track is utilised to provide some of the sound of a performance. Through the use of shorter samples activated by a pedal, this relationship is inverted; the samples are shaped by the timing of the performer.

Text

This is the only work in the portfolio that includes text, an original work of microfiction commissioned for this project, and live human voice. As the voice is a key component in the set-up, it offers another possibility for electronic technological engagement. Set-ups that include text offer an additional site of compositional opportunity. Whereas the musical material of the accordion and clarinet is enhanced through the use of samples, the text is presented in two ways: one 'natural' and one enhanced. The spoken lines are sonically unmodified and deliver more of the narrative in a shorter duration. The sung lines are also semantically important, but the auto-tuned melody is used to accent particular phrases, highlighting some of the more absurd elements of the story (see ex. 5.32). The spoken text is boxed, as it is unmetred and unpitched). In this sense, the text is critical to the electronically enhanced set-up. (The full microfiction is available in Appendix B).

Example 5.32: Sung and spoken text in Charlene from Big Data
(time reference: 01:12 – 01:38)

Chapter 6 Critical Reflection: Form

Chapters six and seven consider key points across the seven compositions. Whereas the previous chapter considered each work in isolation, these chapters tease out themes and make broader comparisons across the submitted works. Compositional form is the focus of chapter six, and the different ways that technology is applied and conceptualised are considered in chapter seven. 'Form', in this context, describes the way that musical ideas are organised across time and how that organisation is experienced by audiences. This discussion in chapter six is centred on three topics. Firstly, consideration is given to transformative moments within the works; how technology shapes the way that musical materials are revealed; and the use of sections which provide high contrast. Secondly, the discussion is focussed on iterative approaches to form. And, thirdly, a discussion of a 'sample-based' approach in relation to the handling of musical material is presented.

6.1 Form: Significant Moments

In this section, form is referred to as the organisation of musical ideas across time with a particular focus on how audiences experience this ordering. As Hamilton states, "'Form' is often held to refer to the perceptual elements of an artwork and the relationships holding between them".[144] Significant moments of transformation, revelation, and contrast are highlighted across all works but discussed in detail in three cases.

In this context, I consider significant moments to be compositional mechanisms or formal sections that change an audience's experience of the music. Stefan Prins' *Piano Hero #1* provides an example of this. Most of the work features the MIDI keyboard programmed to trigger film clips projected onto the screen. For one section, however, this mechanism changes. The MIDI keyboard is played without producing film clips or sound, other than the acoustic noise of the depressed keys. Additionally, the screen is used to project real-time footage of the performer (see 2.2). This moment reconfigures the focus of the work, offering a moment 'outside' the established framework of the composition. I am attracted to musical works that have significant moments

[144] Andy Hamilton, *Aesthetics and Music* (London, Continuum, 2007), 87.

that in some sense alter the work. Focussing on significant moments and how musical materials are organised, transformed, revealed,[145] and contrasted, centres the listener in this discussion.

I do provide some schematic information about the form of each of work, but the primary focus is on how the listener's experience and understanding is transformed at key moments. As is discussed in the next section, in *Alias States*, the role of the electronic drumkit becomes more drum-like through a shift towards more explicitly idiomatic drum practices. Such shifts transform how the set-up is perceived. Similar issues are discussed in relation to *Candela* and *Mikrophonie III*.

Aside from these more detailed discussions, moments of transformation, revelation, and contrast exist in my other works. The timbre of the piano in the second movement of *Piano Nudes* is transformed toward the end of the composition. This is enacted through the substitution of the established piano sample library with another one, significantly changing the tone. In *Kolmanskop* the 'rock' sample, when heard to the end, reveals a longer piece of music, featuring more instruments, developed musical material, and an extended engagement with the rock idiom. *Charlene from Big Data* contains a middle section (b.51 – 60) of heavily reverbed, long clarinet and accordion chords, which provides contrast to the highly focussed clarinet and accordion lines of the other four sections.

In each of the works discussed, electronic technology plays a role in how the musical ideas are transformed and how new contexts are revealed. The influence of electronic technology in the set-ups for my compositions has a clear effect on the creation of sound worlds, but also impacts and shapes the way that musical material is presented within the pieces. Shifts in the presentation of the musical materials can offer new ways of hearing and conceptualising the composition and the role of the instrumentalist.

Transformation

In *Alias States* the identity of the electronic drumkit changes toward the end of the composition. Initially, the drumkit part is embedded with the piano part. The two parts are experienced as a gestalt, but given that the drumkit is performing piano samples, the listener experiences the combination as an expanded and somewhat uncanny (super) piano.

[145] I use the word 'reveal' to refer to a shift in the presentation of the musical material.

The electronic drumkit operates as an audio signal-processed piano, limited in producible pitches. In these opening sections, the pianist and percussionist play similar types of musical material (i.e., single notes across multiple registers) producing similar sounds. There are several shared pitches between both instruments. We could hear this type of musical material as sounding the set-up; in this phase of the piece, we 'learn' its sound through an exploration of the components. This is enacted incrementally across [1] and [2], during which the focus is on particular and limited components. For instance, one arpeggiator is introduced at [1], and another arpeggiator that produces distinct pitches and has a different rate of arpeggiation, is introduced at [2]. Likewise, the hi-hat and low rack tom of the electronic drumkit don't feature in [1] but are prominent in [2]. To highlight this change at [2], both of these drumkit components are heard in isolation, as the drumkit part becomes thinner in texture. Similarly, aside from the recurring ending motif of each rehearsal mark, the piano part is predominately in the upper register of the instrument until the second rehearsal mark. This exploration of the individual components concludes at [3] where we hear all the components together. Figure 6.1 shows a comparison between rehearsal marks one and two.

Figure 6.1: Comparison between rehearsal marks 1 & 2 (*Alias States*)

The most pronounced shift in the presentation of the musical materials occurs at [8], when the electronic drumkit becomes most 'drum-like'. Here the musical material features common drum tropes, including the kick drum on every crotchet (often referred to as 'four to the floor'), the tom drum fill and snare roll into each subsequent repeat (see ex. 6.1). Recontextualised with piano sounds, these phrases retain some of the characteristics of the drumkit; we perhaps perceive this as a joining together of instrumental identities. This would not be the same if this pattern were played on the piano because the drumkit technique and piano samples both impact on our perception of the resulting sound.

Example 6.1: Drum pattern at rehearsal mark 8 (*Alias States*)

The electronic drumkit in *Alias States* reproduces drumkit practice in different ways throughout the work. Initially, the drumkit is evident due to its visual presence on stage. Later, however, the techniques of the performer and elements of the musical material develop a clearer sense of the instrument. Referring to the relational model of musical instruments of chapter 1, the electronic drumkit evokes the drumkit through the percussionist using transduced ergomimetic technique; the visual presence of the electronic drumkit; and also, through the context of the musical material. The identity of the drumkit is, therefore, engaged across multiple domains.

Comparison with *Drummed Variation* (discussed in Chapter 4) highlights some similarities and differences in the how the identity of a drumkit is enacted across both works. In *Alias States* the produced sounds are distinct from the stabilised sounds of the drumkit. Whereas the pseudo-kit of *Drummed Variation* produces non-musical instrument sounds that stand in for conventional drum sounds (e.g., the cardboard box as kick drum), the sounds produced by the electronic drumkit in *Alias States* do not.

As the conventional drumkit practice has been hidden in the earlier sections of *Alias States*, it is here transformed. The drumkit emerges through technique and context, adding to the important visual signification of its presence on stage.

<u>Revelation</u>

A shift in the presentation of musical materials in *Candela* changes the focus of the composition. The opening fourteen sequences of *Candela* (see 5.6) become less complex; the super instrument becomes ‘unravelled’ in the gradual diminution of musical material. Through this process of unravelling, elements of the set-up previously hidden become more perceptible, finally revealing a trio for sampled ASMR voice, light, and violin.

This shift is enacted through the use of electronic technology, which shapes our experience of the music material performed by the live violin. The first half of the work consists of repeated sequences of live violin, overlayed with samples of processed violin, extending the violin's sonic properties. Each sequence is comprised of multiple sound events: each 'moment' is crafted to produce identifiable alterity from the next. This is enacted across the combination of the live violin's musical material, the audio signal processing of the sampled violin and the use of light. The layering and complexity of each sound event is gradually reduced across the composition. The trio of ASMR voice, light, and violin is present within the mix throughout the piece but not fully perceptible until a reduction of other musical material.

From the beginning of the work to [15], the ASMR voice is synchronised with several sound events, but imperceptible within the mix of sounds. This recorded voice starts to emerge from the end of the third sequence and becomes clearly perceptible by the tenth. The emergent quality of the voice encourages an intrinsic listening to its sonic qualities, mirroring the change of tone in this final section. Additionally, where the voice has existed as a short, repeated sample across the opening fourteen sequences, at [15] the ASMR sample is played in full. This longer sample contains more detail and doesn't repeat material. Toward the end of this final section, the voice is only heard during the violin harmonics: the signal from the violin acts as a noise gate, attenuating the voice during the silences between notes.

The ending section of the work is far more delicate in tone than the strident opening, which is supported by a transformation of the light. During the opening, the light is controlled by an automated parameter within the DAW. This parametric control produces fixed periods of outputted lumens by the light; the light is set at a specific brightness for different durations. During the final section, the outputted sound from the violin is used to affect the number of lumens outputted by the light (i.e., the volume of the violin is mapped to the brightness of the light), producing a more responsive, dynamic and flickering amount of brightness, creating a more fragile and intimate effect.

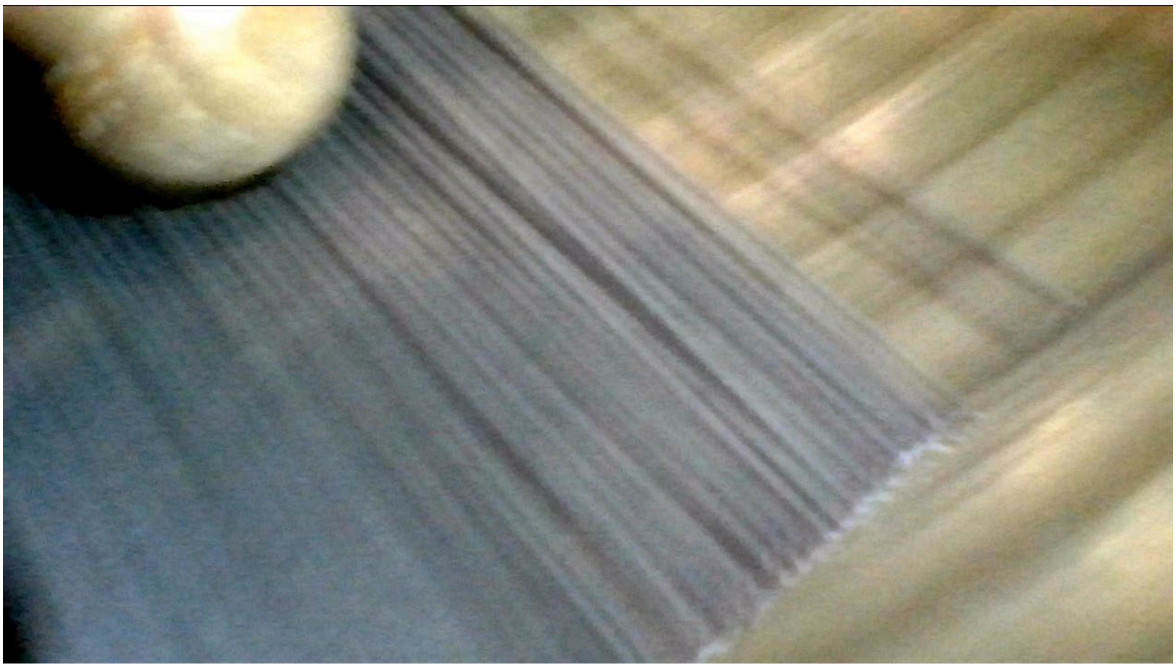
The sound events featuring a harmonic in the live violin part (i.e., sound events five, seven, and thirteen (see fig. 5.9)) become more frequent and occupy more of the sequence as the work moves from [1] to [14]. The final moments of the piece get 'stuck' on this harmonic sonority. Consequently, the ASMR samples, which are the softer sounds within the processed playback part, are revealed. The light becomes more dynamic. The processed violin reduces the range of audio signal processing techniques and focusses on 'freezing' the live violin's harmonics, amplifying and extending the quality of quiet, unstable sounds that defines this end section. This shift of musical material produces a new experience of the set-up.

Contrast

The final section of *Mikrophonie III* provides a moment of high contrast across three aspects of the work: the performance space, the screen, and the interaction between performers. Unlike *Candela*, this final section doesn't reveal something hidden in the composition but changes our experience of the space and the performers within it.

The performance space of *Mikrophonie III* is a feature of the set-up as, throughout the work, performers move around the stage to explore different components. The final section of *Mikrophonie III* relocates the site of performance from the whole stage to a single ride cymbal. Moving from a full-stage environment to a localised point within the space limits the perspective of the audience. This is exacerbated by the positioning of the performers, who turn their backs to the audience.

The screen placed behind the performers extends the performance space into the mediatised realm. Throughout the work, the screen is used to present film clips from performances of the original, *Mikrophonie I*, highlighting the intertextual relationships between the two compositions. The final section changes the film element of the performance from one of reproduction to one of documentation. This is enacted through the application of a hand-held camera operated by one of the performers, which is switched on at the beginning of this end material. Through this camera, the audience is given a close-up perspective of the actions of the performer agitating the ride cymbal (see pic. 6.1).



Picture 6.1: Rehearsal mark 13 of *Mikrophonie III* (still from film)

Before the final section, the performers work individually or in pairs, moving across the performance space to sound and activate the components of the complex set-up. At times, the performers ‘extend’ the performance space through interacting with the mediatised performers from the clips of performances of *Mikrophonie I*. In the end section, all three performers move to be close to one another. Each responds to the movements of the others, unchoreographed, but aware of the others’ presence. The intimacy created from this engages another dimension in the work. The use of the screen offering real-time capture and playback refocuses our attention back onto the gestures and actions of the performers. The hand-held camera is an artificial eye in the closely positioned bodies of the performers, whose attention is on the small physical area of the ride cymbal.

This ending section presents a different type of relationship to *Mikrophonie I*. The performers exciting and documenting the sound of the ride cymbal directly re-enacts the explorative quality of the Stockhausen original. This section marks a shift inward toward the materiality of the ride cymbal, the actions to sound it and the performers’ bodies. Whereas the rest of the work points outwards toward *Mikrophonie I*, through replaying different performances of it and hearing audio recordings of Stockhausen discussing it, the ending section of my work engages *Mikrophonie I* as a compositional model.

In each of the three works considered here, there are significant moments within the form of the work that offer perspective changes. These moments draw attention to characteristics of the composed set-up. The transformation of the electronic drumkit from a gestalt with the acoustic piano to a more conventional idiomatic instrument is experienced through the use of drum patterns and performance techniques. The final section of *Candela* reveals a hidden aspect of the set-up, exposed through changes to the musical material. The high contrast between the end of *Mikrophonie III* and the preceding sections is physically enacted and supported by a change to the mediatised domain. This changes the relationship the composition has with the work it is intertextually engaged with, *Mikrophonie I*.

6.2 Form: Iterative Approach

I have used iterative approaches to material within a number of the submitted compositions. This can be understood as the organisation of musical material into longer phrases, or sequences, which are repeated and adapted through each instantiation. This is similar to, but distinct from, compositional strategies such as theme and variation or material development, common across many types of Western classical music.

Partial Arenas begins with three sections (from [1] to [2], [2] to [3], and [3] to [4]). Each section has a similar shape and passes through similar materials and ends with the same concluding gesture. The concluding gesture consists of the Freeze pedals being activated without 'freezing' the sound of the guitar: we hear the acoustic click of the depressed pedal and the applied audio effects (see bars 21, 41, and 55, for example). The technique of staggering entries is employed to create variety in each of these three sections. For instance, at [2] the second electric guitar plays the same material it played at [1], but now delayed by a minim. Staggered entries also occur in the third and fourth guitar parts in the second section. And at [3], this delayed synchronicity is expanded: all parts play the same musical material, but the second part is delayed by a quaver, the third by two quavers, and the fourth by three. This is shown in figure 6.2. The simple technique of staggered entries provides sonic variety and complexity, while maintaining a strong sense of there being a singular focus and identity across the three sections. As the musical material engages the particular qualities of the set-up, the singular focus generated from working with form iteratively draws attention to these qualities.

The first three sections all end with the Freeze pedal click/audio effect concluding gesture and then a period of silence. The start/stop quality of these iterations is quasi-ritualistic: the performers repeat similar gestures in the production of different versions of the musical material. Through this quasi-ritualistic structure, the first three sections set up formal expectations.

This approach intersects with the previous discussion of significant moments. At [4] of *Partial Arenas*, there is a deviation from the established pattern. As the iterative approach of [1] to [3] builds expectation, as well as form, the contrast created through the introduction of new material is enhanced. At [4], a 'chorale' section provides this moment of high contrast by abandoning the musical materials of the opening sections. All four guitars combine to act as one instrument; the rhythmic interplay of the first three sections is abandoned for rhythmic synchronicity. Additionally, whereas the opening sections set up volume as a parameter explored by the musical material, [4] abandons these nuances for a loud, homophonic texture. The dynamic contrast between [4] and the opening sections breaks this pattern further. This is a moment that provides relief from musical material highly focussed on the qualities afforded by the set-up. Like *Kolmanskop*, where the longer 'rock' exposition moves the work away from an ordered approach (see 5.2), this compositional strategy offers release (and contrast) before the musical material returns to develop the ideas from the opening of the work.

Figure 6.2: Iterations of musical material in the opening three rehearsal marks of *Partial Arenas*

Even more quasi-ritualistic are the sequences of actions that form most of the musical material in *Mikrophonie III*. The sections between [2] and [3], [3] and [4], [6] and [7], and [7] and [8] are all iterations of the section between [1] and [2]. Each iteration features three sets of performer actions, which I have labelled 'A', 'B', and 'C'. Each action consists of:

Action 'A'

- The splash cymbal performer theatrically swinging their large soft beater toward the small splash cymbal before producing a rising dynamic tremolo on the splash using drumsticks.
- The ride cymbal performer walking to the splash cymbal with a hand-held microphone and then returning to the ride cymbal to produce a rising dynamic tremolo on it.
- The MIDI drum pad performer producing a snare drum roll before moving to the ride cymbal with a hand-held microphone (see fig. 6.3).

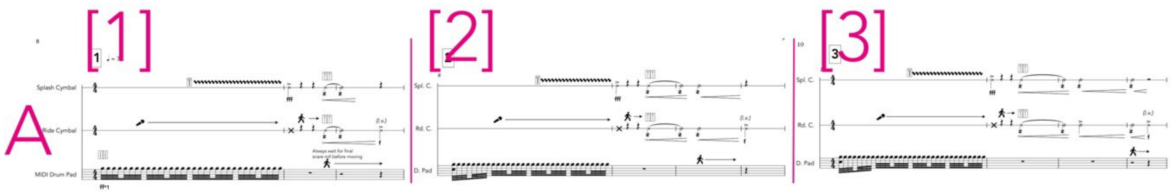


Figure 6.3: Action 'A' in the first three sections of Mikrophonie III

Action 'B'

- The splash cymbal performer exciting the splash cymbal with a drumstick and brush.
- The ride cymbal performer exciting the ride cymbal with a drumstick and brush.
- The MIDI drum pad performer amplifying the sounds produced from the ride cymbal with a microphone (see fig. 6.4).

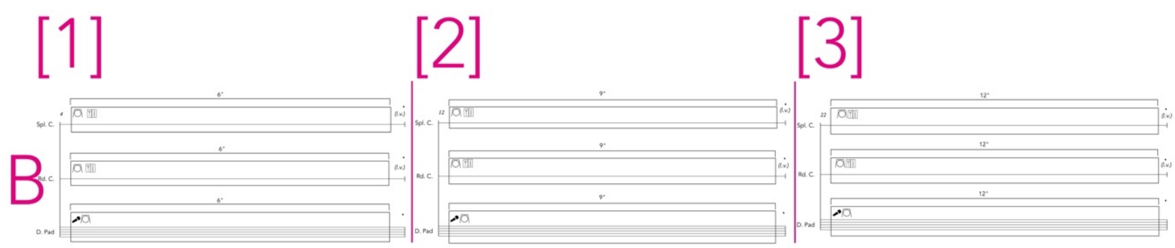


Figure 6.4: Action 'B' in the first three sections of Mikrophonie III

Action 'C'

- The third part of [1] is a composite cross-rhythm across all three parts. The rhythm is enacted using samples, the acoustic sound of the cymbals, and film clips triggered from the MIDI drum pad (see fig. 6.5).

Figure 6.5: Action ‘C’ in the first three sections of *Mikrophonie III*

Across the subsequent iterations, the ‘A’, ‘B’, and ‘C’ sections are extended or reduced in duration. Here, this iterative approach to form produces different outcomes from the repeated actions; each film clip or sample is drawn from a large library of possibilities. As with other iterative approaches to form (i.e., *Candela*), the sequences are concatenations formed from discrete actions or sounds. In *Mikrophonie III*, however, the triggers of samples and film clips aren’t fixed and randomly produce different results. While the iterative form of *Candela* uses repetition to reveal hidden aspects of the set-up, *Mikrophonie III* uses this approach to explore different possible versions of the work.

I also use iterative approaches in *Nara*, but with different techniques. All the composition’s musical material is heard (in embryonic form) in the first section. The first eighteen bars of the work enact different ways of loudly playing a single struck six-string chord. This chordal idea returns frequently throughout the piece, in different configurations and lengths, until b.113 where it begins to develop (see fig. 6.6). The reduction in tempo at b.113 changes our perception of the opening material: at a slower speed and at a quieter dynamic these chords retain the identifiable pitch material[146] but are vastly different in sonic character. The Freeze pedal, rather than capturing the chord at the point of attack, is applied as the sound of the chord decays picking

[146] There are some limited changes of pitch materials across the chords, as highlighted in figure 6.6.

out different tones and harmonics from the sonority. The additional played harmonics that fill the spaces between each chord add to this sense of changed material.

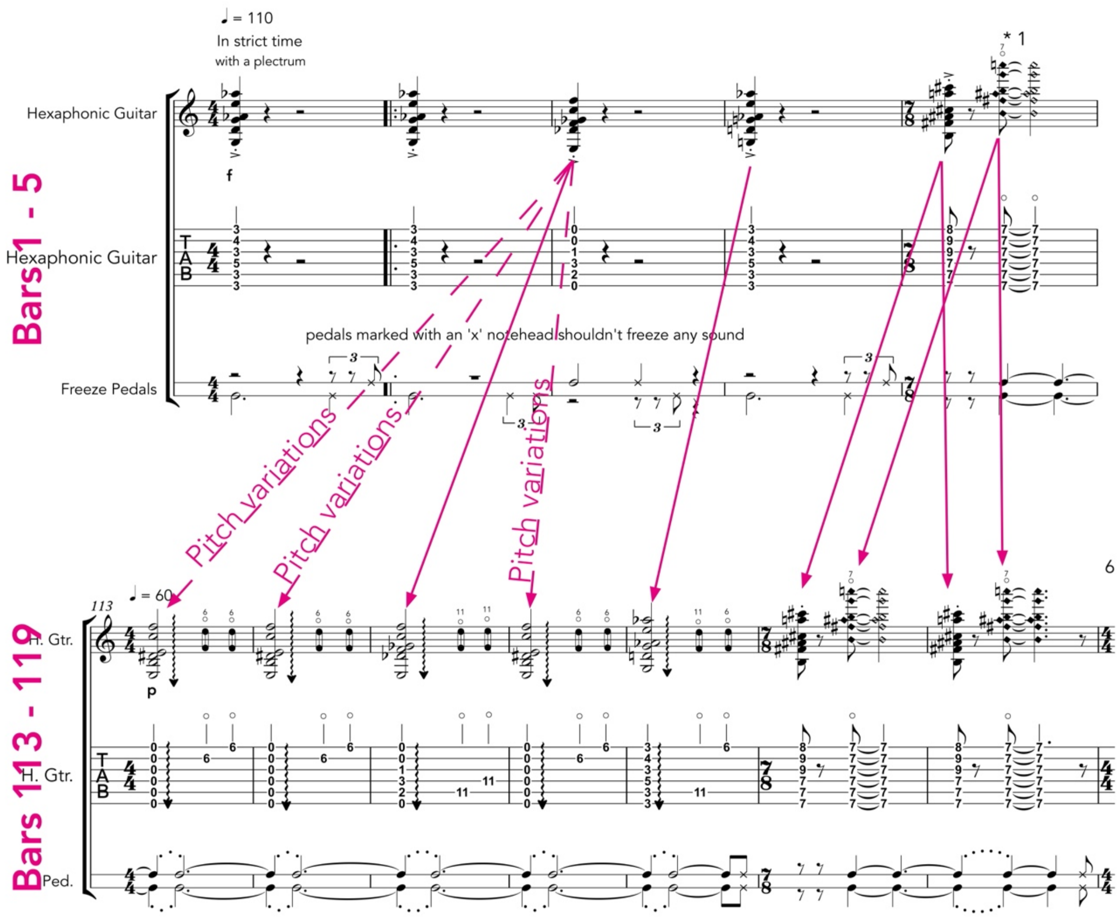


Figure 6.6: Nara - comparison between b.1 – 5 (time reference: 00:00 – 00:10) and b.113 – 119 (time reference: 07:51 – 08:23)

Bar 18 breaks the single chord texture as we hear the first iteration of the ascending harmonic arpeggio. The arpeggio figuration returns throughout the piece but more comprehensively as the final section, b.133 – 162 (see fig. 6.7), through development of the material and the interaction with the Freeze pedals.

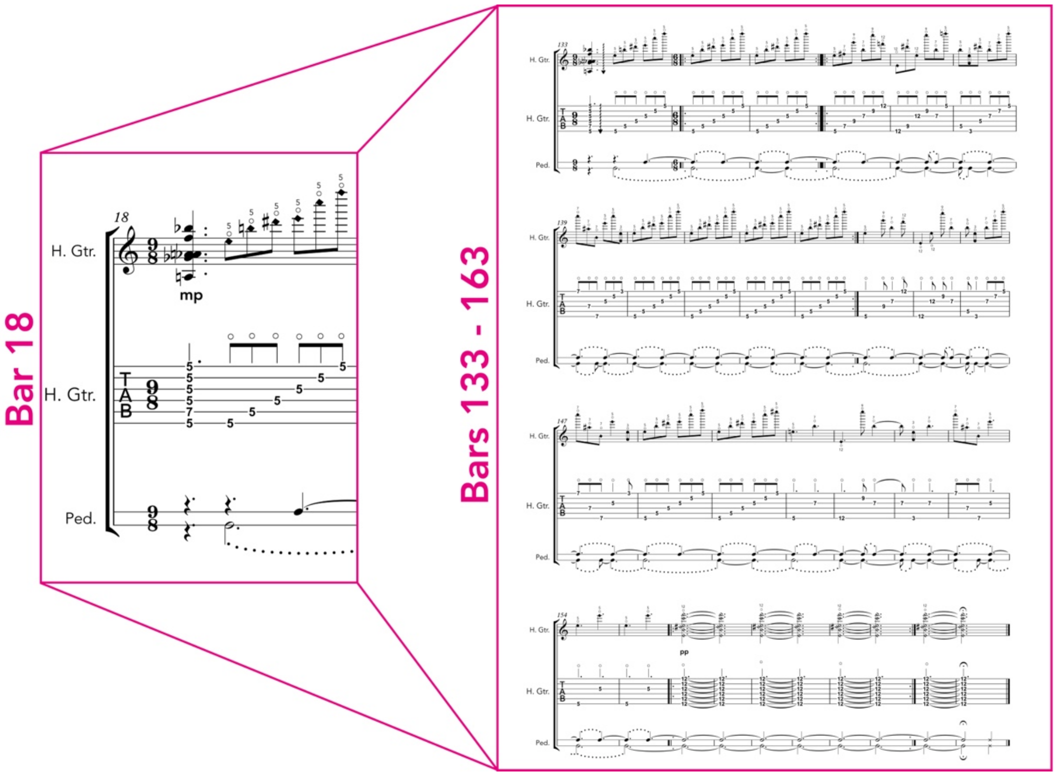


Figure 6.7: Nara - comparison between b.18 (time reference: 00:33 – 00:36) and b.133 – 163 (time reference: 09:20 – 12:23)

The final example of distinct material heard earlier in the work and then developed later is the moments of para-stasis in which the captured sounds from the Freeze pedals become the primary focus of the work. This first appears at b.22 – 23 but becomes extended at b.35 – 41, 44 – 50, and 60 – 71. These Freeze pedal notes exist spatially as 'poles'; the amplifiers are positioned opposite one another. The rhythmic material from b.72 appears from this texture, eventually swamping it and altering it as different notes from the phrase become 'frozen' (see fig. 6.8).

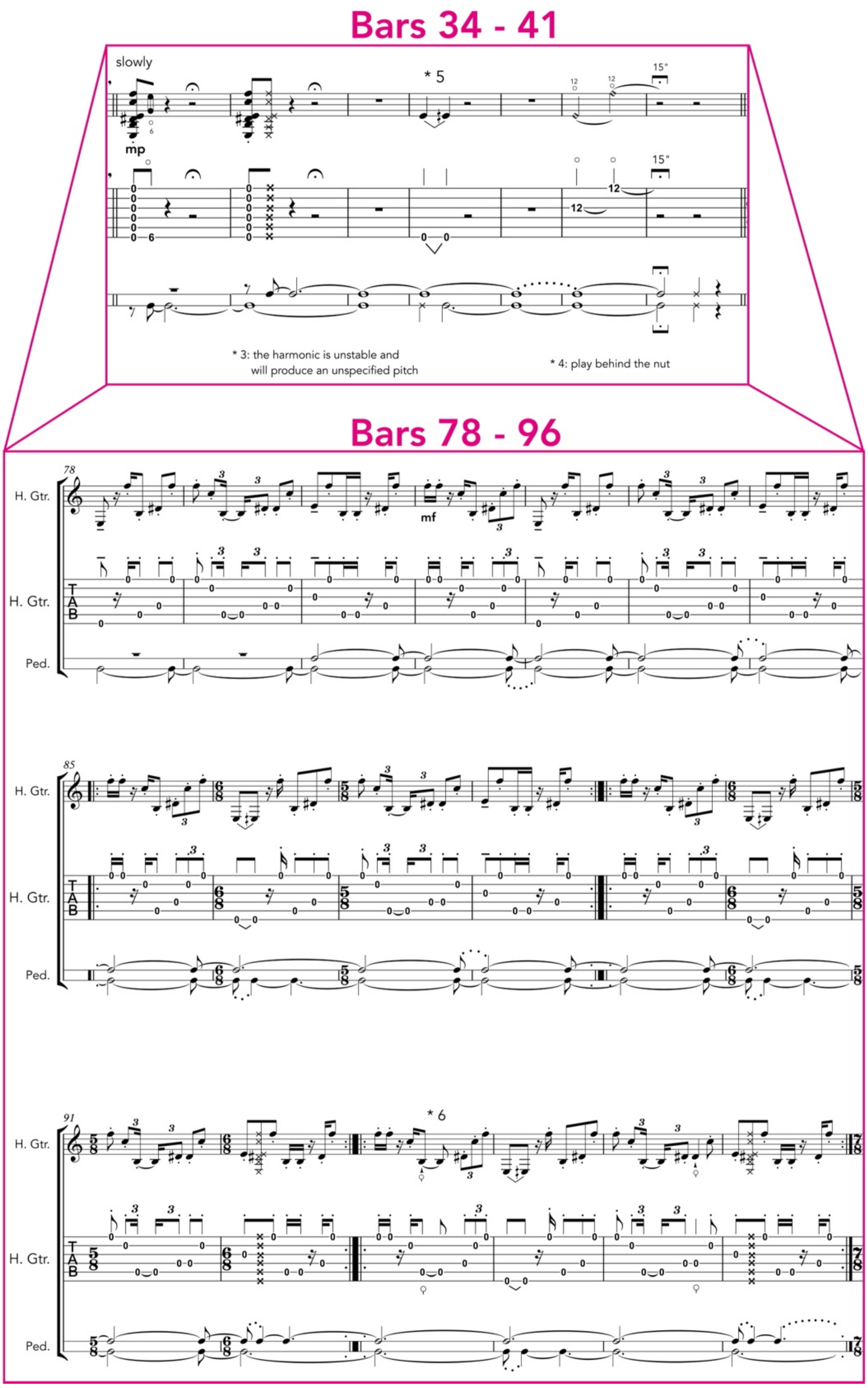


Figure 6.8: Nara - comparison between b.35 - 41 (time reference: 02:07 – 02:47)
and b.78 – 96 (time reference: 05:07 – 05:51)

The musical material of *Nara*, therefore, is expanded from emergent phrases and ideas found at the opening to the work. These iterations are expanded, adapted, and developed into longer sections.

Partial Arenas, *Mikrophonie III*, and *Nara* are three examples of this iterative compositional approach, while other instances exist in *Alias States* and *Candela.* In this approach, there is a sense of 'recycling' material, of altered repetition, or organising formal principles that produce similar, but noticeably different sequences. The discussion of iterations focusses on longer durations of musical material, or sequences. In many of my works, shorter durations of musical materials are formed as compositional building blocks, or samples, which are then arranged into longer chains. There are clear similarities between these formal approaches to ordering musical materials: both engage repetition, patterning, and foreground the beginnings and ends of sequences. A sample-based approach, however, orders sound events at shorter durations.

6.3 Form: Sample-based Approach

Another approach to form in my work is one of 'sample-based' composition, in which short moments of musical material, or sound events, are ordered into longer sequences. In sample-based composition, sound events are static and the compositional interest lies in the creation and disruption of expectation of these orderings across different sequences: "producing such work involves selecting, connecting, remembering, and (re)collecting snippets of audio drawn from heterogeneous contexts into new, hybrid, remixed forms."[147] A sample-based approach to musical materials exists in *Kolmanskop*, *Candela* and the third movement of *Piano Nudes.*[148]

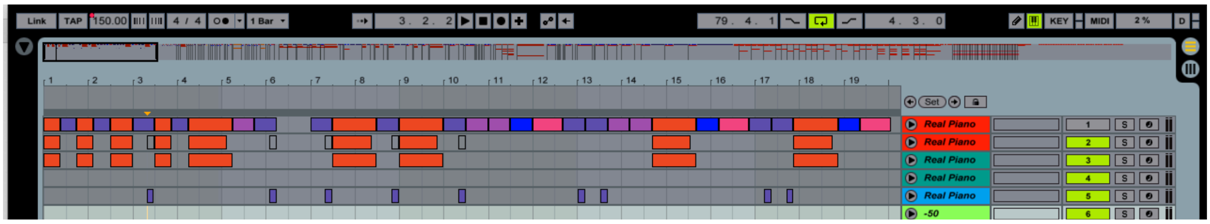
In *Kolmanskop*, the live tuba part, the excerpts of pre-recorded audio, and the audio effects are all treated as samples in that they are fixed length phrases or static audio effects. In this work, the compositional interest lies in establishing and then decoupling default combinations. *Candela* provides a more complex engagement with this process. The samples, or sound events (of which the work is comprised), exist across the various layers of the super instrument (i.e., in the live violin part, in the pre-recorded playback part, and in the light). Furthermore, each sound event in *Candela* is not static and is developed through slight modifications to timbre, duration, or articulation. Additionally, the work sets up our expectations of a similar type of composition to

[147] Owen Chapman, "The Allusive Allure of 'Aura': Sample-based Music and Benjamin's Practice of Quotation," *Canadian Journal of Communication* Vol 36 (2011): 245.

[148] A more complete discussion of the samples, their ordering into sequences, and how these sequences are formally used exists in chapter 5 and is not restated in detail here.

Kolmanskop before revealing something hidden in the last rehearsal mark; the sound events and sequences are replaced by a more 'organic' interplay between violin harmonics, ASMR voice, and light.

In the third movement of *Piano Nudes*, the 'samples' are short piano phrases, chords, or notes. Similar to the opening of *Candela* and *Kolmanskop*, these sound events are established at the opening of the piece and ordered into sequences. Picture 6.2 shows the Ableton mock-up of the opening to movement three with each 'sample' colour coded. The range of 'samples' is increased in the second sequence. Each sequence is separated by a moment of silence, delineating its beginning and end.



Picture 6.2: Opening to *Piano Nudes* Movement 3 (Ableton file mock-up)

There are some clear similarities between the iterative and sample-based approaches to form. The formation of sequences is distinctive of both approaches and features across all submitted works. Yet, how differences between the sequences are enacted vary between both approaches. Iterations of sequences, such as in the *Partial Arenas* example, contain changes to musical material, from pitches and timbres to duration and gesture. Within the submitted compositions, this approach has been used when working with multiple instruments within an ensemble. Iterations, therefore, can occur over time (horizontal) and across instruments (vertical). In comparison, sample-based sequences, as in *Kolmanskop*, focus on the ordering of distinct sound events. *Candela* presents a confluence between the two approaches.

The formation (and disruption) of patterns is key to both iterative and sample-based approaches to ordering musical material. These patterns, however, operate across different durations of material. An iterative approach generates patterns at a sequence level (i.e., over durations lasting tens of seconds and longer), while a sample-based approach focusses on the orderings of shorter sound events within a sequence.

6.4 Form: Beyond Sequences

Working with form through iterative or sample-based sequences focusses the musical material tightly on the characteristics of the set-up. By producing 'versions' of the musical material, the set-up is viewed from different perspectives. In two formal approaches discussed in this chapter (i.e., iterations and samples), the musical material is reworked through variations of sequence length and order; alterations to individual notes and how they are played; and with changes occurring both over time and between instruments. Bryn Harrison describes this approach as "a sense of examining the same object over and over again, often from slightly different angles or perspectives."[149] Although Harrison is referring to works that do this 'obsessively', the mechanism is similar to my approaches to working with musical material.

In future works I am keen to find new ways to organise musical material over time that retain the close relationship between content and set-up but move beyond the limitations of these two approaches to formal orderings, as I feel that there are primarily two limitations with this approach. Firstly, there is an episodic quality to these early compositions. Many of the discrete sections that comprise the submitted works are of a similar length: for example, *Partial Arenas* starts with three sections that last for 1 minute 24 seconds, 1 minute 14 seconds, and 43 seconds. Additionally, across many earlier works (i.e., *Nara*, *Partial Arenas*, *Mikrophonie III*, *Candela*, and *Alias States*), these discrete sections often end with a rhetorical gesture, pause, or silence that provides clear punctuation: the falling glissandi gesture in *Candela*, for instance. Or the episodic quality is enacted by movement between sections that have significantly different musical material: in *Mikrophonie III*, [1], [2], [3], [6], and [7] share similarities; as do [4] and [8]; and [5] and [9]. Secondly, repetition is enacted in only two ways: from sequence to sequence (iterative) or within the smaller building blocks of sequences (sample-based). During this PhD, I have found this approach limiting when producing longer-form compositions. Some works have tried to solve this by 'stepping out' of the established form (i.e., the rock section in *Kolmanskop* and the chorale section of *Partial Arenas*) discussed previously.

Later works, *Piano Nudes* and *Charlene from Big Data*, provide potential solutions to this formal question. Across the three movements of *Piano Nudes* there are longer durations that contain development of musical material. Bars 73 – 108 of the second movement (around 3 minutes and

[149] Bryn Harrison, "Repetitions in Extended Time: Recursive Structures and Musical Temporality," in *Overcoming Form: Reflections on Immersive Listening*, Richard Glover and Bryn Harrison (Huddersfield: University of Huddersfield Press, 2013), 41.

thirty seconds) are highly focussed on one idea, as is the last section (b. 189 – 237) of the third movement (around 2 minutes and forty seconds). Although these moments of material development are different from approaches in earlier works, *Piano Nudes* is largely based on the formal approaches outlined in this chapter. By comparison, the continuous polyphony of *Charlene from Big Data* supports gradual change within the different voices of the texture created from the live and sampled clarinet and accordion. The repetition, although evident, is more complex at these moments because of the number of voices; the musical material is altered, repeated, and developed across time, across the live parts, and across the samples.

This chapter has explored issues that relate to form across the seven works in the portfolio. The importance of the relationship between musical material and the set-up makes issues of form significant and raises questions about how audiences are invited to experience the characteristics or qualities of the set-up. Within these works, this ranges from a more pedantic demonstration (*Kolmanskop*) to gradual exploration (*Alias States*), and from large-scale revelation (*Candela*) to moments in which the focus of the composition switches to another aspect of the set-up (*Mikrophonie III*). Limitations of formal orderings of musical material have been discussed in order to highlight similarities across early works, as well as future ways of working.

Chapter 7 Critical Reflection: Technology

The discussion of the role of technology is organised around two topics in this chapter. The first topic considers the incorporation of both MIDI pedals and guitar effect pedals within the set-up. Then issues arising from the use of visible or hidden technologies within composed set-ups are explored. Finally, the chapter ends with some concluding remarks and reflection.

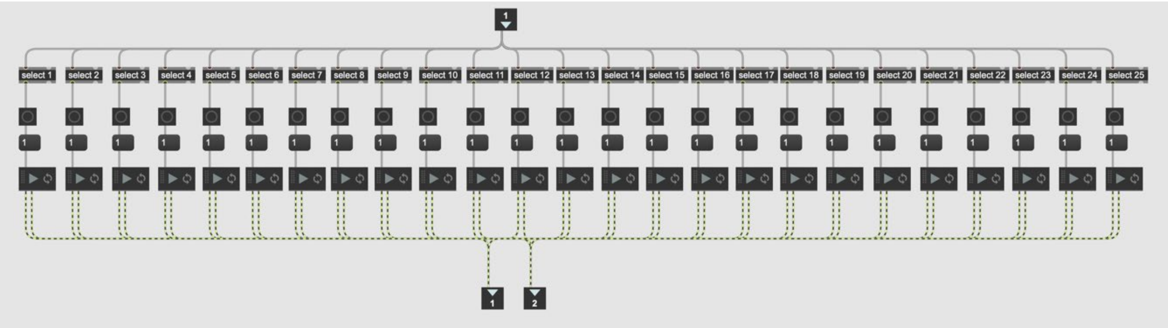
7.1 Technology: Pedal-use in Performance

I am interested in the possibilities afforded by the use of pedals. Firstly, pedals allow for performative control over the playback of samples, leading to greater control over the tempo of the music. Tape parts, a more common method of sample playback, are fixed and are often synchronised with the performer via a click track (see the discussion of *Candela* at 5.6). Secondly, there is an integration of all the components in the environment: it is a performer-controlled set-up (see 2.1). Thirdly, pedal technique is part of many instrumentalists' expanded practice. Guitar effect pedals are common devices in contemporary electric guitar practice, for example.

In many of my submitted works, various types of pedals are a part of the set-up. From the early composition of *Kolmanskop*; to the arpeggiators in *Alias States*; the guitar effect pedals in *Nara* and *Partial Arenas*; and the sample playback triggers of *Charlene from Big Data* and *Piano Nudes*; how these pedals operate, how the performers interact with them, and what technology they activate has been a source of development and research. There are three types of pedals used in my works: the MIDI switch pedal, which sends an 'on'/'off' signal to the computer; the MIDI continuous pedal, which sends MIDI data from 0 – 127; and the guitar effect pedal.

<u>MIDI Systems</u>

The set-up of *Kolmanskop* includes four MIDI switch pedals which produce fixed results: each pedal triggers a sample for the duration the pedal is depressed thus adding an audio effect to the sound of the tuba. Similarly, the pedals in *Alias States* activate samples, but these are MIDI continuous controller pedals that emulate the physical design of a sustain pedal of the piano. Their functionality, however, is different and allows for the continuous production of MIDI data. This enables the samples to be shaped dynamically: the more the pedal is depressed, the louder the output dynamic of the sample. In *Piano Nudes* and *Charlene from Big Data*, the MIDI pedals also activate samples which replace individual notes or short phrases. Wherein *Kolmanskop* and *Alias States* every pedal always triggers the same sample, the samples in *Piano Nudes* and *Charlene from Big Data* cycle through banks of samples and each sample is replayed at a fixed dynamic (see pic. 7.1).



Picture 7.1: Max/MSP sample bank for Charlene from Big Data

<u>MIDI Systems: Challenges</u>

Working with MIDI pedals offers many possibilities but can also create performative, mechanical, and perceptual challenges. In *Kolmanskop*, for example, controlling the pedals while playing the tuba part was a challenge for the tuba player. In a direct way, the physical presence of the tuba restricted sight of the pedals and this led to issues in the realisation of the piece. In instrumental practices where pedals are integrated into the *pedagogical* relationship, such as a piano, sight of the pedals is unnecessary. Wilson, referencing Merleau-Ponty's phenomenology, describes this relationship as naturalised:

> This process of the habitualisation of a relationship between user and the object of use, Merleau-Ponty calls a *body-schema*. Or rather, the body becomes used to certain pieces of technology around it, and this organises it—schematises it—in a way that accommodates these technologies.[150]

The *Kolmanskop* example highlights the difference in instrumental practices between the piano and tuba. Where the piano has habitualised the pedal, tuba practice clearly has not. Similarly,

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[150] Samuel Wilson, "Building an Instrument, Building an Instrumentalist: Helmut Lachenmann's Serynade," *Contemporary Music Review* 32, no. 5 (2013): 429.

asking the clarinettist and accordionist to trigger samples via a MIDI data processing foot pedal in *Charlene from Big Data*, is a technique outside of the established conventional instrument practices of either instrument. The restriction to one pedal, however, rather than the four of *Kolmanskop*, reduces the amount of physical movement required from the performers and related issues arising from restricted sight of the pedals.

Another problem can arise when using multiple short, note length samples, as is the case in both *Charlene from Big Data* and *Piano Nudes.* While this allows for greater levels of expression, it also adds risk to performances, as each depression of the pedal cycles through a bank of different samples with no ability to go back to an earlier sample. This approach also requires the performer to match the dynamics of the pedal parts, as the pedals are on/off devices (i.e., they trigger samples), rather than continuous controller pedals (i.e., they apply dynamic control of the samples).

Guitar Effect Pedals

The guitar effect pedals in *Nara* and *Partial Arenas* are conventional and commonplace. Their use opens another site of performance within the set-up. The opening material of *Nara* focuses attention on the acoustic click sound produced by the activation of the Freeze pedal; the application is performative and doesn't 'freeze' any notes (see fig. 7.1).

Example 7.1: Opening to Nara

(time reference: 00:00 – 00:10)

The mechanical sound of the Freeze pedals being activated is further crafted in *Partial Arenas* through the addition of contact microphones onto the pedal and audio signal processing added to this acoustic sound. In both compositions, the pedals are performatively important and key elements of the musical material. This contrasts with the use of audio effect pedals for guitarists in forms of popular music. The changes of sonority enacted through foot pedals often serve to articulate musical structure (for example, the addition of distortion to thicken a texture in the chorus of a song).

The use of pedals in the submitted works have created new possibilities for performers to interface with electronic technology using established instrumental techniques. Furthermore, the use of pedals offers an alternative method for the inclusion of samples with live performance. The pedal interface is either foregrounded and included as part of the musical material of the work, such as the *Partial Arenas* example, or it can be an underlying mechanism that is physically hidden from view, such as the *Piano Nudes* example. Presenting technology as part of the musical material or synthesising it within the mechanics of the set-up is further discussed in the subsequent section.

7.2 Technology: Visible/Hidden Electronic Objects

Works that signify that they are electronic (i.e., there is visible electronic technology in the performance space) produce different listening contexts from works that signify that they are acoustic. In the submitted portfolio, all the works are 'electronic' in some capacity. There are examples of works that display this overtly: the electronic drumkit, microphones, and P.A. system of *Alias States*, for instance. At the other end of this continuum is *Piano Nudes*, which has no visible electronic technology and presents as an acoustic work. Our listening is framed by the presence or absence of electronic devices.

Furthermore, electronic music complicates our perception of cause and effect; electronic technological systems parse the sonic result from performative gestures: "many electronic instruments function as 'black boxes' that render sound creation invisible."[151] Many of my compositions present technology in this 'invisible' way in which the relationship between the

[151] Joanna Demers, *Listening Through the Noise: The Aesthetics of Experimental Electronic Music* (Oxford: Oxford University Press, 2010), 39.

actions of the performer and the consequent sonic result is complicated. Additionally, the inner mechanisms of electronic technological objects are often detached from the sound produced.[152]

Piano Nudes presents a hybrid instrument constructed from visible acoustic and hidden electronic technologies. The mechanisms that allow for sample playback (i.e., the laptop, the interface, the pedal, and the loudspeaker) are all placed out of sight of the audience. The first deviation from the standard tuned piano is provided by the de-tuned piano note samples at b.5. As the samples are so closely embedded into the musical material, the effect is intensified by the absence of a clear mechanism that could afford this extension of sonic possibilities. Also, the samples here sound like an acoustic piano, albeit detuned: the samples aren't aesthetically electronic. In this work, the technology is, literally, 'invisible'. Other works, signify as electronic but the process of sound creation is hidden within the digital systems.

Alias States signifies differently due to the presence of the electronic drumkit; our listening expectations are framed by the clear visual identity of electronic technology. In this work, the electronic technology is foregrounded, setting the context for the audience's listening. The invisibility of the sound creation processes is due to the modifiable nature of DMIs, these devices can be configured to produce different outputs (see the discussion of the Kaosspad at 4.2). This can lead to perceptual challenges for both performers and audiences, which is key to our experience of the gestalt in *Alias States*. The auditory feedback loop for the percussionist playing the electronic drumkit is disrupted by the configuration of the electronic drumkit to produce piano pitches; there is a dislocation between gesture (i.e., striking the drum pad) and resulting sound. Performing this piece by simply responding to the sounds produced by the drumkit was challenging, due to the close blend of sounds of the sampled piano and live piano.

How the technology is engaged with by performers and how the technology is experienced by audiences are central concerns in this project. The use of pedals as an interface between digital and analogue systems raises issues of performance and the mechanics underpinning their operation. Furthermore, visibly presenting technology within the set-up is part of the composition of the set-up, as it affects how audiences listen. In *Piano Nudes*, for example, the conventional pedal technique of the performer 'hides' the interface of sample playback. Whereas the technique of the percussionist on the electronic drumkit is central to our experience of *Alias*

[152] Ibid., 41.

States. Integrating electronic technology into the relationship between instruments and instrumentalists is fundamental to this project.

7.3 Concluding Remarks

The focus of this work has been on two core areas: composing set-ups and composing for the set-up. This approach is characterised by the creation of bespoke environments in which electronic technology is applied somewhere in the signal chain of a performer playing a musical instrument. The effect of working in this manner is to provide new sounding results, create new compositional possibilities, as well as producing new listening perspectives on established conventional instruments.

This compositional approach is evident in the work of other practitioners and reviewing a selection of these related compositions has helped locate it.

The research presented a relational definition of musical instruments, in which our experience of them is explored through considering the instrument as technology, the instrument as technique, the context in which we engage with instruments, and how we listen to them. This definition provided a framework within which to discuss the qualities or characteristics of musical instruments and how we can evoke their presence within compositions.

Furthering this conceptualisation of musical instruments is the idea of the set-up. Creating specific set-ups as part of the creative act is a key research area in this project. The electronic technology in the set-up is used to transform the way we think about and experience musical instruments.

The other key area of research is the development of methods to create musical material that exploits the characteristics of the set-up. Central to this approach is composing music that explores the particular features of each set-up, so that the unique qualities of the set-up are foregrounded and not incidental.

The first part of the commentary establishes terminology and theoretical frameworks. These frameworks are then explored through examples and a more nuanced sense of the ideas and issues at stake. This discussion, including the case studies, also provides context for my works. As well as providing a more general set of terms and descriptions, there are clear links between particular works in the portfolio, the two case studies, and the review of related compositions: *Drummed Variation* and *Alias States* engage drumkit practice; *Making One Leaf Transparent and then Another* and *Piano Nudes* focus on the qualities of modified piano sounds; the set-ups for

Partial Arenas and *Last Song for Charleroi* demonstrate a similar approach to shaping the sound of the electric guitar; and *Mikrophonie III* builds on the concept and documented performances of *Mikrophonie I*.

The works in the portfolio demonstrate continuing research and development in this compositional approach. There is a sequential aspect to the research: problems and limitations in one work were addressed in following works. Key examples of this include:

- *Kolmanskop* is more traditionally electroacoustic in quality than my other works and the degree of synthesis between the electronic and acoustic domains is limited. The subsequent completed work, *Nara*, produces the more complex and richer set-up of a hexaphonic environment.

- The pedal practice of *Nara*, which features the highly limited acoustic sound of the click of the pedal, is sonically expanded in *Partial Arenas*. Elevating the hidden mechanical sounds of instrumental performance offers potential new research areas.

- The playback part of *Candela* is a non-performer-controlled component of the set-up. The use of pedals to trigger short samples as in *Piano Nudes* and *Charlene from Big Data*, effectively replaces a playback, or tape, part.

The earlier works in the project have clear differences to those composed later. Initially, I was keen to create electronic technological systems where the mechanisms were readily perceptible by audiences. In these compositions the technological mechanism is experienced explicitly by the audience. For example, the operation of the MIDI pedal to activate the distortion effect in *Kolmanskop* is a clear gesture; the audience sees the performer engage the technology and experiences its impact on the resulting sound. While this approach has certain attractions of fidelity (i.e., the mechanism functions as we perceive it to function) and legibility (i.e., the mechanism is a visible part of the set-up), it also has severe limitations. For example, the type of experience the audience has in *Kolmanskop* is unambiguous; the relationship between technology and sound doesn't require much interpretation.

Whereas the experience of the earlier works in the portfolio is predicated upon a certain amount of fidelity and legibility, moving away from this provided richer compositional possibilities and enabled more ways to activate listener curiosity. For example, the use of the MIDI pedal in *Piano Nudes* is less visually prominent but, more importantly, it is also unclear how the mechanism impacts on the sound. Part of the audience's experience of that piece is deciphering how the sound is created.

This change to compositional approach occurred during the composition of *Mikrophonie III* and was developed further in *Candela*. *Mikrophonie III* originally used microphones on the cymbals to trigger the audio samples (see *Mikrophonie III*). This technological mechanism encapsulates a concern with fidelity and legibility. The replacement of these microphones by hand-held switches continued the audience's experience of how the technology functioned without the underlying mechanism working as such. Not being confined to issues of fidelity and legibility offered new ways of working. The first work completed after *Mikrophonie III* was *Candela*, where all sound processing was completed prior to performance and then reproduced via playback. Compositions after *Candela* developed these working methods until later works, such as *Piano Nudes* and *Charlene from Big Data*, were made exclusively through sample playback. This shift retains the ethos of the project while operating with simpler, more reliable set-ups.

As identified in the introduction, works for specific set-ups are more commonplace within New Music. By considering the set-up from an expansive perspective, as all the human and non-human resources employed in the performance of a musical work, I hope to provide a way of discussing these compositions: how they function, how audiences experience them, and how composers write for them. Moreover, with the increasing ubiquity of electronic technology in performance practice, this project highlights questions and provides frameworks for discussing how composers integrate acoustic musical instruments with technology.

As the research is ongoing new issues remain unresolved, which I plan to explore in future works. The *Piano Nudes* approach to the use of samples and pedals offers a way of extending the sonic properties of pianos. This raises the possibility of further works for solo piano or also as a way of expanding the instrument within ensemble contexts. The synthesis between sound diffusion points within the piano (i.e., the sample playback loudspeaker is positioned under the soundboard) allows the piano to retain its role in different established acoustic instrumental genres, such as the piano trio and the piano quintet, or as a supporting instrument for other solo instruments. Developing control over the dynamics of the sample playback will enhance this approach.

Charlene from Big Data presents a way to incorporate texts and voices into a composed set-up. The voice can be extended and adapted through the application of electronic technology in the same way that other acoustic instruments within the portfolio have. Furthermore, working with short story texts, or microfiction, offer the possibility of the creation of a ‘microsong’ cycle for the *Charlene* set-up.

Additionally, during this project, I started work on a string quartet using auto-tune. As discussed at 5.9, I am particularly interested in auto-tune, as it expands the sonic properties of a musical instrument, while simultaneously building on, and modifying, established relationships between instrument and instrumentalist.

I regard the primary achievement of this work as contributing to emerging discussions about how electronic technology is used in live music performance. This project has sought to refocus this discussion on how electronic technology can frame interaction between players and instruments, instruments and audiences, as well as offering new compositional opportunities.

Through the creation of bespoke set-ups, this part of compositional practice is relocated as a fundamental part of the work of the composer. The research in this thesis has begun the process of suggesting terms, concepts, and frameworks with which to discuss the composed set-up. Locating the set-up as part of the creative act of composition centralises the acoustic musical instrument and how electronic technology can produce new contexts in which to experience it.

Appendix A: Score for Kolmanskop

Kolmanskop

for tuba and live electronics

2

Technical Set Up

1. Download the Ableton patch from:
https://www.dropbox.com/s/053rh04n19hs6yg/KOLMANSKOP%20PERFORMANCE%20PATCH.als?dl=0

2. A microphone needs to positioned as close to the tuba as possible. The microphone is plugged into the audio interface.

3. The different pedals affect the live sound once pressed and should be momentary MIDI functions. Depressing the pedals also activates the samples. Using keyboard sustain pedals is recommended.

4. The affected sound from the speakers should be louder than the dry sound.

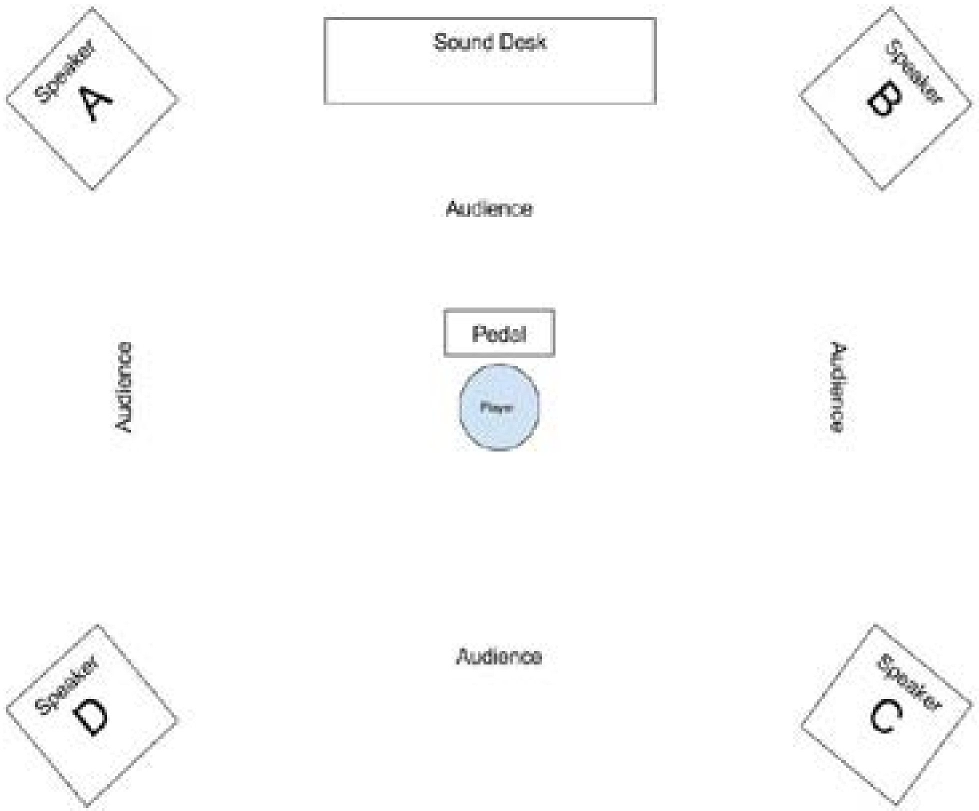
Pedal FX and Samples:

Pedal A = Modulated delay & carnival ambience sample
Pedal B = Delay & jungle ambience sample
Pedal C = Harmoniser & brass band warming up sample
Pedal D = Distortion & rock drum beat sample

Technical Specification:

1. P.A. system with four speakers
2. Quadraphonic audio interface (with leads)
3. Computer (running Ableton Live)
4. 1 x microphone (with stand & lead)
5. 4 x keyboard sustain pedals & adapter.

Stage Set Up


Speaker A
Sound Desk
Speaker B
Audience
Pedal
Audience
Audience
Speaker D
Audience
Speaker C


♩ = 100
Tuba in B♭
mf
A
B
C
D
7
Tuba.
16
Tuba.
26
Tuba.


38
Tuba.
A
B
C
D
51
Tuba.
A
B
C
D
64
Tuba.
pp
A
B
C
D
78
Tuba.
pp ff pp
pp ff pp
pp ff pp
A
B
C
D
88
Tuba.
ff
pp
pp ff
pp
mf
A
B
C
D


6
100
Tuba.
A
B
C
D
f
110
fp
f
119
mf
f
129
fp
f
139
mf
f


148
Tuba.
fp
f
A
B
C
D
156
Tuba.
fp
f
A
B
C
D
165
Tuba.
mf
A
B
C
D
170
Tuba.
f
A
B
C
D


8
176
Tuba.
mf
A
B
C
D
186
196
206
x 6
212
x 4
pp

Appendix B: Lyrics for Charlene from Big Data

I think everything got out of hand, when the smoothies started getting friendly. My carton of non-dairy milk substitute had a cartoon glass of non-dairy milk substitute with a moustache and three friendly white drops issuing from the top, and a speech bubble that said, *put me in your bones!!!!*

But when things started getting personal I decided I'd had enough. I needed to speak with Big Data, but I didn't know where to begin. I typed "I would like to speak to a Big Data representative" into google, pressed search and hoped it would reach them. Then I held my phone in front of me and said loudly, *I would like to speak to a representative of Big Data please*.

That evening, I received a call from an unknown number.

A voice said, *Hello, this is Charlene from big data. How can I help you today?*

She continued, *Before we proceed any further I will need to ask you a quick security question.*

I said, You're asking me?

She said, *Which Showergel do you feel best encapsulates the need for freedom?*

I said the first one I could think of and she said, *yes, that's correct, that's what we thought you'd say.*

Now I could explain my situation. I told them I was feeling targeted. Charlene said, *Thank you very much. Feedback is extremely important.* Then she said, *Can I call you back if we have any more questions?*

Thank you, I said, but I really don't know when I'll have the time. She said, *You're mostly free on Wednesdays*, and hung up.

I looked again at the cartoon milk and pondered my unknown future.

By Rose Biggin & Keir Cooper

Appendix C: Study Scores for Piano Nudes

Piano Nudes

for solo piano and electronics
[study score]

Olly Sellwood
2020-21

for Yshani Perinpanayagam

Study Score Information

This is a study score for the three movements of *Piano Nudes*. The score shows the live piano part, the pedal part and a transcription of the samples triggered by the application of the piano.

In some cases, the transcription of the samples is approximate, as some of the shorter phrases exist in a different tempo. At these points, a general sense of the phrase is given to avoid unnecessary overcomplicated notation.

Key:

> Microtones are highlighted with + or - the amount of cents changed from standard tuning. E.g. +50 or -25
> Longer groups of microtones are indicated with a bracket
> R = samples have extra reverb added
> = vibrato
> Diamond noteheads indicate a timbral change to the piano sound
> Res = samples have extra resonance added
> F = samples are filtered
> EQ = samples are EQ'd

1

I

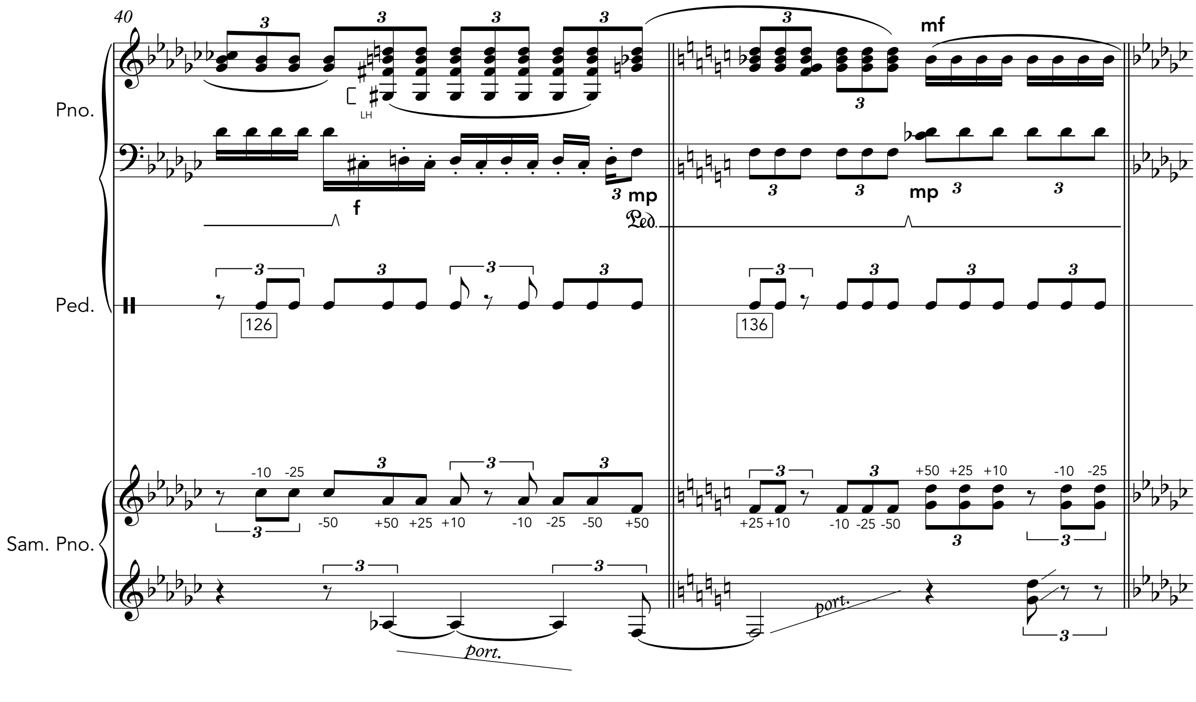
*1 Sample numbers are given at the beginning of each bar

*2 The pedal duration should always be short. Other values are used for rhythmic clarity

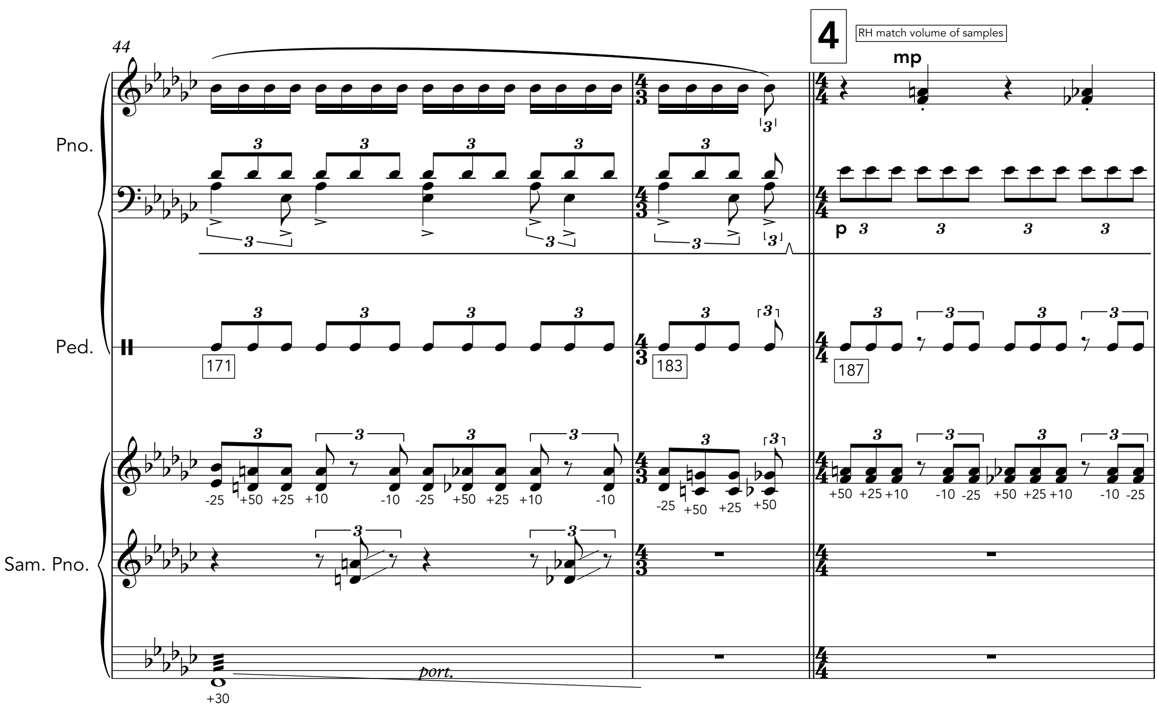

32
3
♩ = 60
Pno.
mp
Ped.
59
64
69
74
Sam. Pno.
-25 -50 +50 +25 +10
+50 +25 +10
-10 -25
-25 -10


36
Pno.
mp
mf
f
Ped.
84
94
Sam. Pno.
+50 +25 +10
-10 -25 -50
-25 -10
port.


38
Pno.
mf
Ped.
104
116
Sam. Pno.


40
Pno.
LH
f
mp
mf
Ped.
126
136
Sam. Pno.
port.
port.


42
Pno.
Ped.
147
159
Sam. Pno.


44
4
RH match volume of samples
mp
Pno.
p
Ped.
171
183
187
Sam. Pno.
port.
+30

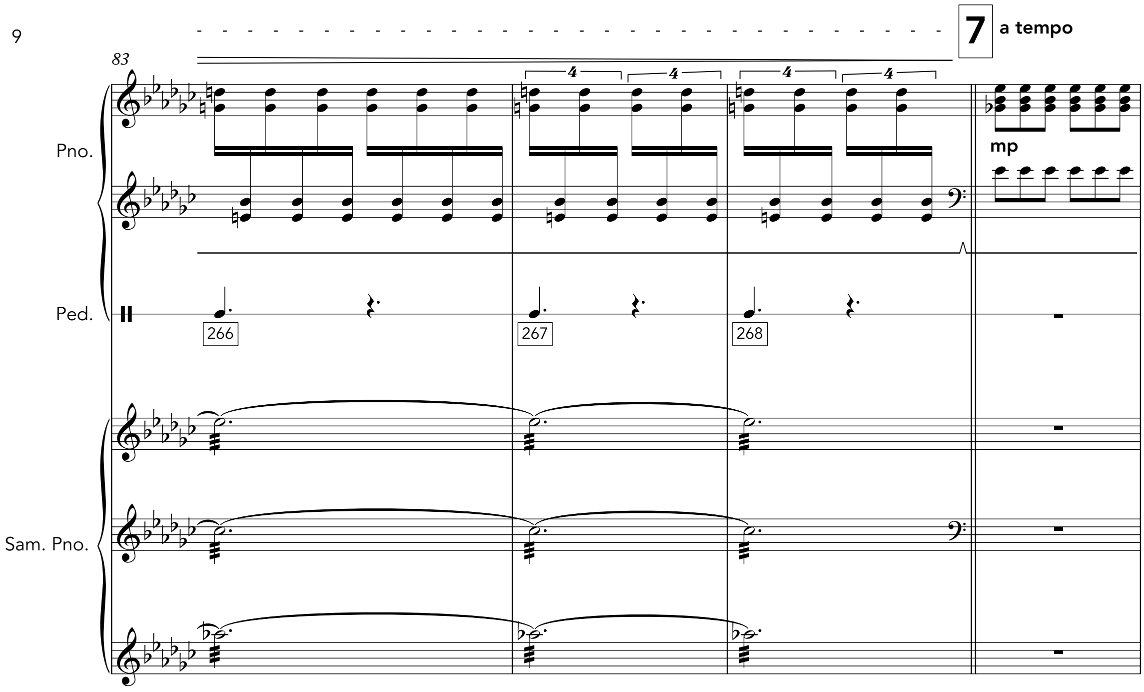

47
Pno.
Ped.
Sam. Pno.
197
207
217
+50 +25 +10
-10 -25
50
+25 +50
52
5
p
mf
223
c.2"
gliss.

7


54
6
♩. = 60 (♩ = ♪)
Pno.
pp
mp
Ped.
224
229
234
Sam. Pno.
-25 -50 +50 +25 +10
-25 -50 +50 +25 +10
-25 -50 +50 +25 +10


59
the piano f should match the loud samples
f
mf
Pno.
Ped.
239
240
243
245
Sam. Pno.
+10
-25
-50
-30
-50
+25
+30


66
8
mp
mf
mf
mf
mf
mf
Pno.
Ped.
247
248
249
251
252
253
254
255
257
258
259
Sam. Pno.
+25
+50
-50
-25
-50
+10
-25
+25
-50
+10
-10
+10
-50
port.
port.
port.
port.
77
rit.
mp
mp
mp
mp
mf
4
4
Pno.
Ped.
260
261
262
263
264
265
Sam. Pno.
port.
port.
port.
-50


83
7
a tempo
4
4
4
4
Pno.
mp
Ped.
266
267
268
Sam. Pno.


match volume of samples
87
Pno.
ff
Ped.
269
275
281
287
293
Sam. Pno.
+50 +25 +10 -10 -25
+50 +25 +10 -10 -25
+50 +25 +10 -10 -25
8vb


93
Pno.
mp
ff
Ped.
299
305
311
317
Sam. Pno.
+50 +25 +10
-10 -25
(8)
8vb


99
Pno.
Ped.
323
329
335
341
347
Sam. Pno.
+50 +25 +10
-10 -25
(8)

11


104
Pno.
Ped.
mp
p
353
359
365
+50 +25 +10 -10 -25
Sam. Pno.
R until bar 122
(8)
107
371
377
109
383
389


12
111
Pno.
Ped.
395
401
Sam. Pno.
+50
+25
+10
-10
-25
113
407
413
115
419
425
117
431
437

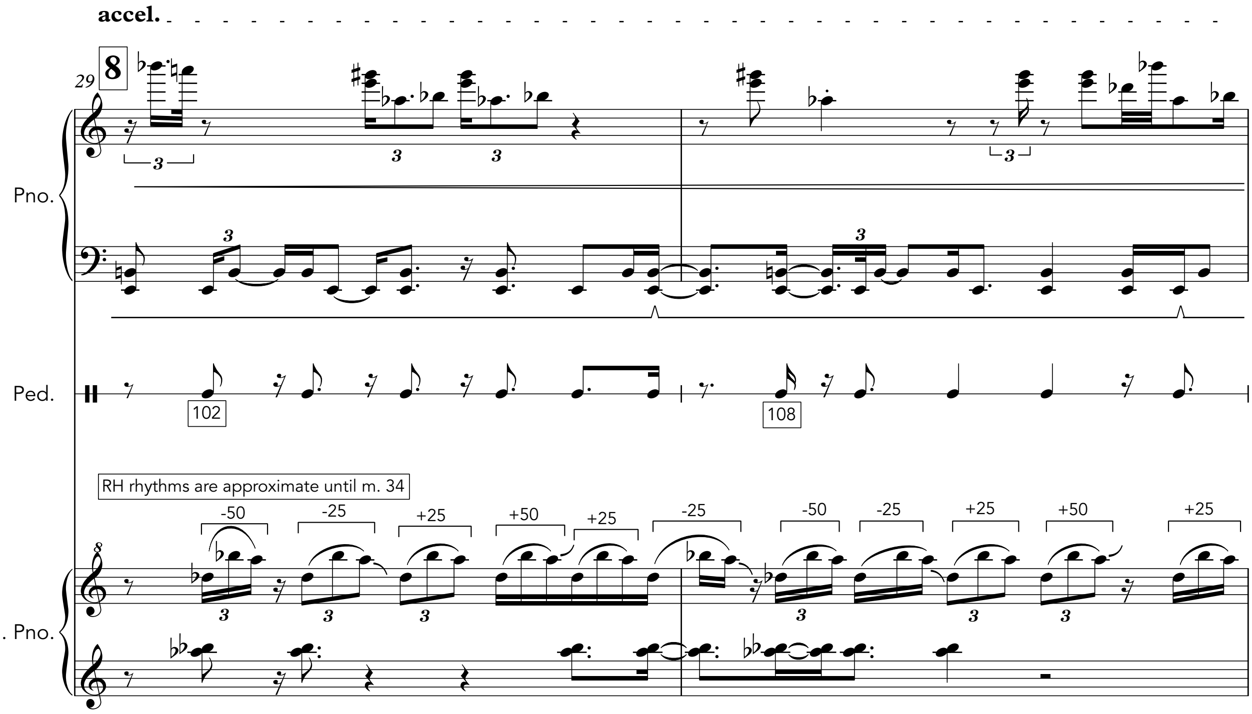

13
119
Pno.
Ped.
443
449
+50
+25
+10
-10
-25
Sam. Pno.
121
rall.
pp
455
461
Gradual slow down on tremolo
125
130
462
468
474
480
c. 2"
port.

II

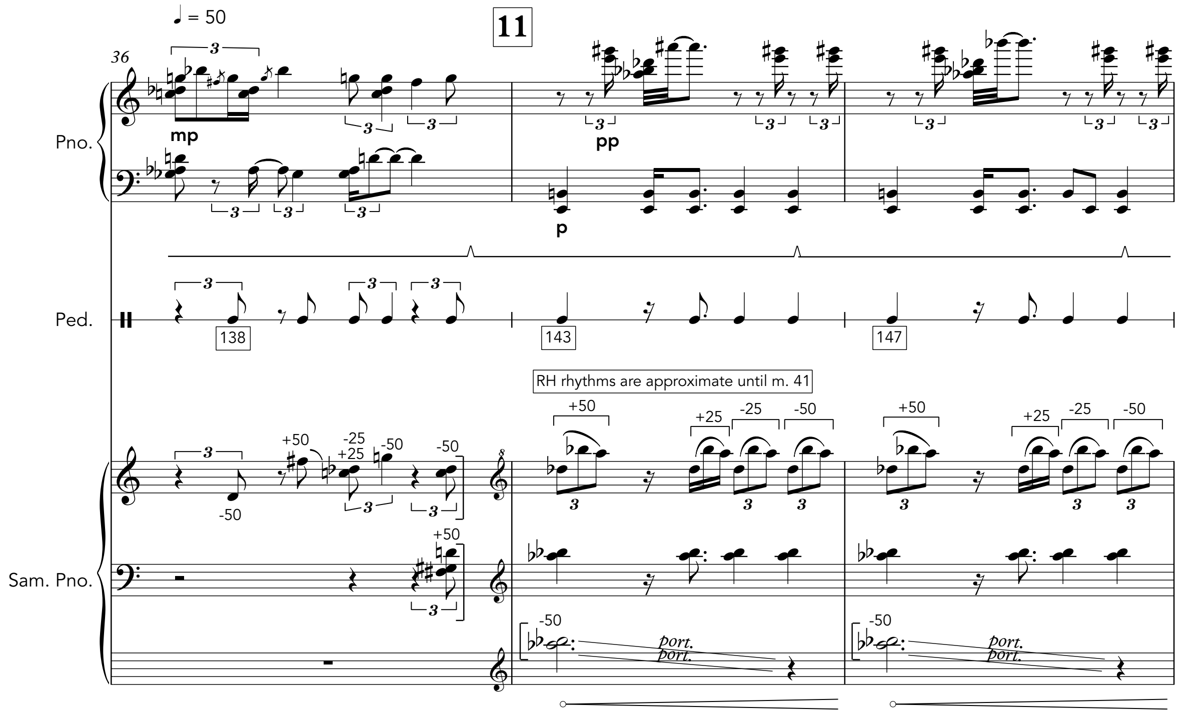

15
12
2 ♩ = 70
Pno.
ppp
Ped.
45
49
53
Sam. Pno.
15
3 ♩ = 80
pp
57
61
17
p
65
8va
8vb


4
Pno.
mf
pp
Ped.
Sam. Pno.
Port.
accel.
5
♩ = 80
mp
6
molto rall.


7
♩ = 80
27
Pno.
mf
mp
Ped.
94
98
Sam. Pno.
-50
-25
+50
+25
port.


accel.
8
29
Pno.
Ped.
102
108
RH rhythms are approximate until m. 34
Sam. Pno.
-50
-25
+25
+50

9
♩ = 100
31
Pno.
Ped.
113
118
Sam. Pno.
-25
-50
+25
+50
33
10
♩ = 75
mf
ff
124
128
133


♩ = 50
11
36
Pno.
mp
pp
p
Ped.
138
143
147
RH rhythms are approximate until m. 41
Sam. Pno.
port.
port.


39
Pno.
p
Ped.
151
155
159
Sam. Pno.
port.
port.


20
12 ♩ = 80
42
Pno.
pp
Ped.
161
165
169
173
Sam. Pno.
-50 -25 +25 +50


13
46
Pno.
mp
Ped.
177
180
185
189
Sam. Pno.
-50 and ord.


50
14
21
Pno.
Ped.
193
197
201
204
Sam. Pno.
54
207
210
213


57
15
Pno.
f
Ped.
216
217
Sam. Pno.
-50
+50
-25
+25 +25 +25

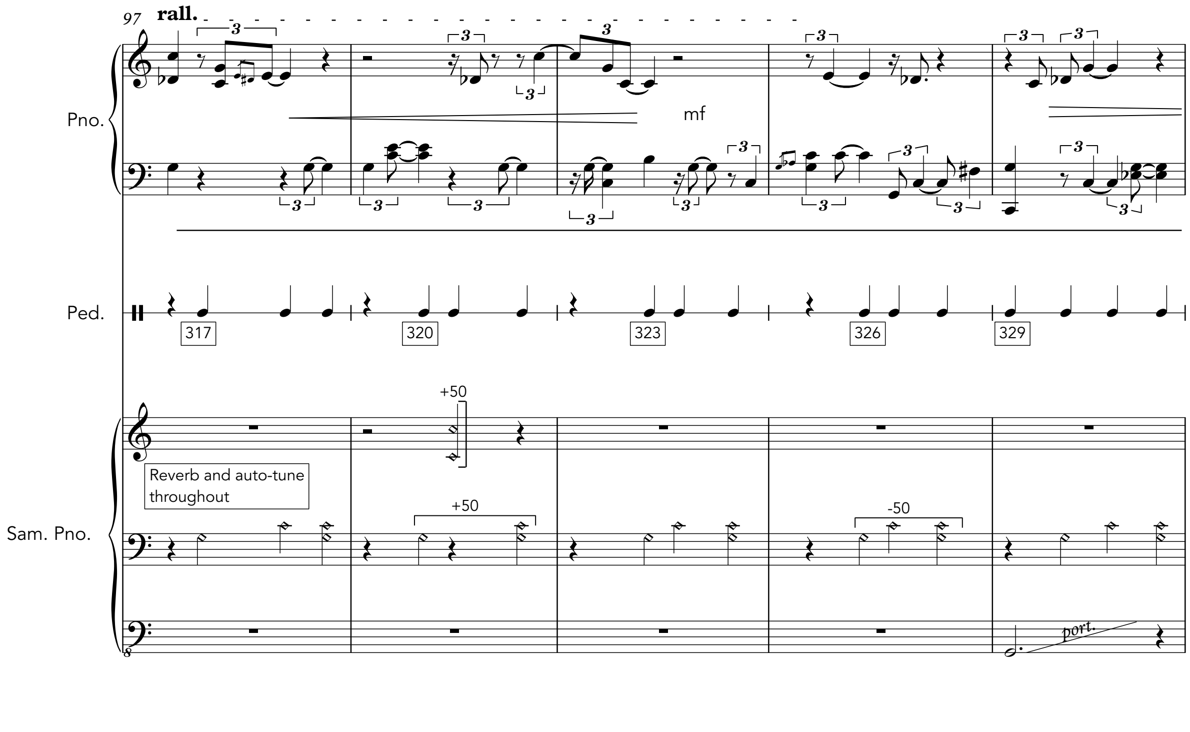

60
molto rall.
Pno.
Ped.
218
219
221
Sam. Pno.
-25
-50
+50
port.
port.
-50
+25
-25
+25


63
Pno.
p
Ped.
222
224
226
227
Sam. Pno.
-50
+25
-25
+50
67
♩ = 50
230
231
233
port.
73
16
pp
Ped.
234
237
240
243
246
250
254
258


81
Pno.
Ped.
262
266
269
273
277
281
Sam. Pno.
port.
port.
R
R


87
Pno.
Ped.
285
289
293
296
299
Sam. Pno.
port.
R


92
Pno.
Ped.
302
305
308
311
313
Sam. Pno.
-50
-25
+50
+25
R
port.


97
rall.
mf
Pno.
Ped.
317
320
323
326
329
Sam. Pno.
+50
Reverb and auto-tune throughout
-50
port.


102
Pno.
Ped.
333
337
341
Sam. Pno.
+50
-50
port.
port.


♩ = 20
105
pp
Pno.
Ped.
345
346
+50
-50
+50
Sam. Pno.


27
III
*1
played as
1
♪ = 300
Live Piano
ff
*1
Pedal
Sample Piano
Res
Pno.
sim.
mf
Ped.
Sam. Pno.
F
2

28


17
Pno.
Ped.
Sam. Pno.
mf
p
ff
17
18
20
22
EQ
F
22
23
24
25
27
26
pp
29
30
31
Res


Pno.
Ped.
Sam. Pno.
3
pp
ff
mf
32
33
34
35
39
43
46
47
48
49
50
51
52
53
54
55
56
57
EQ
Res
F


30
Pno.
Ped.
Sam. Pno.
EQ
Res


80
Pno.
Ped.
Sam. Pno.
pp
mf
p
Res
87
port.
F
-50
93
EQ


99
Pno.
pp mf
Ped.
98
99
100
101
Sam. Pno.
EQ
Res
105
p
pp mf
pp f
102
103
104
105
106
107
108
109
port.
F
113
f
110
111
112
113
114
115
116

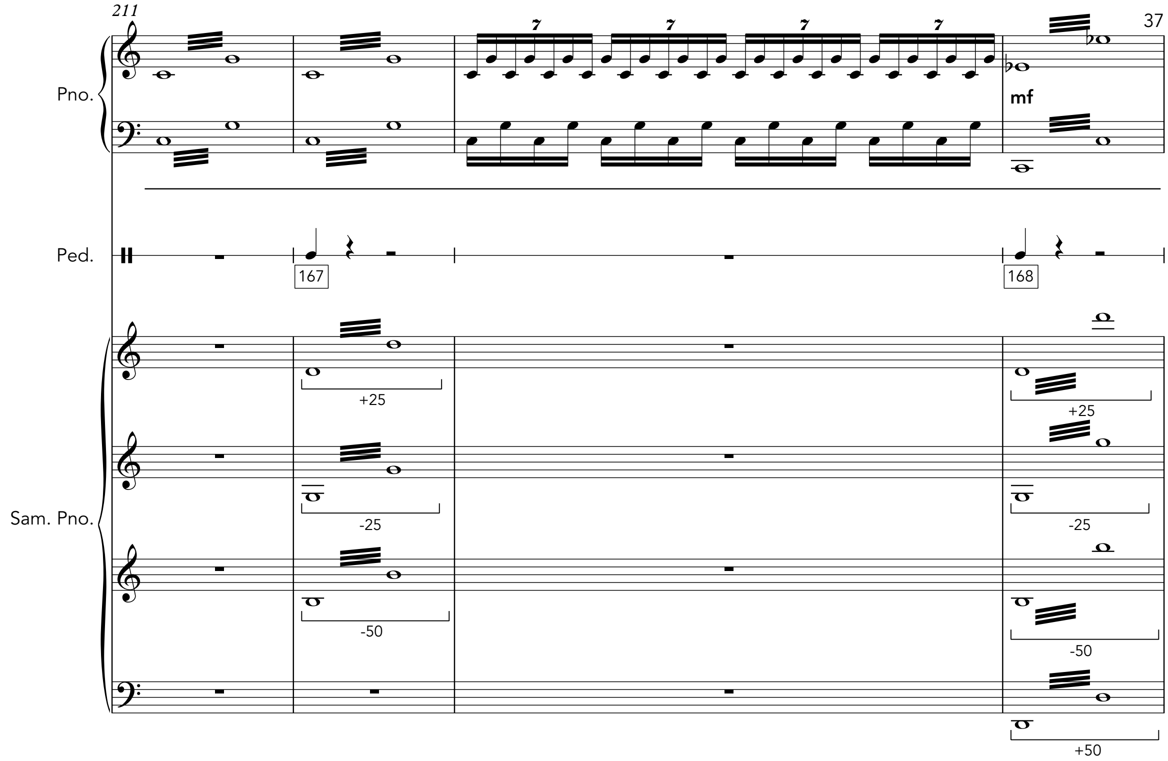

33
121
pp f
Pno.
Ped.
117
118
119
120
121
122
123
-50
Sam. Pno.
130
5
p f
mp
124
125
126
127
128
-50
-25
+25
+50
140
129
130
131
132
133
134
135
136

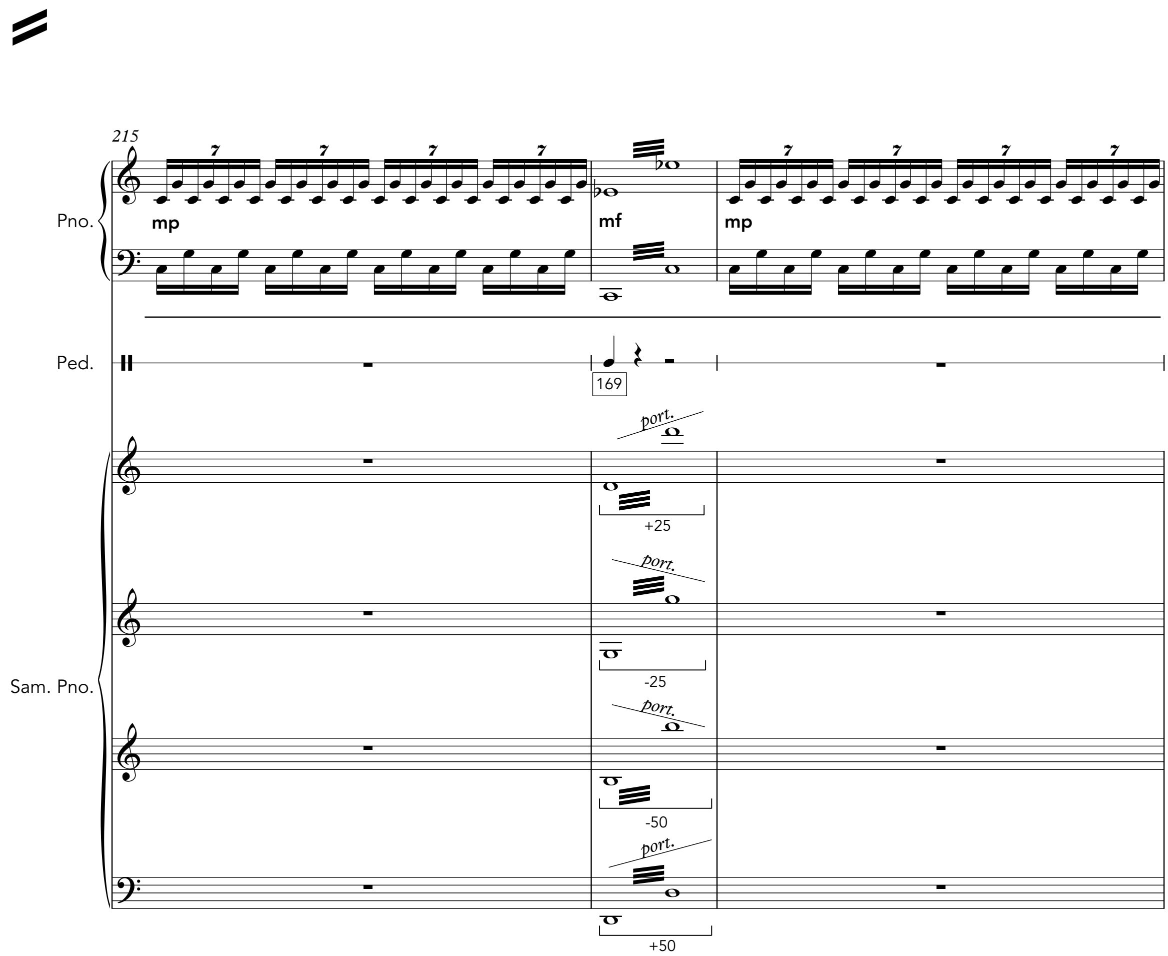

151
Pno.
Ped.
Sam. Pno.
p
mp
137
138
139
140
141
161
142
143
144
145
170
146
147
148

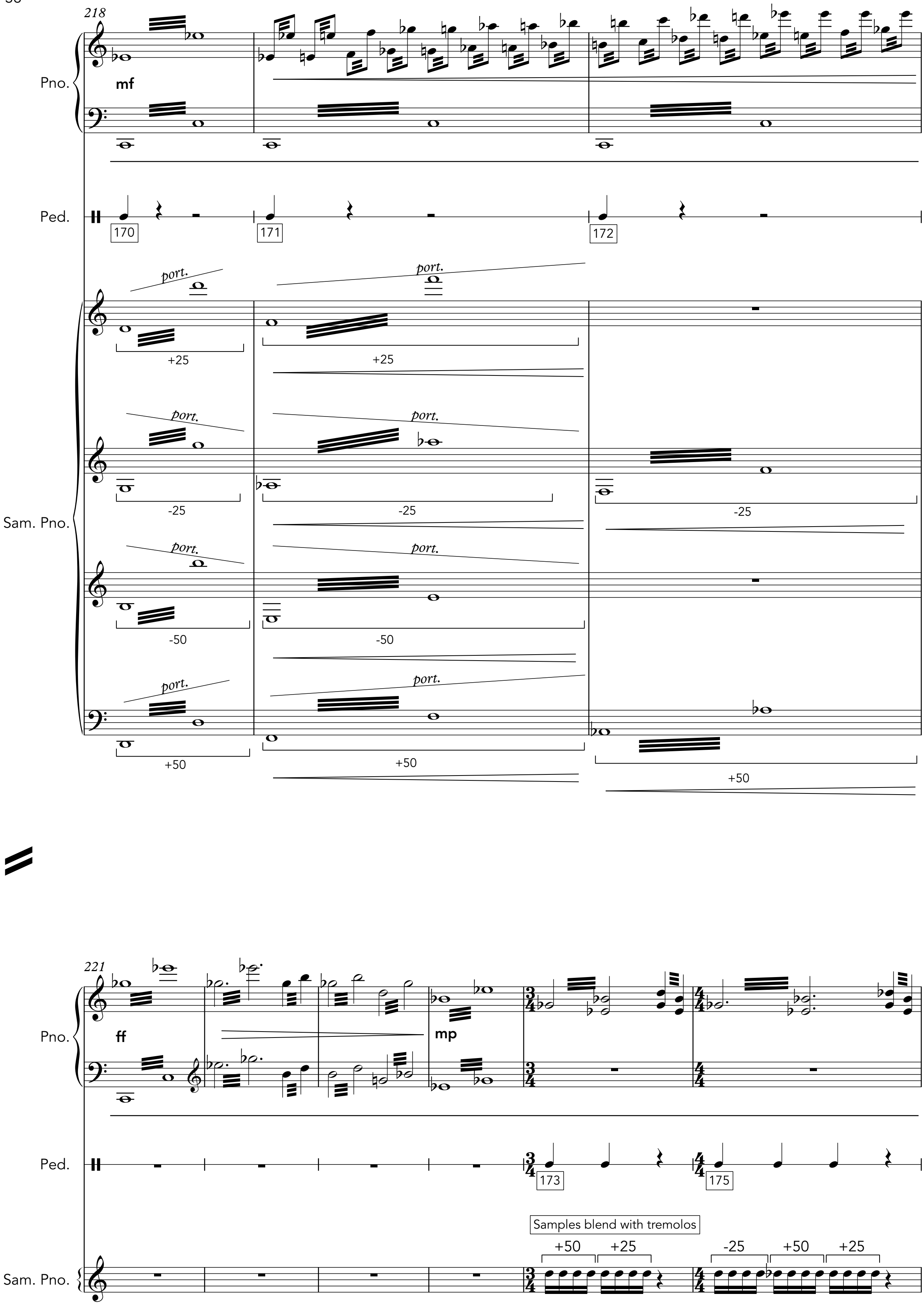

6
♩ = 75
35
180
Pno.
mp
p
Ped.
149
150
-25
Sam. Pno.
port.
191
151
152
153
154
-50
197
155
156
157
158

36


201
Pno.
Ped.
159
160
161
162
163
Sam. Pno.
-50
-25
port.
-50
-25
port.
-50
-25
-50
208
Pno.
Ped.
164
165
166
Sam. Pno.
port.
-25
-50


211
37
Pno.
mf
Ped.
167
168
Sam. Pno.
+25
-25
-50
+50


215
Pno.
mp
mf
mp
Ped.
169
Sam. Pno.
port.
+25
port.
-25
port.
-50
port.
+50


218
Pno.
mf
Ped.
170
171
172
port.
+25
-25
-50
+50
Sam. Pno.
221
ff
mp
173
175
Samples blend with tremolos
+50
+25
-25


39
227
Pno.
Ped.
178
181
184
187
Sam. Pno.
-25 +50 +25
-25 +50 +25
-25 +50 +25
-25 +50 +25
231
Pno.
Ped.
190
193
196
Sam. Pno.
-25 +50 +25
-25 +50 +25
-25 +50 +25 -25
234
Pno.
Ped.
200
204
208
Sam. Pno.
+50 +25 -25 +50
+25 -25 +50 +25

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University of Southampton

Faculty of Humanities

Music

Alias States: Composing (for) Electronically Enhanced Set-ups

Volume 2 of 8

by

Oliver Arthur Ashworth Sellwood

ORCID ID 0000-0003-2674-4481

Thesis for the degree of Doctor of Philosophy

May 2022

Alias States

for piano and electronic drumkit

Olly Sellwood

2019

for Siwan Rhys and George Barton

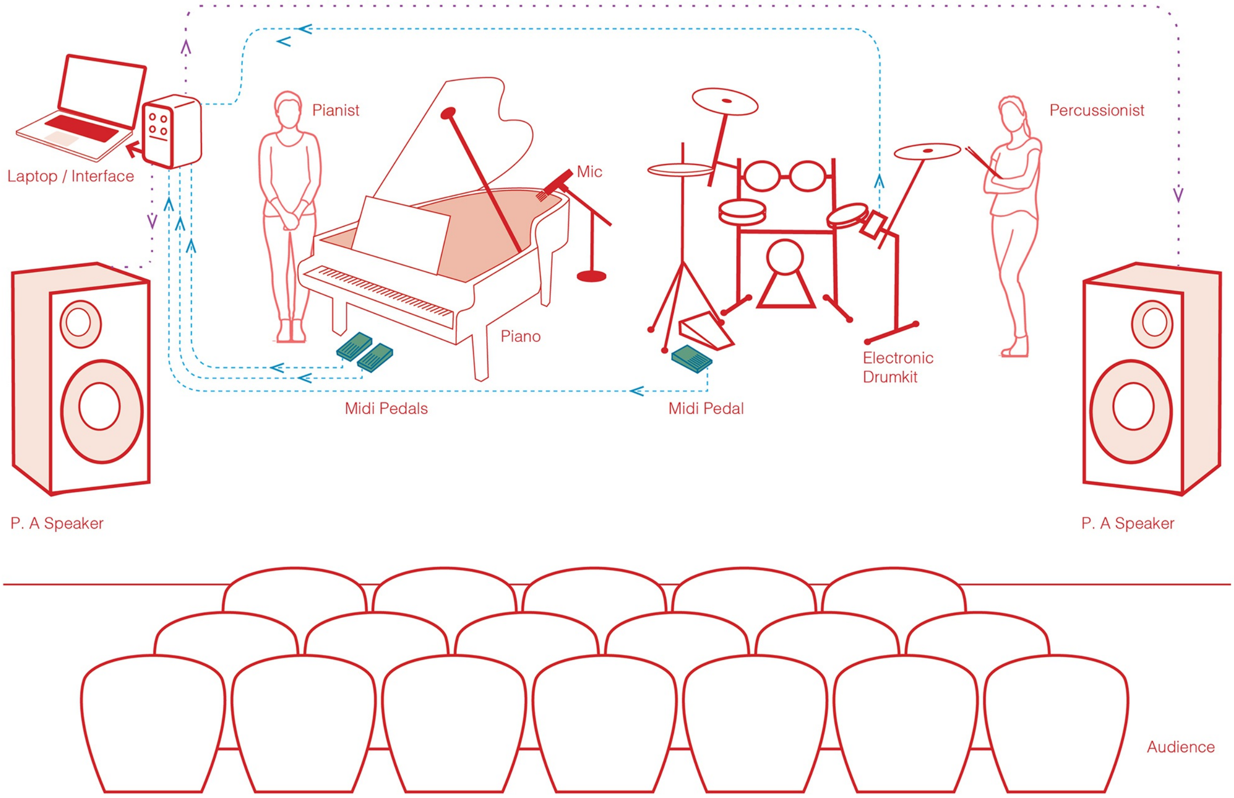
Technical Information

Equipment:

> Grand piano
> Electronic drum kit [kick, snare, hi-hat, hi-hat pedal, two rack toms, floor tom, two crashes]. The rim of the snare must be able to send a separate MIDI note.
> PA system with two speakers
> Laptop running Ableton Live 9 Suite. Patch available here:
https://www.dropbox.com/sh/9uzg3pru19yjkzt/AAC_cOSFpr7sihqC5dJywGM9a?dl=0
> Audio/MIDI interface
> MIDI lead
> 3 Keyboard sustain pedals capable of outputting MIDI data
> Drum sticks
> Microphone for the piano and optional volume pedal

Set-up Information

1) Assemble the electronic drumkit and plug the MIDI cable from the MIDI out of the drum module to the MIDI in of the audio/MIDI interface.
2) Test that Ableton can read the incoming MIDI messages.
3) In Ableton's audio preferences set the buffer size to a suitable setting to avoid any latency.
4) In Ableton, arm all the tracks.
5) Make sure that the outputted MIDI notes from each pad (via the drum module) match with the notes in each drum channel in Ableton. If not change the MIDI notes via the drum module, not Ableton.
6) You may need to adjust the sensitivity and threshold parameters of the pads. Do this via the drum module.
7) Plug the keyboard sustain pedals into the audio interface. This may require a separate interface to convert the data into MIDI data.
8) Plug the output of the audio/MIDI interface into the PA system and adjust the volume between the individual pads, which should be all equal, and then balance the electronic drumkit with the acoustic piano, which should also be equal.

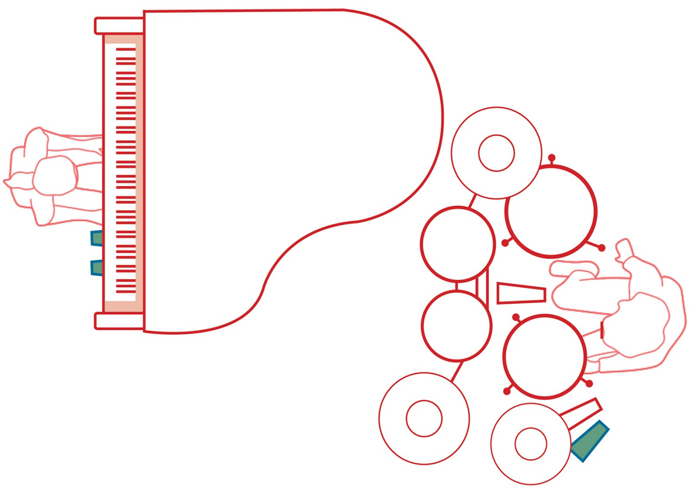


Stage Set-up

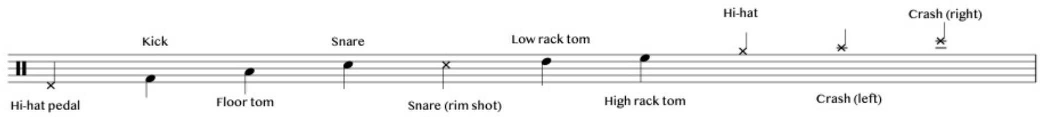
> Place the PA speakers on stands, one either side of the instruments.
> Place a microphone in the piano, this can be set up so a sound engineer adjusts the sound or the pianist can do so through a volume pedal.

> The electronic drum module has a volume dial on it and should be set at 75% at the beginning of the piece, this is then turned up to 100% at Rehearsal Mark 7.

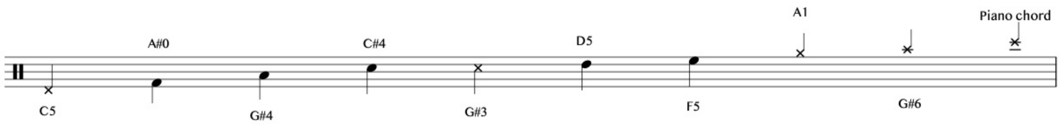
> Open the piano lid fully or remove the lid. Place the laptop behind the piano and out of sight of the audience.



Drum Notation Key



These are the piano notes that are assigned to each electronic drum pad:



Performance Information

The piano player plays the grand piano and activates two arpeggiated notes via the two extra keyboard sustain pedals, which are placed next to the other piano pedals. The first arpeggiator (top line) is on C#4. The second arpeggiator (bottom line) is on E5. Both arpeggiators are velocity sensitive.

The percussionist plays the electronic drumkit and, additionally, a piano sustain pedal. Each drum pad has a piano note assigned to it.
The sustain pedal triggers a longer piano sample.
All of the notes and the sample are velocity sensitive; the harder they are hit (or depressed), the louder the note/sample sounds.


1
♩ = 75 quiet and mechanical
(B)
Piano
Pedals (Pno.)
Electronic Drumkit
mp
mp
mp
5
Pno.
Ped.
E. Dr.
9
Pno.
Ped.
E. Dr.


13
Pno.
Ped.
E. Dr.
Ped.
mp [ped. vol.]
2
17
Pno.
mf
Ped.
mp
p
Ped.
mp
E. Dr.
mp
p


23
loco
Pno.
Ped.
E. Dr.
mf
p
mp
28
(D)
mp
mf
mp
mf
32
(B)
mp
mp
mp
Ped.
mp


37
Pno.
E. Dr.
mf
Ped.
3
With energy
(B)
40
43
46


49
loco
Pno.
E. Dr.
52
f
Ped.
mf
54
4
loco
(B)
pp
Ped. [sempre]
pp


59
Pno.
Ped.
E. Dr.
63
(Gb)
pp
67

*1 All tremolomarks = 32nd notes for the note duration


5
90
(C#)
Pno.
Ped.
E. Dr.
pp
p
f
96
99
mf
Ped.


103
Pno.
Ped.
E. Dr.
loco
(D)
(C)
(A)
(Bb)
(D)
(E)
(C)
107
(C)
6
♩ = 150 [♩ = 𝅗𝅥]
mp
mf
111
mf
mf


116
Pno.
Ped.
mf
mf
p
E. Dr.
p
121
Pno.
Ped.
f
f
f
f
E. Dr.
sim.
f
f
f
f
f
126
Pno.
Ped.
sim.
mp
E. Dr.


133
Increase piano volume slightly
Pno.
ff
Ped.
f
E. Dr.
ff
139
Pno.
Ped.
E. Dr.
142
Pno.
Ped.
E. Dr.


145
Pno.
Ped.
E. Dr.
148
x4
7
Increase volume of the piano in preparation for rehearsal mark 8
x10
Increase the kit to full volume over these ten bars
x4
x10
mf
150
x6
ff
x6


8
Expansive
153
Pno.
E. Dr.
ff
f
Ped.
f
155
Pno.
E. Dr.
157
Pno.
E. Dr.
159
Pno.
E. Dr.


161
Pno.
E. Dr.
Ped.
164
Pno.
Ped.
E. Dr.
167
Pno.
Ped.
E. Dr.


170
Pno.
Ped.
ff
E. Dr.
9
173
Pno.
ff
E. Dr.
ff
Ped.
ff
176
Pno.
E. Dr.


178
Pno.
E. Dr.
180
Pno.
E. Dr.
Ped.
182
Pno.
E. Dr.
185
Pno.
Ped.
E. Dr.

Total duration: c. 10'

University of Southampton

Faculty of Humanities

Music

Alias States: Composing (for) Electronically Enhanced Set-ups

Volume 3 of 8

by

Oliver Arthur Ashworth Sellwood

ORCID ID 0000-0003-2674-4481

Thesis for the degree of Doctor of Philosophy

May 2022

Candela

for violin, electronics and light

Olly Sellwood

2019

for Mira Benjamin

Set-Up Instructions

Equipment

> PA System
> Microphone
> Laptop running Ableton 9 with this patch:
   https://www.dropbox.com/sh/7sqm4o7rf5ydb60/AAD2EeS6R-hBjgqYagRx-Ptaa?dl=0
> Soundcard & leads
> Headphone & extension
> DMX adapter (such as the DMX Entec)
> DMX light & stand
> Digital score reader (such as an iPad or similar)

Place the DMX light directly above the violin player. The beam should be wide enough to just cover the body of the violinist. The house lights should be turned down so that the DMX light is the only light source.

The microphone can be a close mic (attached to the body of the violin) or placed on a microphone stand.

Due to the lighting design, the score should be read from a digital device. This will emit some light and won't affect the intended result.

Ensure that the volume of the tape through the PA system matches the live violin amplified sound. The overall volume should be loud.

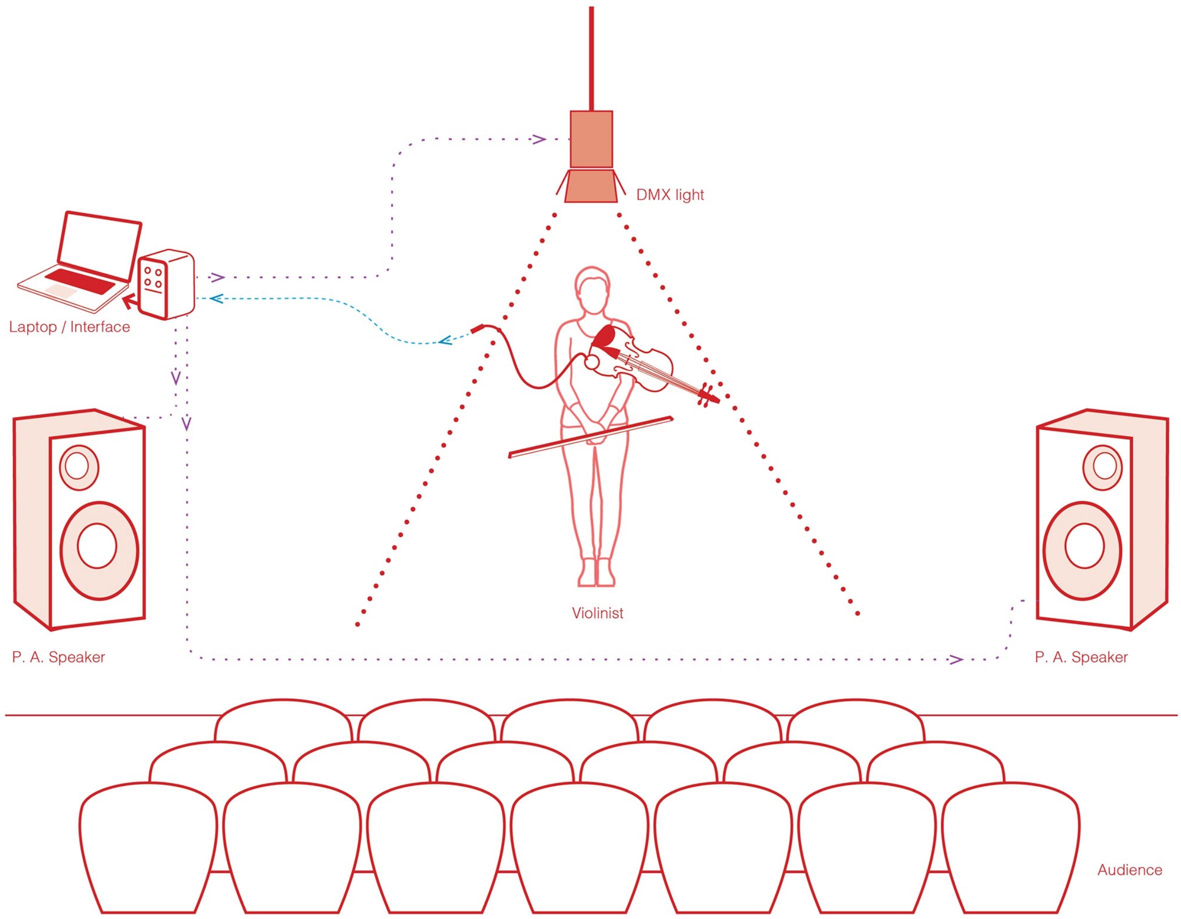
Open up the Ableton file and do the following:

1) Set the computer output to the soundcard you are using. Ensure that the cue output sends the click to the headphones only.
2) In the M4L object for the MIDI Lights channel and the Audio Lights channgel, set the controller to the DMX adapter you are using.

Notation

> st = sul tasto
> sp = sul ponticello
> bat. = battuto con crini (hit with the hair of the bow) with a slight up or down bow
> nat = natural bowing position
> = heavy vibrato

Stage Set-up



Performance Instructions

The electronics and tape part is syncrhonised to the score via a click.
Use in-ear headphones and adjust the volume in Ableton.

*1 use the same strings as indicated here each time this figure appears


57
Vln.
bat.
arco
ff
6
♩ = 100
bat.
arco
s.t.
nat.
+
pizz.
arco
mf
7
From here to bar 115 there's a process to reduce the volume of the louder notes. Notes marked f or ff should be played quieter 2nd time through
65
bat. arco
ff
♩ = 130
(four clicks)
pp p
f
ff
sim.
72
s.p.
p
nat.
mp
pizz.
pp
gliss.
80
8
9
Notes marked mf should be played quieter 2nd time through
87
mf
Snap pizz. dynamics now equal input effort rather than sonic output
10
Notes marked mp should be played quieter 2nd time through
94
11
Notes marked p should be played quieter 2nd time through
101
12
108
13
14
ppp


15
♩ = 60
115
arco
ppp
Vln.
122
129
136
143
150
158
166

Total duration: c. 9'30

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Volume 4 of 8

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Thesis for the degree of Doctor of Philosophy

May 2022

Charlene from Big Data

for voice, accordion, clarinet in Bb, and electronics

Olly Sellwood

2021

for Eva Zöllner and Heather Roche

Set-up Instructions

Equipment:
> laptop running Max/MSP
> this Max patch and samples: https://www.dropbox.com/sh/4gq7lcjafxlnqdh/AAAmpG-jnlBI4YsJX5ndiRFja?dl=0
> soundcard
> two high quality speakers that match the volume of the acoustic insruments and fit under the performers' chairs
> two MIDI footpedals. The footpedals shouldn't make sounds when depressed/released.
> one microphone for the vocalist
> P.A. system

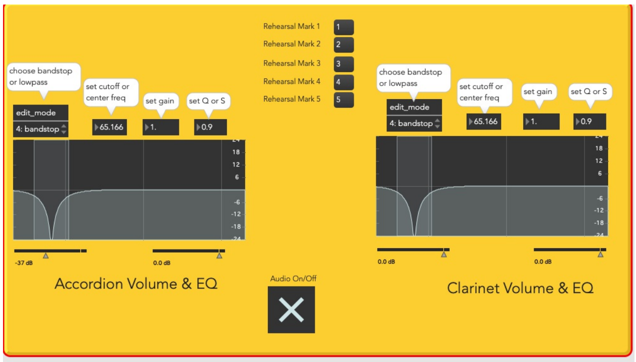
Place the laptop and soundcard out of sight of the audience. Place one speaker under the accordionist's chair and the other under the clarinettist's chair.

<u>Routing</u>

> vocal microphone to laptop
> MIDI footpedals to laptop
> laptop/soundcard to stero speakers

<u>Electronics</u>

> open the Max patch
> set the audio drivers for your soundcard
> switch on the audio
> adjust the volume of the samples so that the first number of samples match the mezzo-piano dynamic over the played clarinet and accordion parts
> if necessary, use the EQ settings to calibrate the sound for the speakers
> the microphone is auto-tuned via Ableton. Open the Ableton file and set the volume of the microphone on the audio interface or P.A. system. The microphone is the only audio routed to the P.A. system.

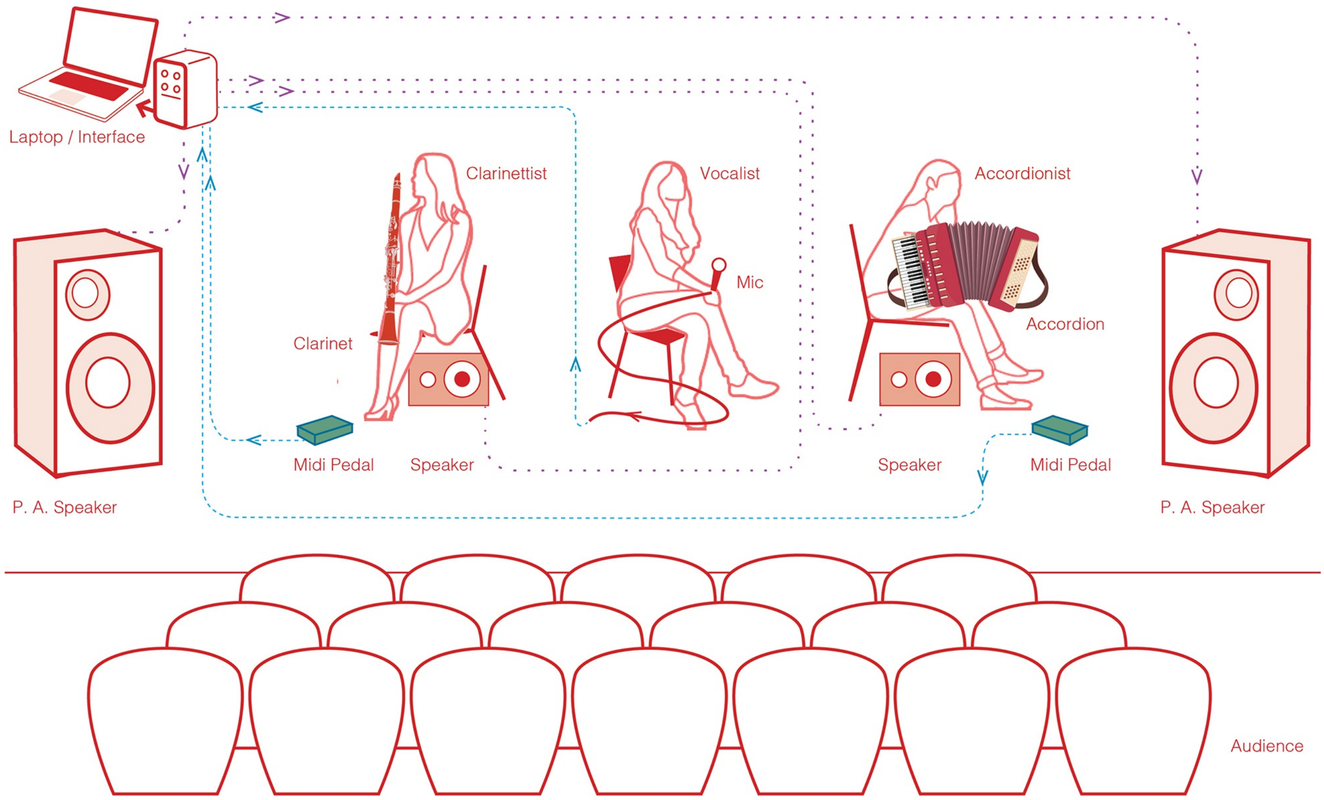


Charlene from Big Data

<u>Samples</u>

> the clarinettist has 107 samples
> the accordionist has 85 samples
> once the MIDI footpedal is depressed, the sample will play in its entirety. The durations of the footpedal markings are not important.

Stage Set-up



Voice

> ideally, the vocal part would be performed by a non-specialist singer. This activates the auto-tune more and adds a less-trained vocal quality.

> the vocal part is a combination of sung and spoken phrases.
> the vocalist may be any gender (transpose into a suitable octave).
> the vocalist is routed through live auto-tune audio processing.
> the vocalist sings the notated pitches in the score and speaks the boxed text.

Text

Original microfiction by Rose Biggin & Keir Cooper

I think everything got out of hand, when the smoothies started getting friendly. My carton of non-dairy milk substitute had a cartoon glass of non-dairy milk substitute with a moustache and three friendly white drops issuing from the top, and a speech bubble that said, *put me in your bones!!!!*

But when things started getting personal I decided I'd had enough. I needed to speak with Big Data, but I didn't know where to begin. I typed "I would like to speak to a Big Data representative" into google, pressed search and hoped it would reach them. Then I held my phone in front of me and said loudly, *I would like to speak to a representative of Big Data please*.

That evening, I received a call from an unknown number.

A voice said, *Hello, this is Charlene from big data. How can I help you today?*

She continued, *Before we proceed any further I will need to ask you a quick security question*.

I said, *You're asking me?*

She said, *Which Showergel do you feel best encapsulates the need for freedom?* I said the first one I could think of and she said, *yes, that's correct, that's what we thought you'd say.*

Now I could explain my situation. I told them I was feeling targeted.

Charlene said, *Thank you very much. Feedback is extremely important.*

Then she said, *Can I call you back if we have any more questions?*

Thank you, I said, but I really don't know when I'll have the time.

She said, *You're mostly free on Wednesdays*, and hung up.

I looked again at the cartoon milk and pondered my unknown future.

Score

Score in C

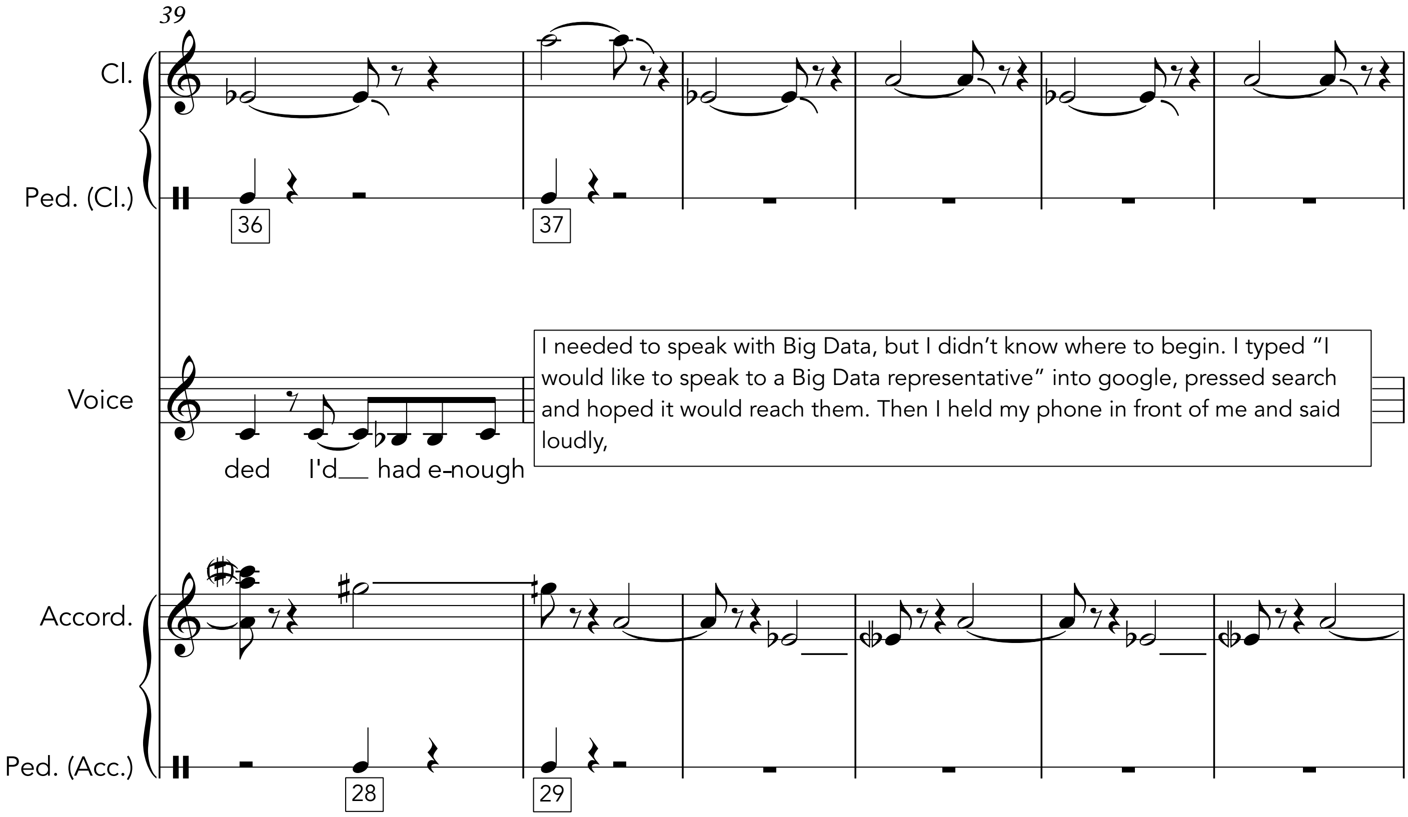

1
♩ = 94
Match volume of samples
Clarinet in B♭
Pedal (Cl.)
Voice
Accordion
Pedal (Accord.)
Cl.
Ped. (Cl.)
Match volume of samples
Accord.
Ped. (Acc.)

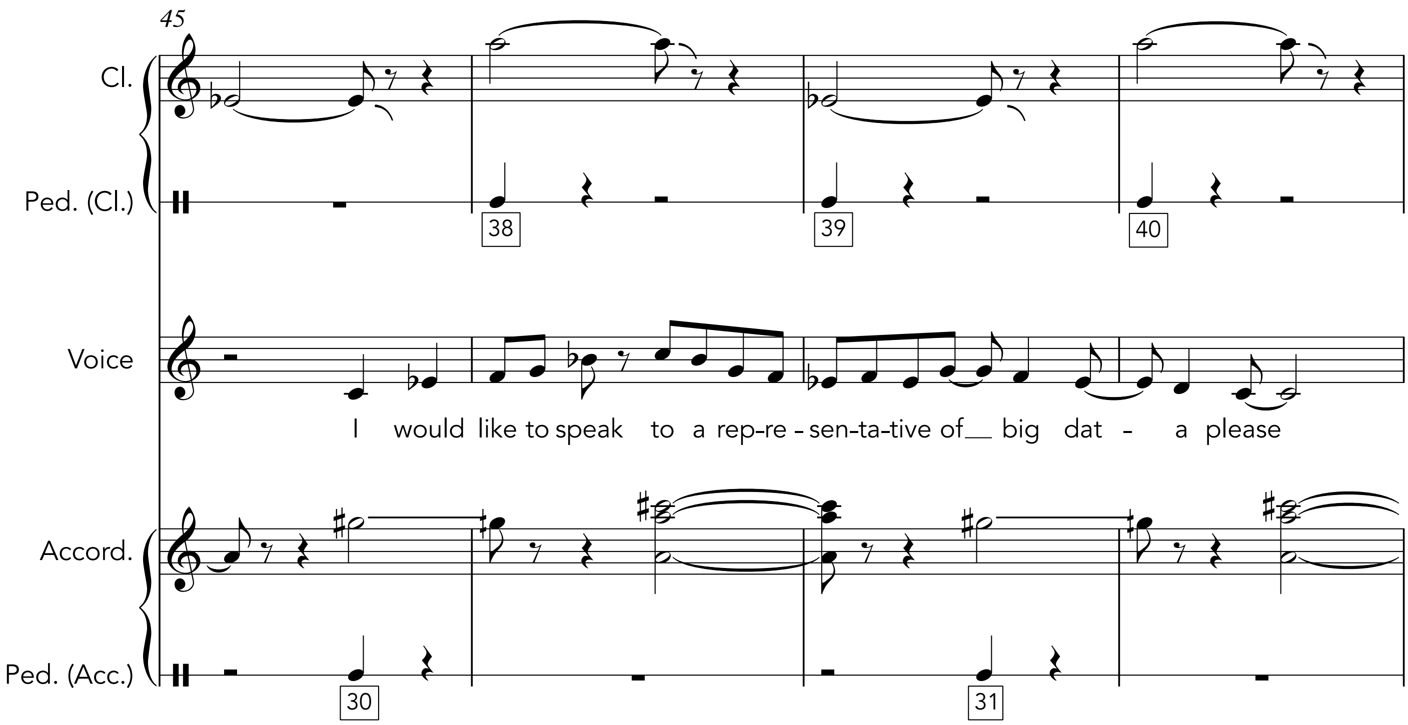

10
Cl.
Ped. (Cl.)
Accord.
Ped. (Acc.)
p
mp
p
mp
p


2
14
Cl.
Ped. (Cl.)
Voice
Accord.
Ped. (Acc.)
p
I think ev-
mf
p


19
Cl.
Ped. (Cl.)
19 20 21 22 23
Voice
ery thing got out of hand When the smooth - ies___ star-ted get-ting frien
Accord.
Ped. (Acc.)
18 19 20
24
Cl.
Ped. (Cl.)
24 25 26 27 28
Voice
dly My car-ton of non dai - ry milk sub-sti-tute had a car-toon
Accord.
Ped. (Acc.)
21 22


29
Cl.
Ped. (Cl.)
29
30
Voice
glass of non-diary milk sub-sti-tute
with a moustache and three friendly white drops
issuing from the top, and a speech bubble that said,
Put me
Accord.
Ped. (Acc.)
23
24
25
34
31
32
33
34
35
in your bones But when__ things star-ted get-ting per-son-al I de-ci
26
27


39
Cl.
Ped. (Cl.)
36
37
Voice
ded I'd__ had e-nough
I needed to speak with Big Data, but I didn't know where to begin. I typed "I would like to speak to a Big Data representative" into google, pressed search and hoped it would reach them. Then I held my phone in front of me and said loudly,
Accord.
Ped. (Acc.)
28
29

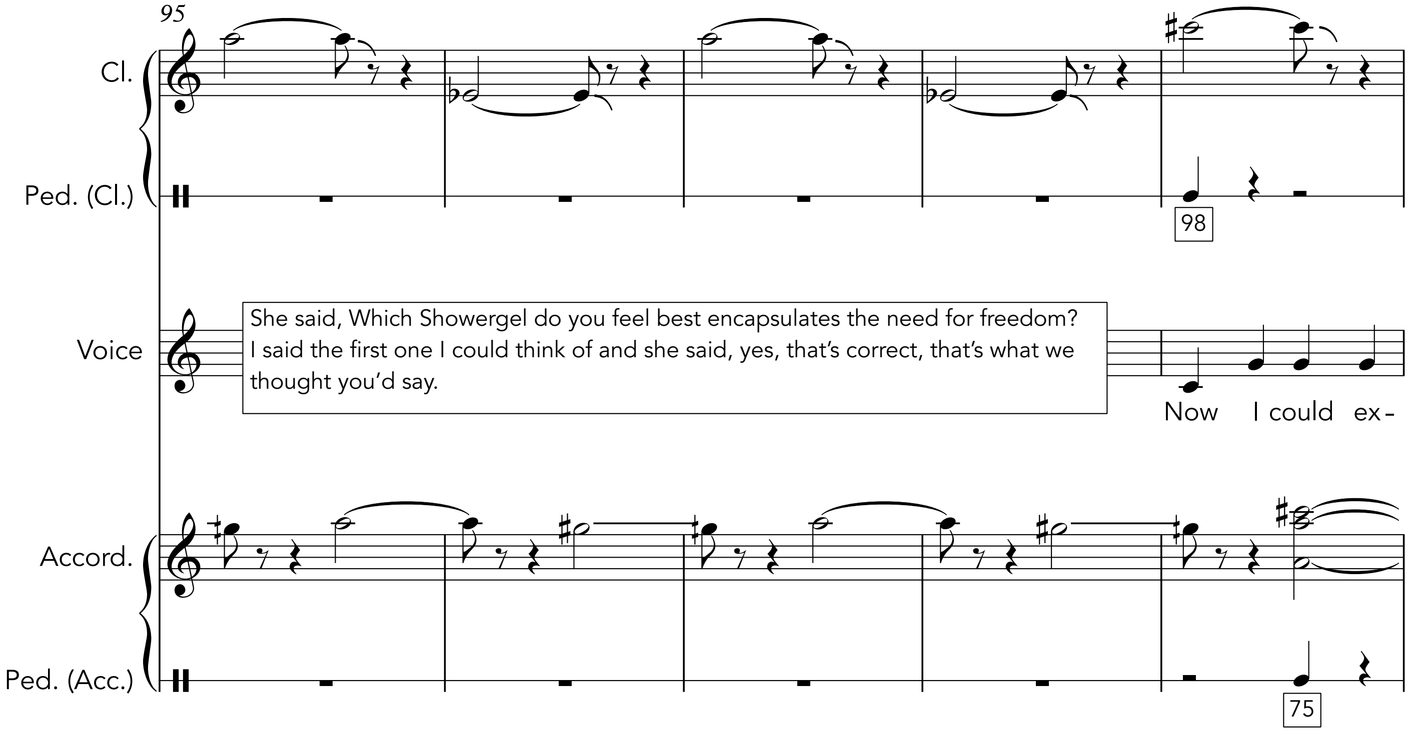

45
Cl.
Ped. (Cl.)
38
39
40
Voice
I would like to speak to a rep-re-sen-ta-tive of__ big dat - a please
Accord.
Ped. (Acc.)
30
31


49
Stop note at the word 'from'
3
Pause until reverb tail has ended
sim.
Cl.
mf
Ped. (Cl.)
41
42
Voice
That evening, I received a call from an unknown number
Stop note at the word 'from'
Pause until reverb tail has ended
sim.
Accord.
mf
Ped. (Acc.)
32
33
34
55
4
Cl.
mp
Ped. (Cl.)
43
44
45
Accord.
Ped. (Acc.)
35
36
37


61
Cl.
Ped. (Cl.)
Accord.
Ped. (Acc.)
mp
47
49
51
53
39
41
42
44
65
55
57
59
61
47
48
49
69
63
65
66
68
51


73
Cl.
Ped. (Cl.)
mp
70
72
74
76
Accord.
Ped. (Acc.)
53
55
56
58
77
78
80
82
84
61
63
65
81
86
88
89


5
85
Cl.
p
Ped. (Cl.)
91
92
93
94
95
Voice
A voice said, He - llo this is Char- lene from big dat - a How can
mf
Accord.
p
Ped. (Acc.)
66
68
69
70
71
90
Cl.
Ped. (Cl.)
96
97
Voice
I help you to - day?
She continued, Before we proceed any further I will need to ask you a quick security question.
I said, You're asking me?
Accord.
Ped. (Acc.)
72
73
74


95
Cl.
Ped. (Cl.)
98
Voice
She said, Which Showergel do you feel best encapsulates the need for freedom? I said the first one I could think of and she said, yes, that's correct, that's what we thought you'd say.
Now I could ex-
Accord.
Ped. (Acc.)
75


100
Cl.
Ped. (Cl.)
99
100
101
102
Voice
plain my sit-u-a-tion I told them I was fee-ling tar-ge-ted
Accord.
Ped. (Acc.)
76
77
78
79

Total duration: c. 5'15

University of Southampton

Faculty of Humanities

Music

Alias States: Composing (for) Electronically Enhanced Set-ups

Volume 5 of 8

by

Oliver Arthur Ashworth Sellwood

ORCID ID 0000-0003-2674-4481

Thesis for the degree of Doctor of Philosophy

May 2022

Mikrophonie III

for percussion trio

Olly Sellwood
2018

for line upon line

Percussion Items

The piece is written for three performers: the splash cymbal performer (s.c.p.), the ride cymbal performer (r.c.p.), and the MIDI drum pad/snare drum performer (m.d.p.).

S.c.p. needs a soft mallet, metal brushes, a drum stick, two soft beaters, and a cloth.

R.c.p. needs metal brushes, a drum stick, two soft beaters, and a cloth.

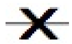
M.d.p. needs two drum sticks and two sections of coarse sandpaper.

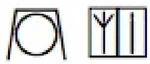
Key

Walk towards the instrument that you are next scored to play. This should take the length of time the arrow indicates:

Pick up microphone and walk towards the cymbal, pointing the microphone at the cymbal as you walk:

At this point the microphone should be close to the cymbal without inhibiting its movement:

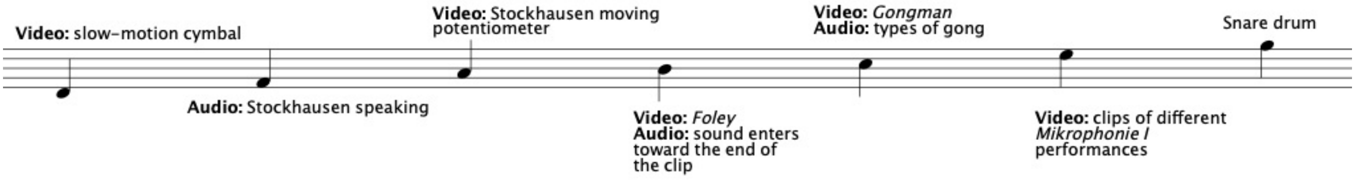


Lightly agitate the cymbal with both brush and stick: 

Switch on the microphone by depressing the MIDI footswitch and move the microphone near the ride capturing its resonance.
Move the microphone from side to side and from close to far to change the sound of the resonance: 

Swing the soft mallet at the splash for the length of time indicated by the arrow in the same style as the gongman video clip: 

MIDI Drum Pad Performer Score Key



Equipment

> 1 splash cymbal, suspended between two cymbal stands using string (imitating the set up of the tam-tam in Stockhausen's *Mikrophonie I*)
> 1 ride cymbal, set up similarly
> 1 snare drum
> MIDI drum pad with at least seven pads, stand and USB A -> USB B lead. [The MIDI drum pad may need to be configured so that each pad sends out only one MIDI message, regardless of the dynamic it is struck.]
> a laptop running Max/MSP with an audio soundcard that has three inputs and a stereo output
> this Max/MSP patch and related content: https://www.dropbox.com/sh/eugni3xhyzc01ex/AAC8pcIEcuRTbeX_w9KR1HWqa?dl=0
> a projector and lead
> a stereo PA system
> two hand-held switches that send MIDI data
> two SM57 microphones (or similar). One is just a prop and does not need to be plugged into the soundcard.
> a footswitch to switch the SM57 on or off
> USB camera

Max/MSP Set-up

The Max/MSP patch needs to be configured before use.

Step 1: Open the patch and plug in the MIDI drum pad. When you hit the different pads a number will appear in the box marked 'pitch' at the top right-hand side of the patch. Make a note of each number for each pad. Double-click on the box that says 'p drumpad', another window should open. Unlock the Max patch and find the box that is called 'select 61'. Change the number '61' for the pad that you want to correspond to the gongman video. Repeat this process so that all pads are assigned to the right sample and/or video clip. There is one further 'select' you need to change in the 'p hocket' window.'

Step 2: Place one switch behind the ride and one behind the splash. They should be out of sight of the audience and within easy reach. When clicked, the switch
will play a sample.

Step 3: Plug a MIDI control pedal into the computer. Once depressed microphone 3 should be active. Open up the 'p dance' window and see where it says 'change mic sensitivity'. The louder the volume into the microphone, the clearer the video. You want the loudest sounds to produce a clear image but lower volumes should produce a ghostly image.

Step 4: Adjust the volumes of all the clips. Generally, all sounds should be of a similar volume. If you need to change the volume of the cymbal samples then there are two faders in the main window that can be adjusted and two in the 'p dance' window.

Step 5: Make sure the the floating window that shows the video clips is the only thing displayed by the projector. This may involve making some changes to the settings of the laptop.

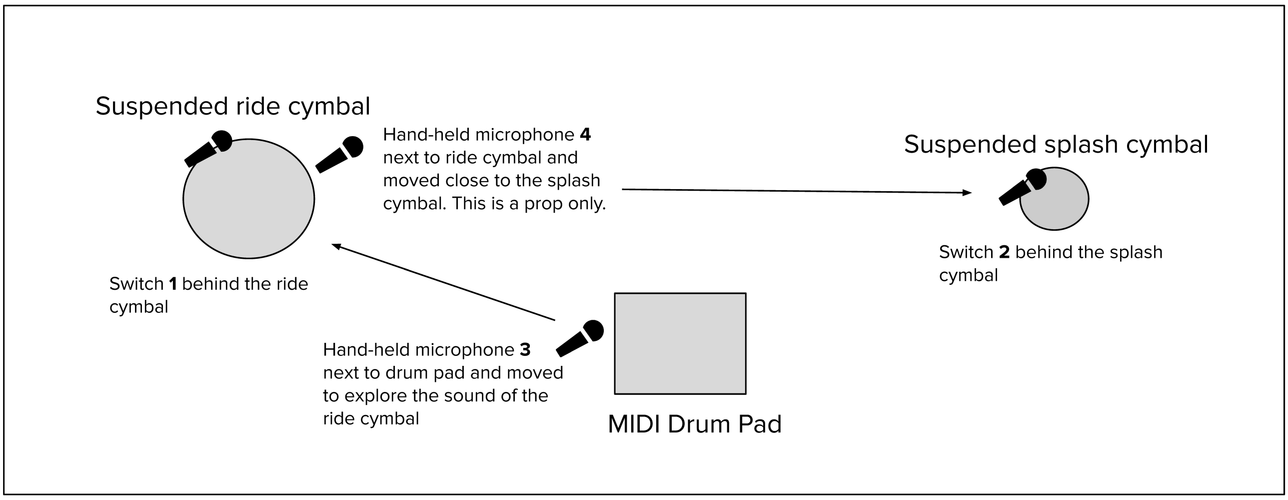
Step 6: Set the webcam option to the USB camera. If you test it before performance, ensure that you press the '0' next to the 'jit.matrix' box to clear the screen. The USB camera will turn on when you hit the pad that triggers the slowed-down cymbal hit

Performance Instructions

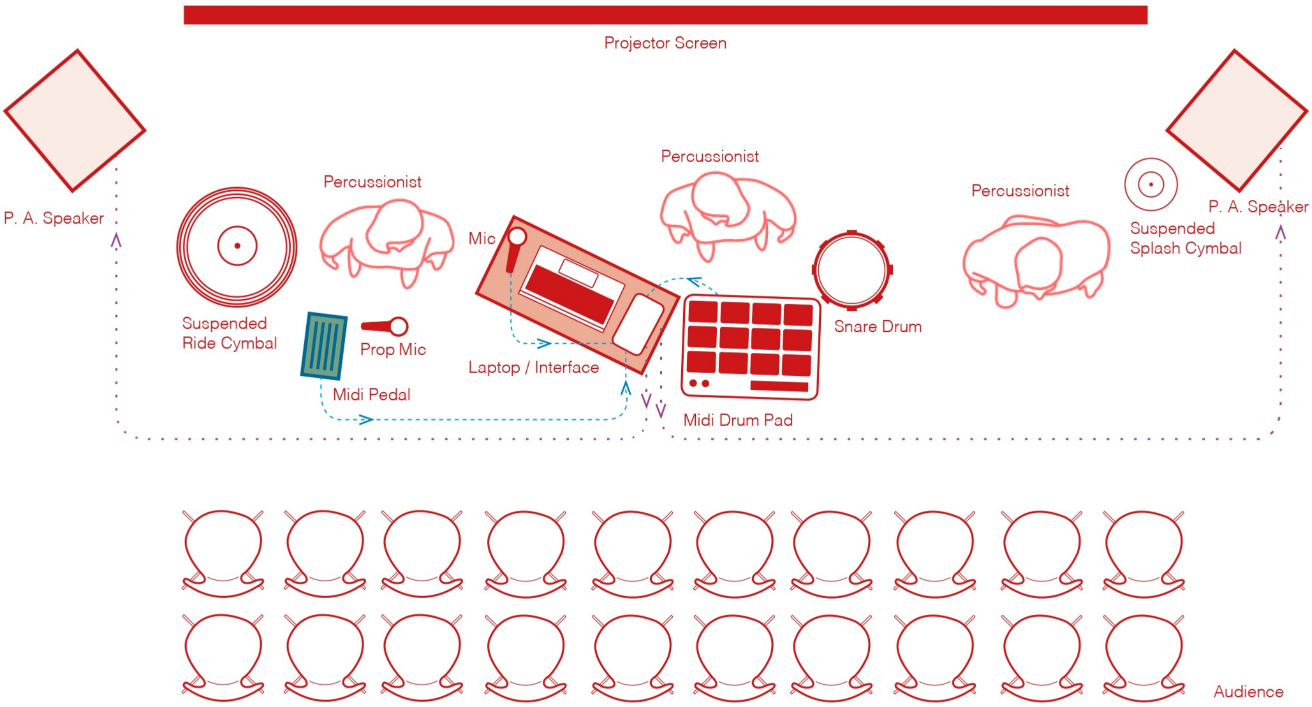
> M.d.p.: the opening snare roll at the beginning of rehearsal marks 2, 3, 6, 7, & 8 is roughly timed so that the recorded gong sound should occur at the end of the roll. Please adjust the length of the roll to account for any discrepancies.

Microphone Plan

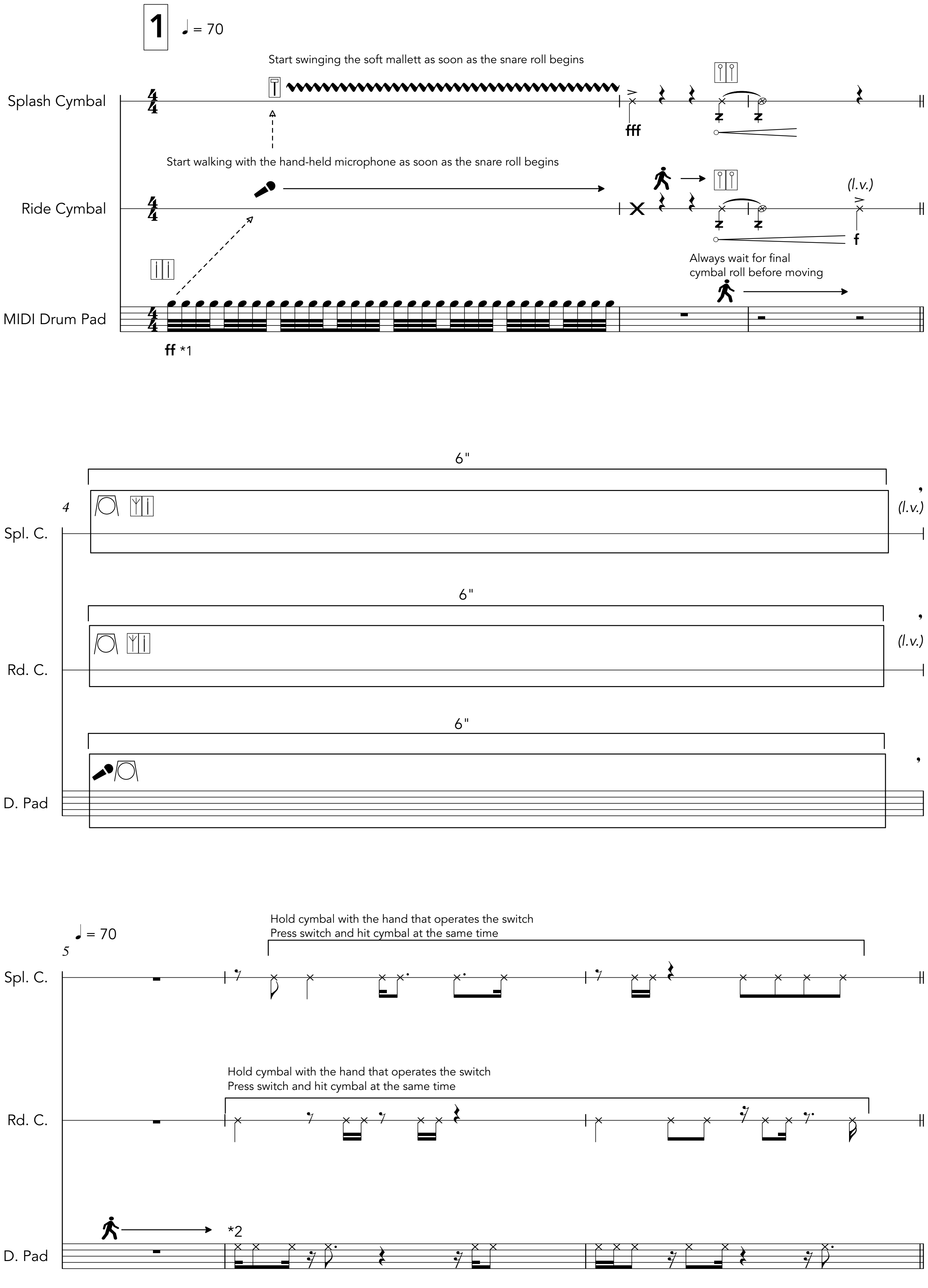
The piece requires the performers to move to different parts of the stage with microphones. The plan for this is outlined below. Movements across the stage should be uninhibited by the positioning of equipment.



Stage Set-up

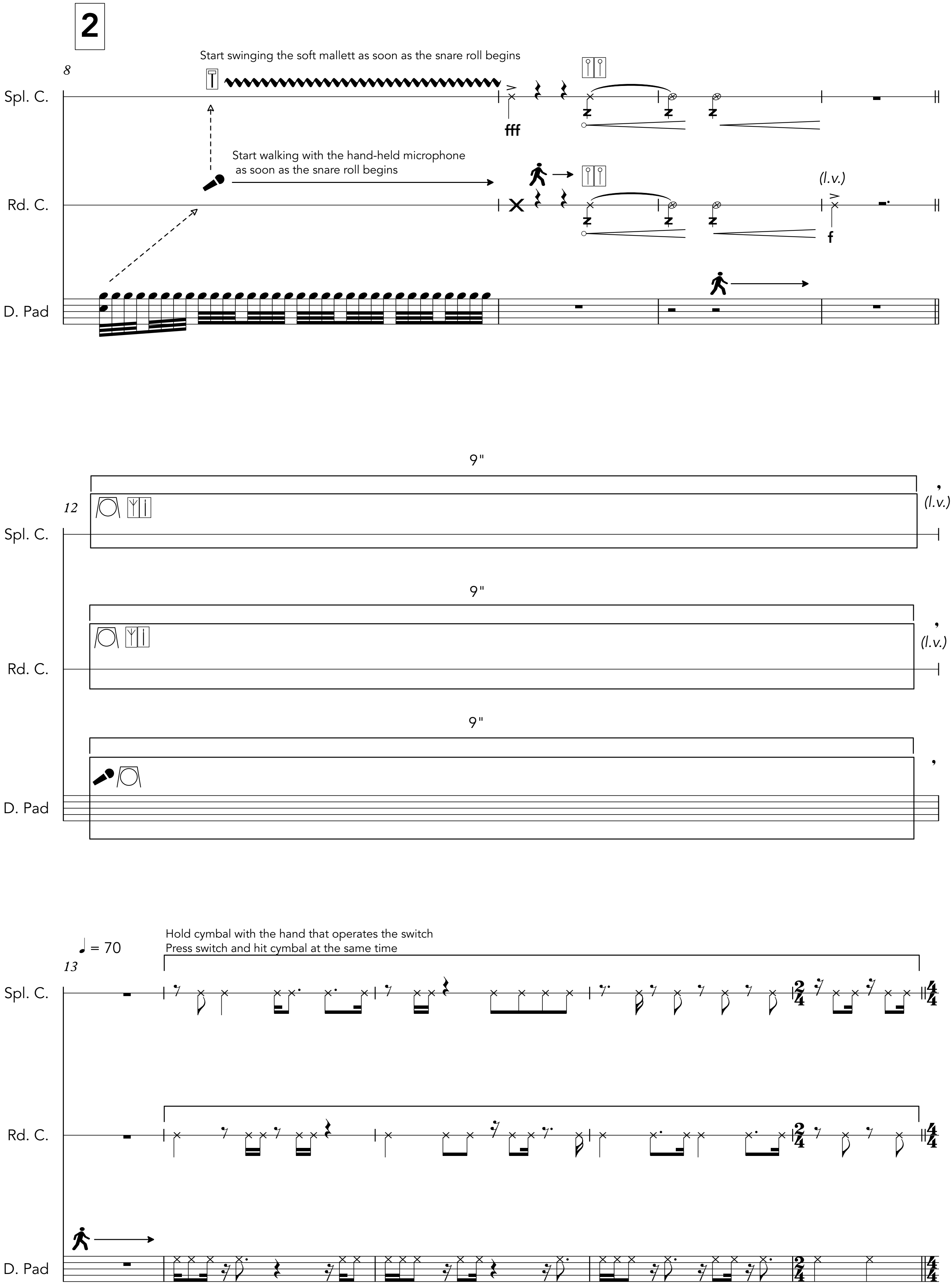


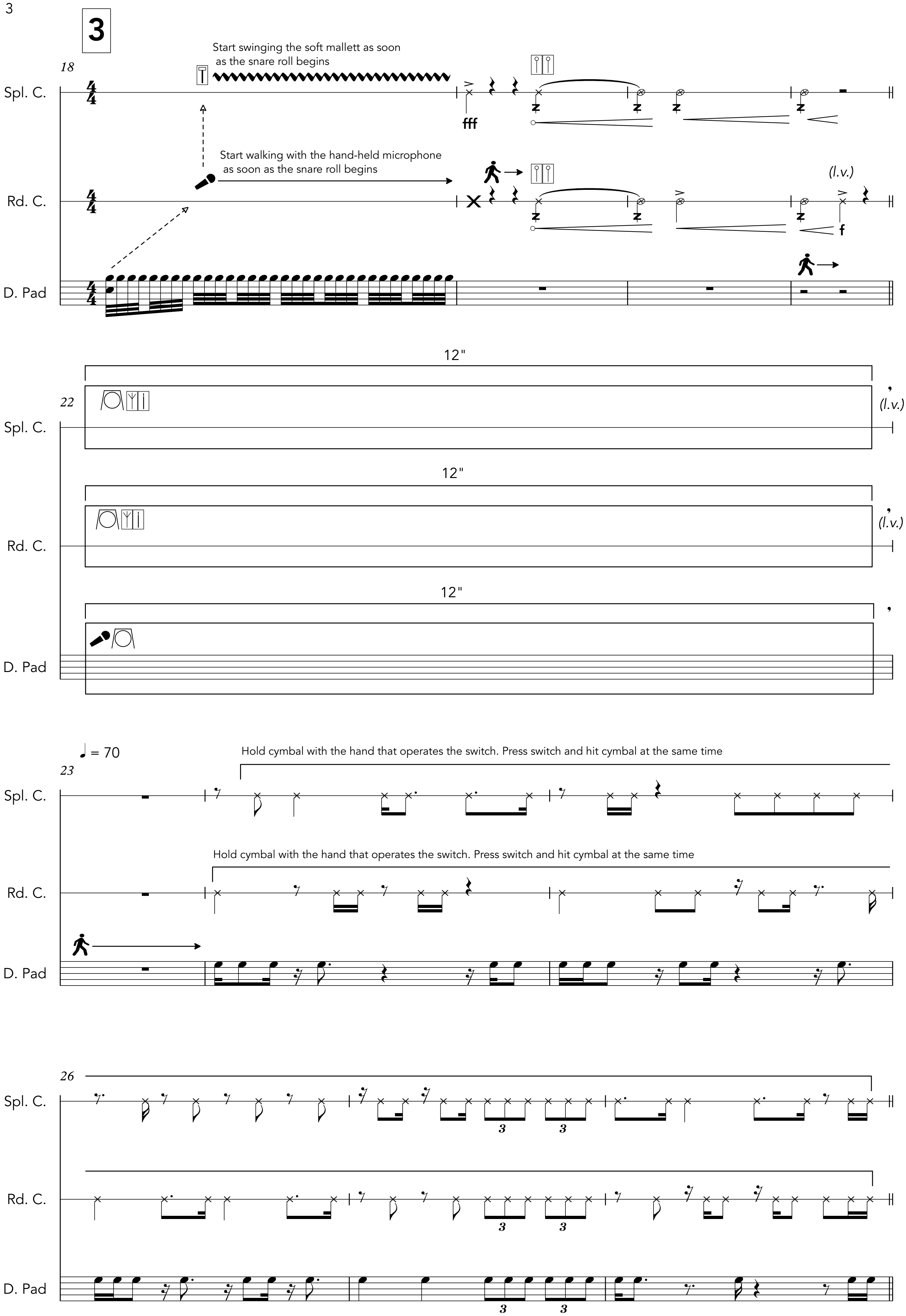
Projector Screen
P. A. Speaker
Percussionist
Percussionist
Percussionist
P. A. Speaker
Suspended
Splash Cymbal
Mic
Suspended
Ride Cymbal
Prop Mic
Midi Pedal
Laptop / Interface
Snare Drum
Midi Drum Pad
Audience



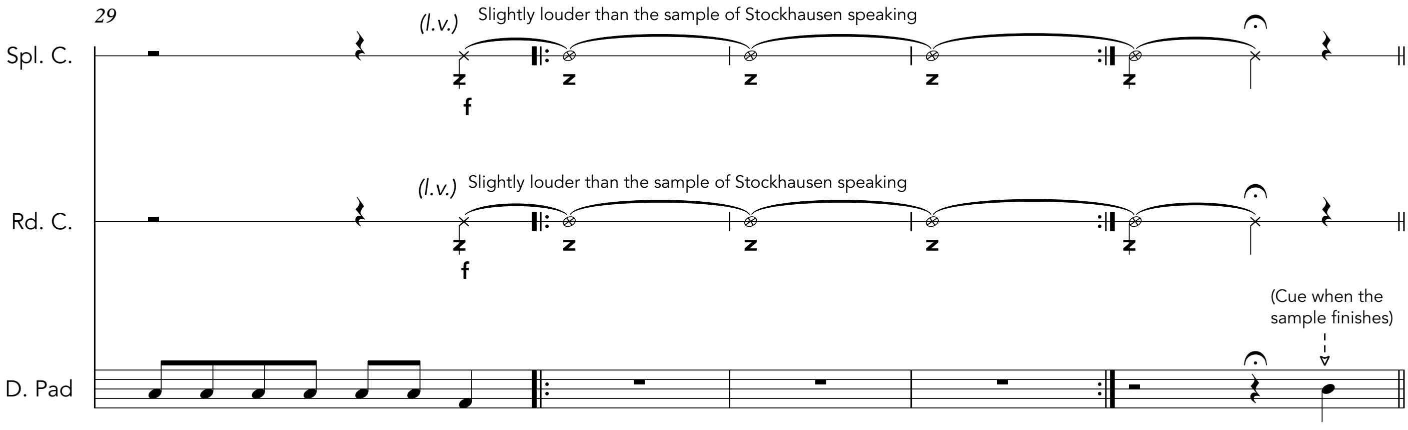
*1 Snare roll should always be **ff**

*2 Hit a pad that doesn't have a sample assigned to it

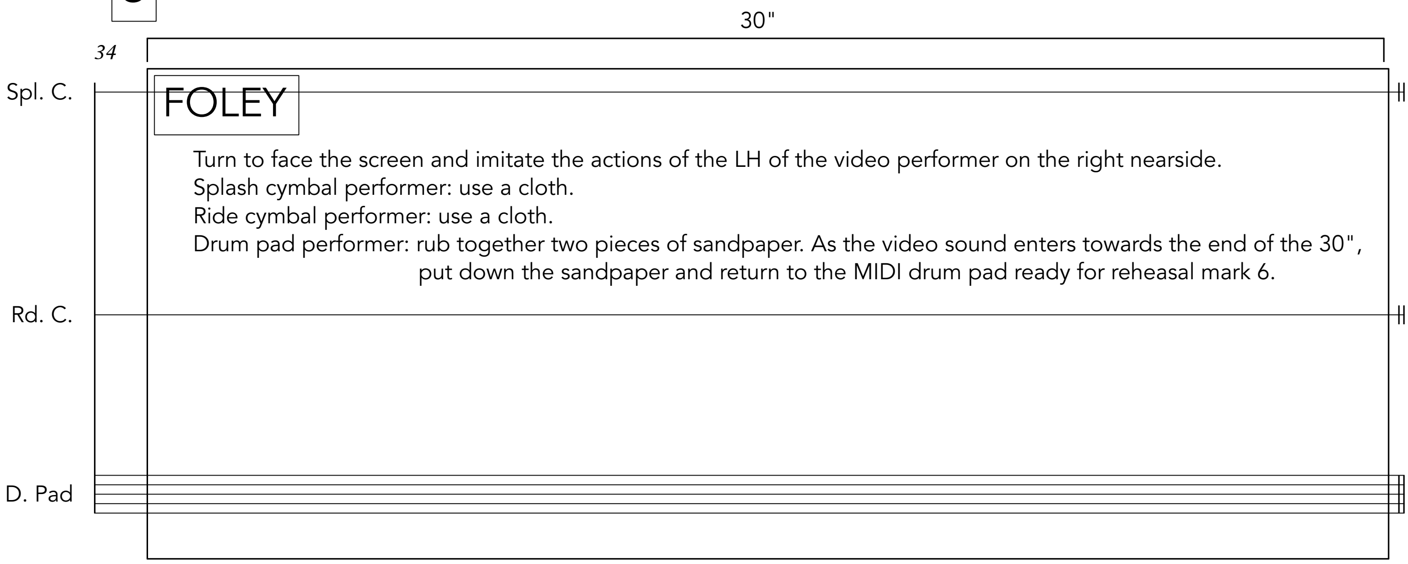

2
8
Start swinging the soft mallett as soon as the snare roll begins
Spl. C.
fff
Start walking with the hand-held microphone
as soon as the snare roll begins
(l.v.)
Rd. C.
f
D. Pad
9"
12
(l.v.)
Spl. C.
9"
(l.v.)
Rd. C.
9"
D. Pad
♩ = 70
13
Hold cymbal with the hand that operates the switch
Press switch and hit cymbal at the same time
Spl. C.
2/4
4/4
Rd. C.
2/4
4/4
D. Pad
2/4
4/4


3
18
Start swinging the soft mallett as soon
as the snare roll begins
Start walking with the hand-held microphone
as soon as the snare roll begins
fff
(l.v.)
f
Spl. C.
Rd. C.
D. Pad
22
12"
(l.v.)
23
♩ = 70
Hold cymbal with the hand that operates the switch. Press switch and hit cymbal at the same time
26

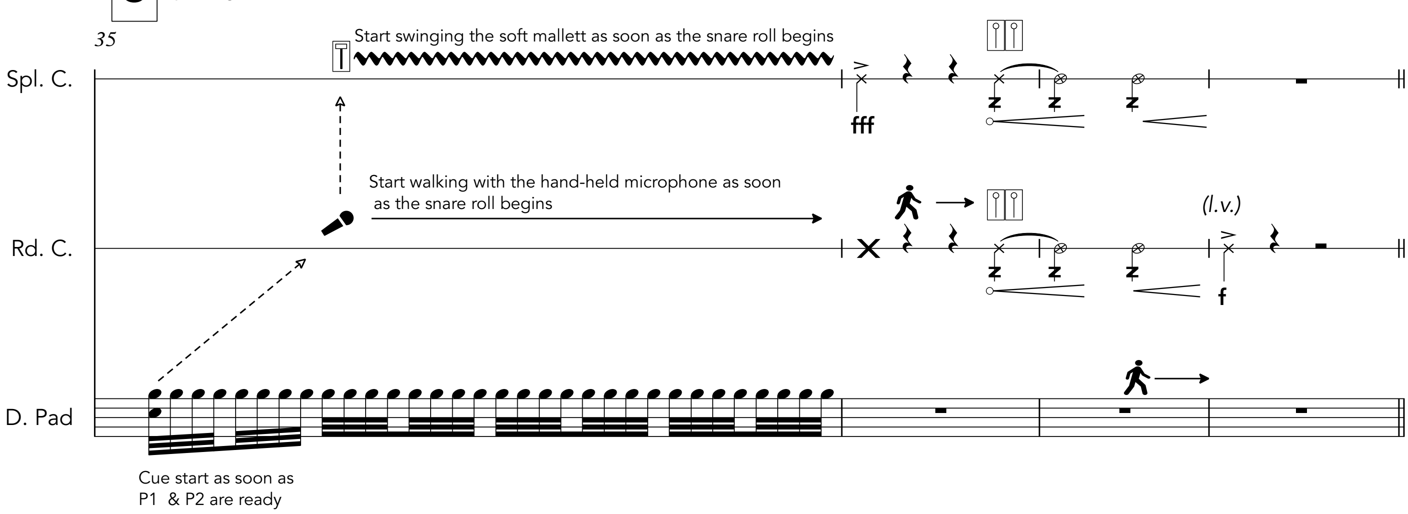
4

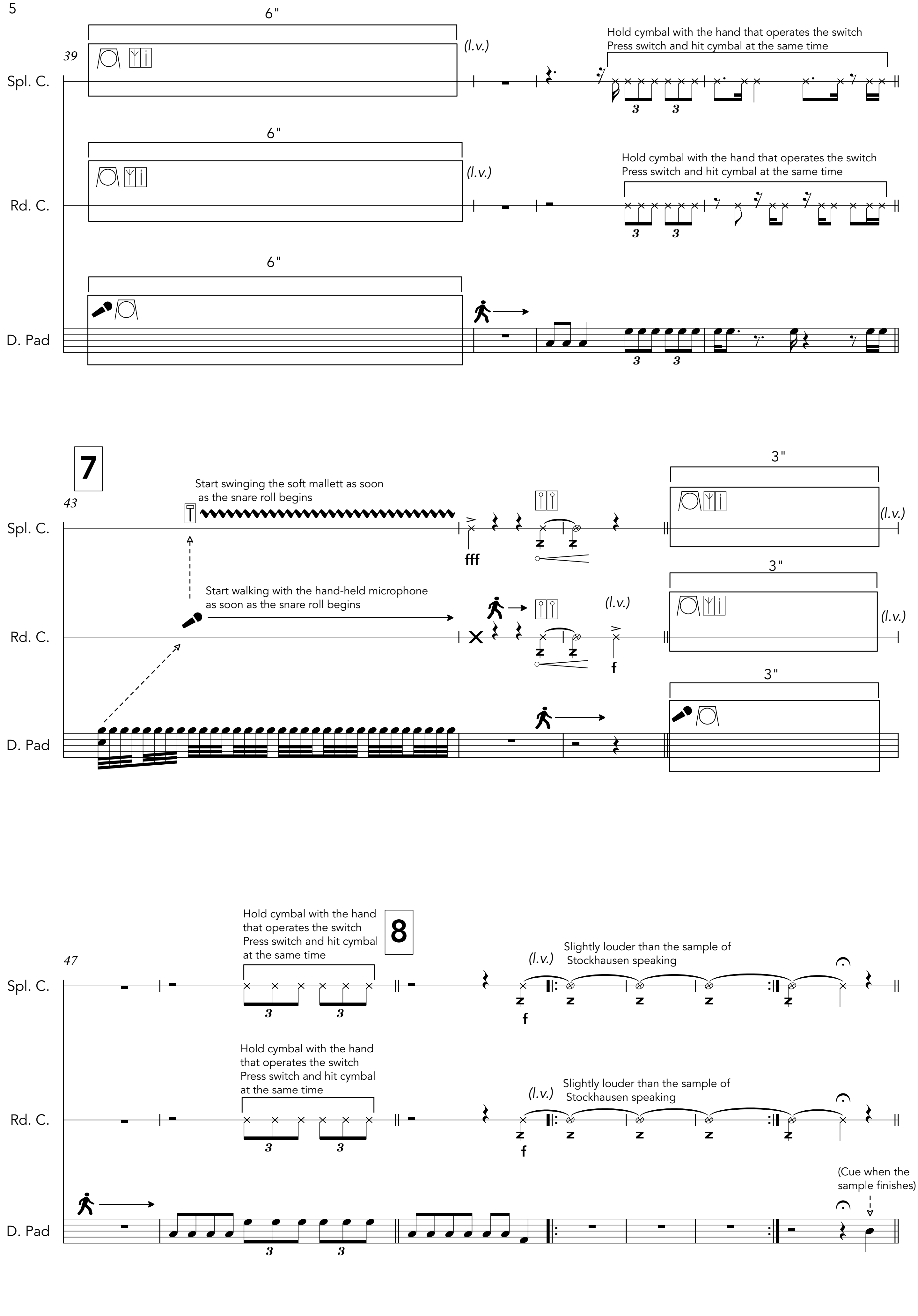

29
Spl. C.
(l.v.)
Slightly louder than the sample of Stockhausen speaking
f
Rd. C.
(l.v.)
Slightly louder than the sample of Stockhausen speaking
f
(Cue when the
sample finishes)
D. Pad

5

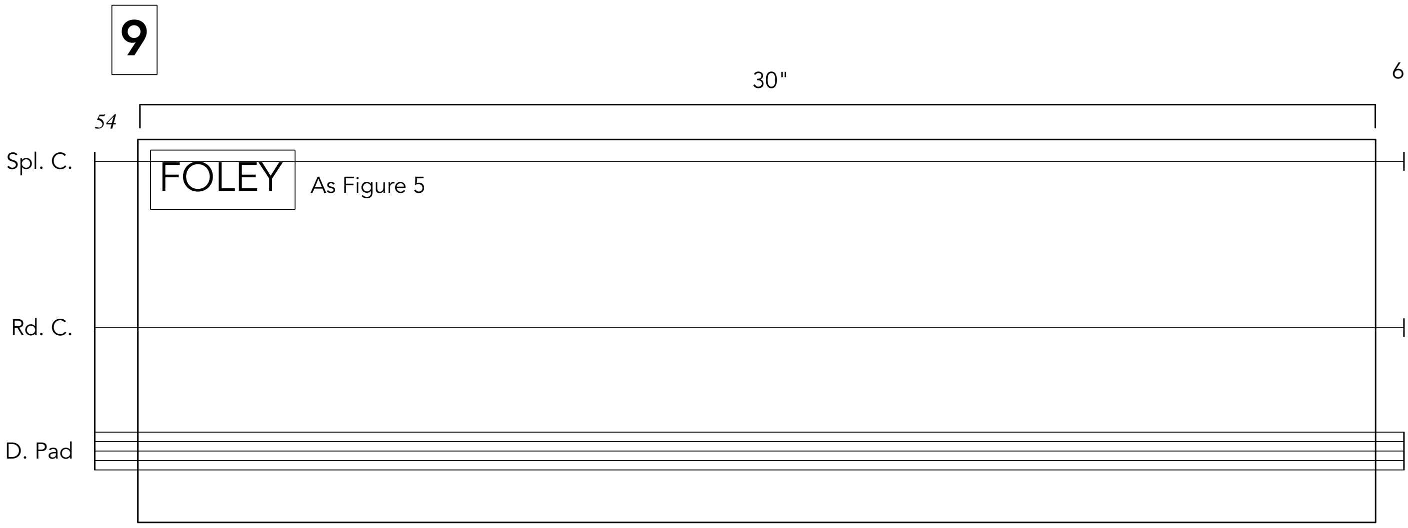

30"
34
Spl. C.
FOLEY
Turn to face the screen and imitate the actions of the LH of the video performer on the right nearside.
Splash cymbal performer: use a cloth.
Ride cymbal performer: use a cloth.
Drum pad performer: rub together two pieces of sandpaper. As the video sound enters towards the end of the 30", put down the sandpaper and return to the MIDI drum pad ready for reheasal mark 6.
Rd. C.
D. Pad

6

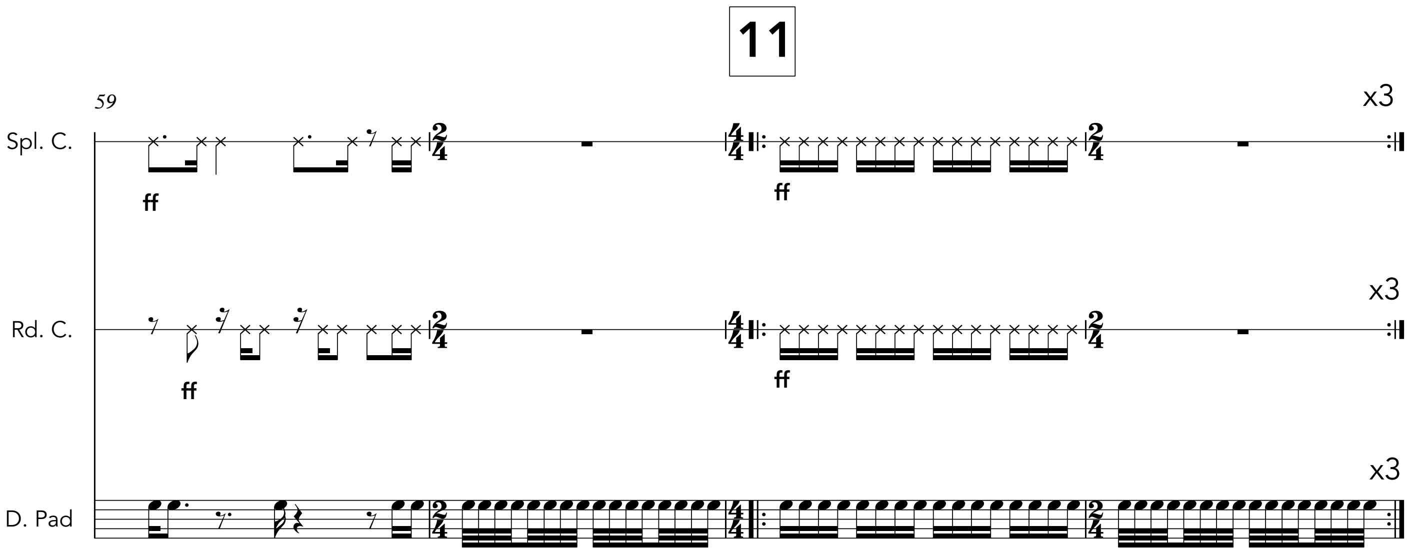

♩ = 70
35
Spl. C.
Start swinging the soft mallett as soon as the snare roll begins
fff
Rd. C.
Start walking with the hand-held microphone as soon
as the snare roll begins
(l.v.)
f
D. Pad
Cue start as soon as
P1 & P2 are ready

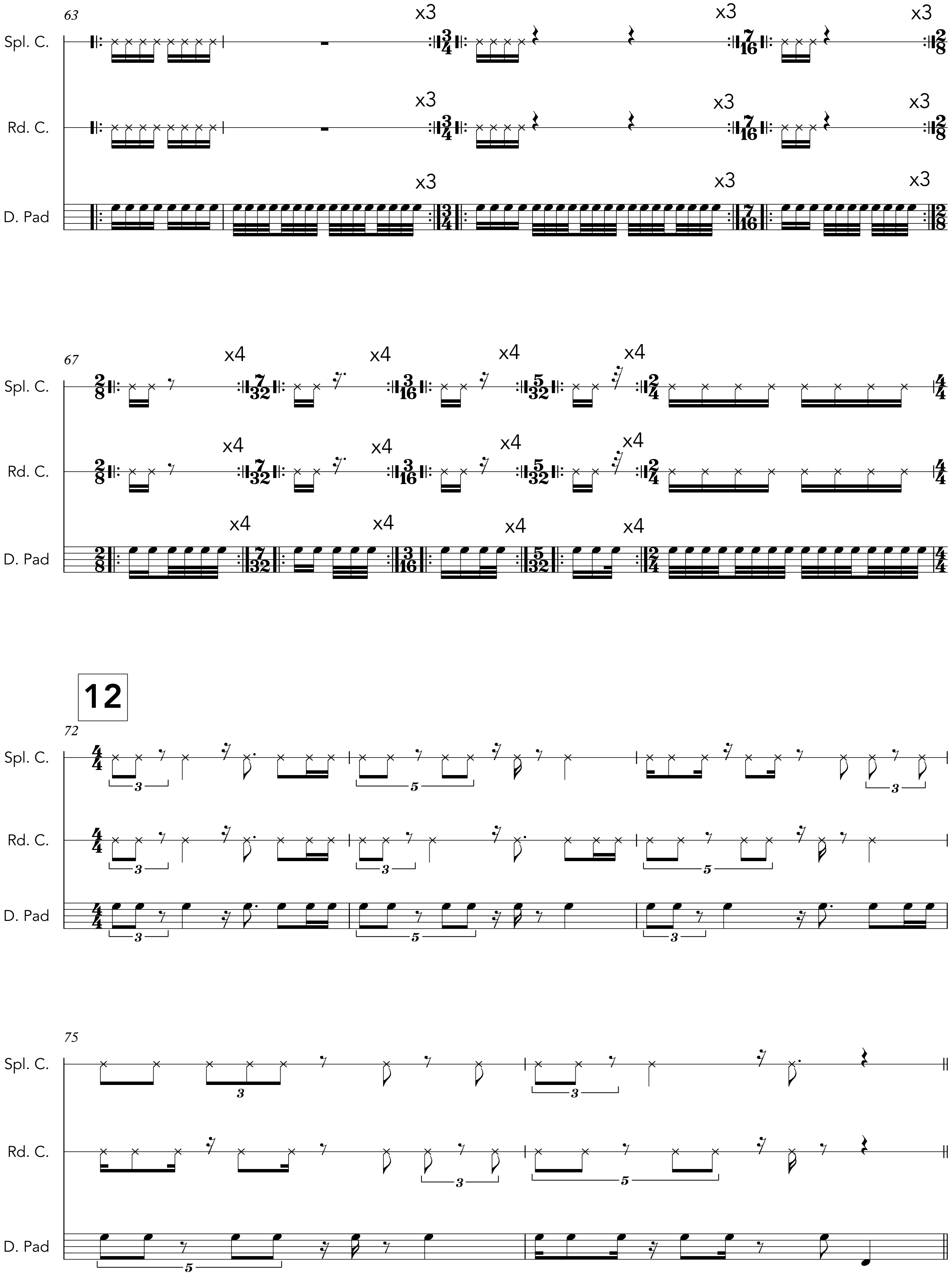


6"
(l.v.)
Hold cymbal with the hand that operates the switch
Press switch and hit cymbal at the same time
39
Spl. C.
6"
(l.v.)
Hold cymbal with the hand that operates the switch
Press switch and hit cymbal at the same time
Rd. C.
6"
D. Pad
7
43
Start swinging the soft mallett as soon
as the snare roll begins
fff
3"
(l.v.)
Start walking with the hand-held microphone
as soon as the snare roll begins
(l.v.)
f
3"
(l.v.)
3"
47
Hold cymbal with the hand
that operates the switch
Press switch and hit cymbal
at the same time
8
(l.v.)
Slightly louder than the sample of
Stockhausen speaking
f
Hold cymbal with the hand
that operates the switch
Press switch and hit cymbal
at the same time
(l.v.)
Slightly louder than the sample of
Stockhausen speaking
f
(Cue when the
sample finishes)


9
30"
54
Spl. C.
FOLEY
As Figure 5
Rd. C.
D. Pad


10
55
Spl. C.
Rd. C.
Cue start as soon as
P1 & P2 are ready
D. Pad


11
59
Spl. C.
ff
x3
Rd. C.
ff
x3
D. Pad
x3


63
Spl. C.
Rd. C.
D. Pad
x3
x3
x3
67
x4
x4
x4
x4
12
72
75

13

All performers to ride cymbal.

Splash cymbal performer: agitate the splash lightly with brush and stick.
Ride cymbal performer: take hand-held camera, switch on and closely follow the brush and stick.
MIDI drum pad performer: take the hand-held microphone, switch on and closely follow the brush and stick.

Develop these actions slowly over 2 minutes by reducing the range and movement of the actions and increasing the proximity to the splash cymbal.

End with all three performers in close contact with each other on the side of the cymbal closest to the audience.

Total duration: c. 9'30

University of Southampton

Faculty of Humanities

Music

Alias States: Composing (for) Electronically Enhanced Set-ups

Volume 6 of 8

by

Oliver Arthur Ashworth Sellwood

ORCID ID 0000-0003-2674-4481

Thesis for the degree of Doctor of Philosophy

May 2022

Nara

for solo hexaphonic electric guitar

Olly Sellwood

2017

for Ben Jameson

Set-up Instructions

The guitar should be tuned in the following way:
String 6 = E2
String 5 = B2
String 4 = D#3
String 3 = E3
String 2 = C4
String 1 = F4

Six amplifiers (of any make/model, although of similar power) should be placed around the performer at similar distances and equally spaced. There should be enough space for some of the audience to sit/stand between the amplifiers and the performer, although this may not be possible. The amplifiers should be set up to produce similar sounds and volumes (before the effects pedals are switched on).

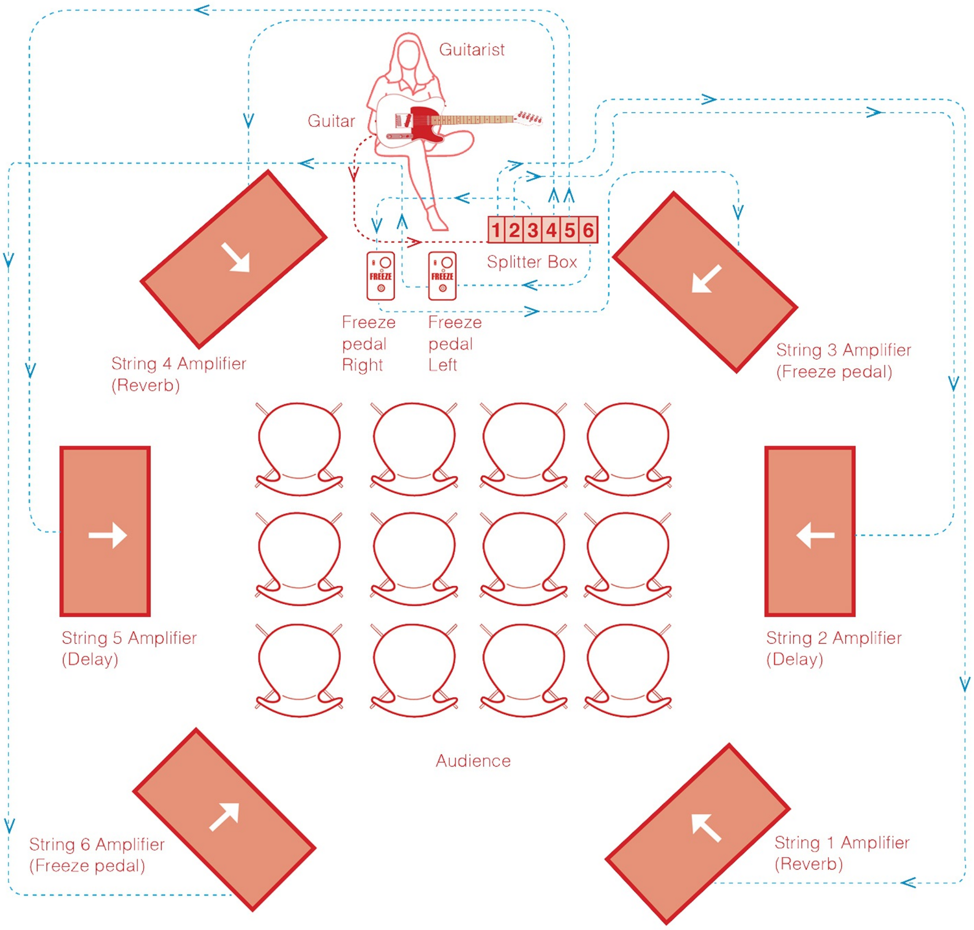
The following pedals are required:
Pedal 1 = Freeze Pedal
Pedal 2 = Delay Pedal (delay time between 100ms + 500 ms)
Pedal 3 = Reverb Pedal (reverb amount between 1s + 5s)
Pedal 4 = Freeze Pedal
Pedal 5 = Delay Pedal (delay time between 100ms + 500 ms)
Pedal 6 = Reverb Pedal (reverb amount between 1s + 5s)

Hexaphonic Guitar output 1 (E2) into Freeze Pedal into Amp 1
Hexaphonic Guitar output 2 (B3) into Delay Pedal into Amp 2
Hexaphonic Guitar output 3 (D#3) into Reverb Pedal into Amp 3
Hexaphonic Guitar output 4 (E3) into Freeze Pedal into Amp 4
Hexaphonic Guitar output 5 (B4) into Delay Pedal into Amp 5
Hexaphonic Guitar output 6 (C4) into Reverb Pedal into Amp 6

Both Freeze Pedals should be set to 'Latch' and the output volume should match the dry volume of the guitar.
The Delay Pedal into Amp 2 should be repeat more slowly than the Delay Pedal into Amp 5. Both Delay Pedals should have a long regeneration/feedback amount.
Both Reverb Pedals should be set with a long reverb time.
The freeze pedal mechanism should be audible and may need to be amplified in larger venues.

Bars 72 - 113 played with the addition of a banjo pick on the left hand to pluck the strings behind the nut.

Stage Set-up



Information about the Hexaphonic Guitar

The hexaphonic guitar is a standard electric guitar but with a pick up replaced with a hexaphonic pick up. The hexaphonic pick up enables each string to have a separate output.

More information can be found at http://www.ubertar.com/hexaphonic/

Performance Instructions

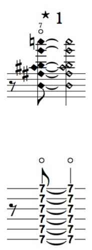
The performer should sit in order to use the two freeze pedals most effectively.

The freeze pedals are notated to indicate the length of activation. Pedal 1 (on the low E string is on the lowest line of the stave.

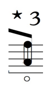
They will need to be switched on at the start of the note and off at the end. These actions should be rhythmic accurate as the operation of the pedal will produce sound.

The precise moment that the pedal should be switched on to best capture the note will require some experimentation. The sound should be as similar as the played
note as possible.

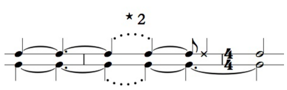
The notation shows the sound produced by the scodatura effect. The tablature shows where on the guitar the notes should be played.



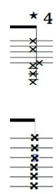
Harmonics are notated by showing which fret to place your hand



The harmonic is unstable and will produce an unspecified pitch



Pedals marked with a dotted slur line shouldn't be switched off at the end of the note; the freeze sound should run into the new freeze sound



Notes shown as an 'x' are played on the string behind the nut on the headstock of the guitar, or by the bridge if needed during faster passages

* 1: harmonic - fret indicated by the number

* 2: don't switch pedal off, only switch on at the new note

* 3: the harmonic is unstable and will produce an unspecified pitch

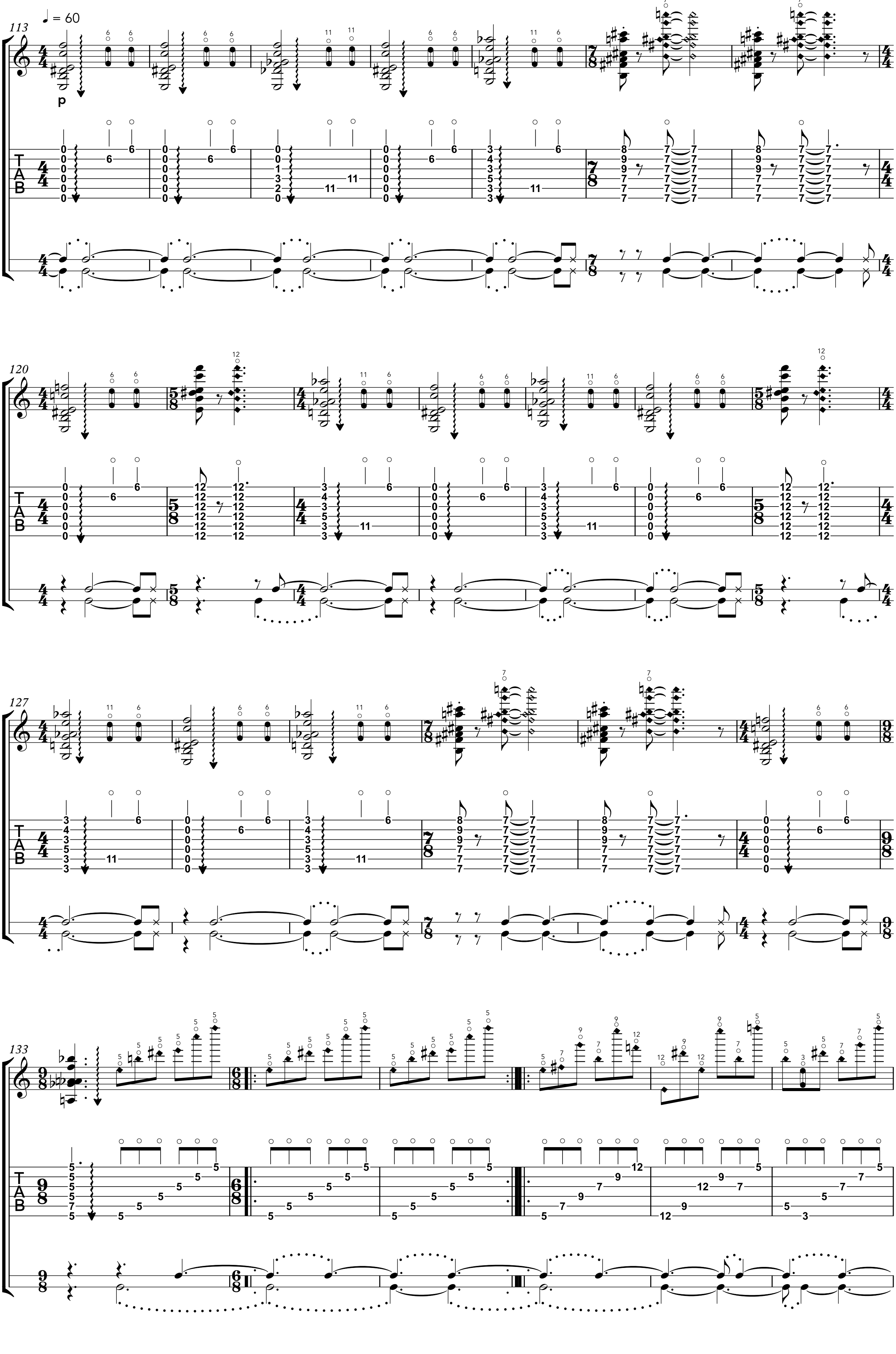
* 4: play behind the nut

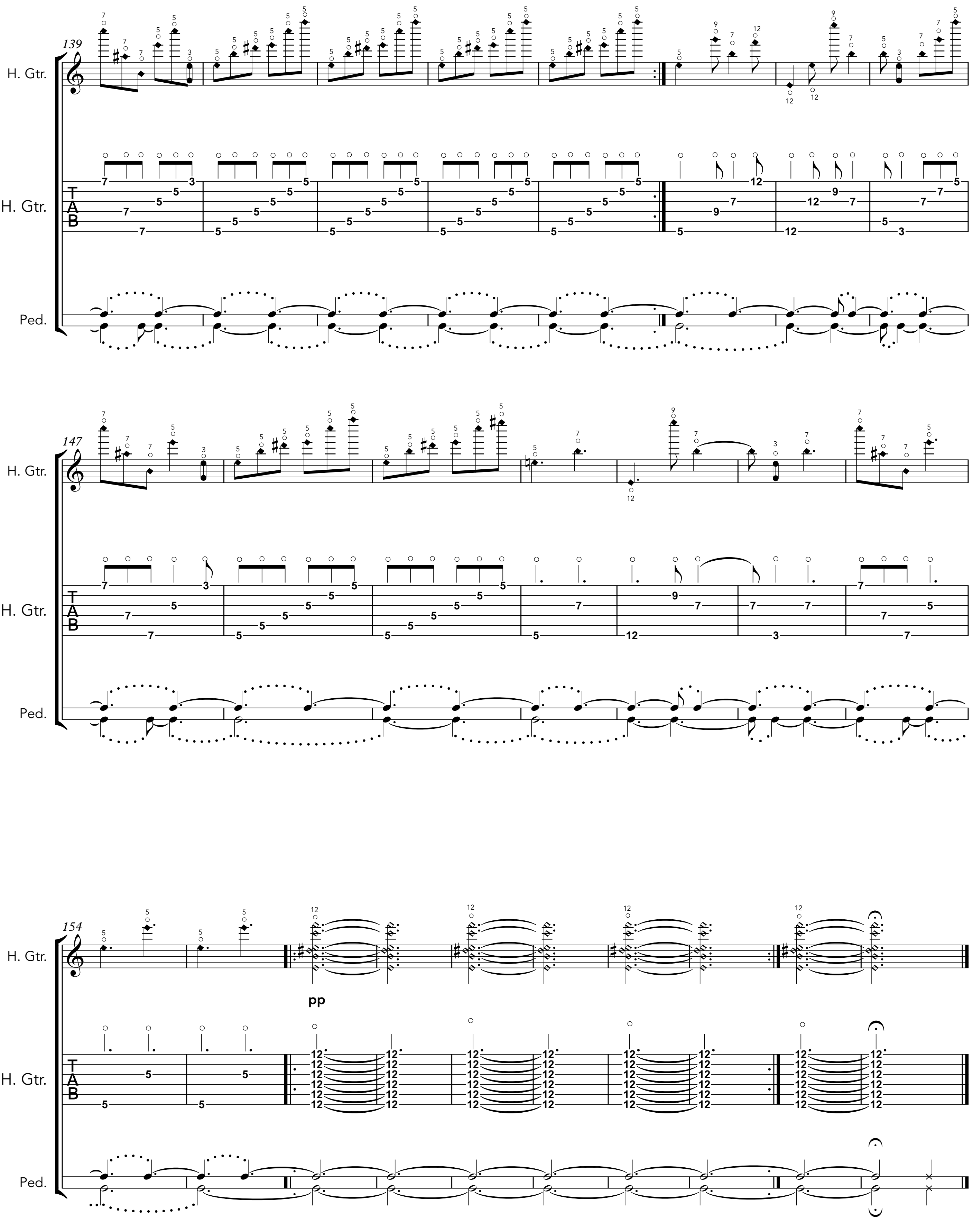
* 5: play the string and then bend the note a quarter note sharper

slowly
a tempo
H. Gtr.
H. Gtr.
Ped.
15"
f
mp
p
a tempo
heavy palm mute on staccato
notes until bar 113

* 6: played with the addition of a banjo pick on the left hand to pluck the strings behind the nut. All notes marked (♀).


97
H. Gtr.
f
H. Gtr.
Ped.
101
ff
x 4
x 4
x 4
105
fff
Reduce dynamic at the start of each repeat.
The final repeat should be as quiet as is physically possible.
109
ff (first time only)
x 8
x 8
x 8


113
♩ = 60
H. Gtr.
H. Gtr.
Ped.
p
120
127
133



Total duration: c.12'30

University of Southampton

Faculty of Humanities

Music

Alias States: Composing (for) Electronically Enhanced Set-ups

Volume 7 of 8

by

Oliver Arthur Ashworth Sellwood

ORCID ID 0000-0003-2674-4481

Thesis for the degree of Doctor of Philosophy

May 2022

Partial Arenas

for four electric guitars and live electronics

Olly Sellwood

2018

for Zwerm

Set-up: for each guitar

Equipment:
> Four electric guitars (with plectrums)
> Four amplifiers
> Four Freeze pedals
> Four volume pedals
> Four small contact microphones that can clip onto the volume knob of the Freeze pedals
> A laptop running Ableton
> An audio interface
> P.A. system
> For larger venues, microphones can be used to amplify the acoustic sound of the guitar strings. These microphones should be routed directly to the P.A. system.

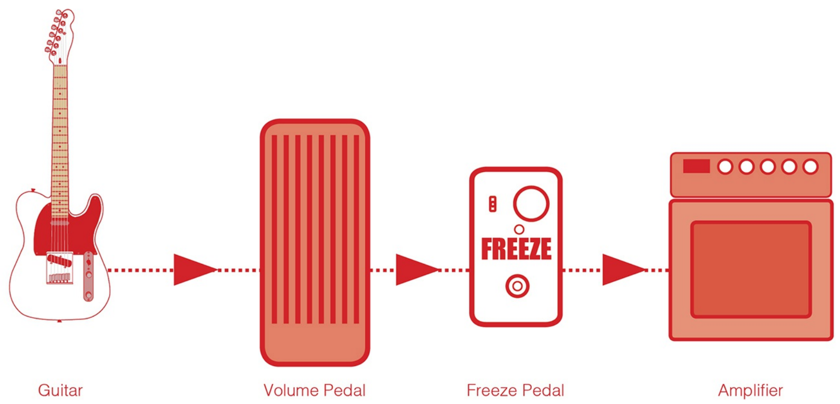
Each freeze pedal has a contact microphone attached to the volume knob.
The contact microphone is connected to a laptop running Ableton, via a soundcard.
Each Freeze pedal has a different effect added to the dry signal via Ableton.
The Ableton patch is available here:
https://www.dropbox.com/s/tbgjna5jq4r1aag/ZWERM%20Performance%20Patch.als?dl=0

Each amp should have a slight overdrive.

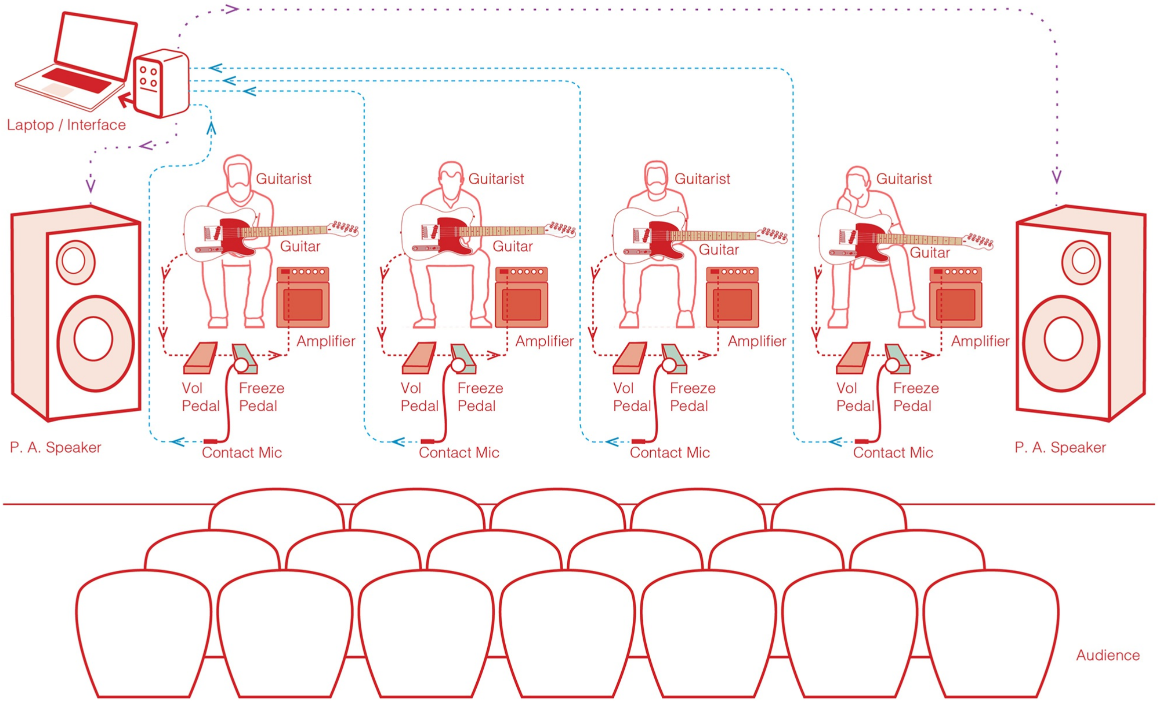
The volume of each amp should be high so that the delicate sounds from the guitar can be heard at a high amplitude.

The strings on the guitar be amplified through the use of a microphone in larger spaces so that they are audible.

The sound of the strings, the wet and dry sound of the pedals should be routed through a PA system set up in stereo surrounding the ensemble.



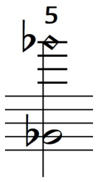
Stage Set-up



Laptop / Interface
Guitarist
Guitar
Amplifier
Vol Pedal
Freeze Pedal
Contact Mic
Guitarist
Guitar
Amplifier
Vol Pedal
Freeze Pedal
Contact Mic
Guitarist
Guitar
Amplifier
Vol Pedal
Freeze Pedal
Contact Mic
Guitarist
Guitar
Amplifier
Vol Pedal
Freeze Pedal
Contact Mic
P. A. Speaker
P. A. Speaker
Audience

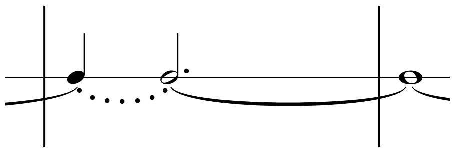
Performance Instructions

The piece should be performed with plectrums.
Always allow the harmonics to ring on.
The dynamics apply to the playing of the guitar and this may be the opposite of the actions on the volume pedal.
Harmonics marked forte should be played aggressively even if the intended pitch is compromised as a result.

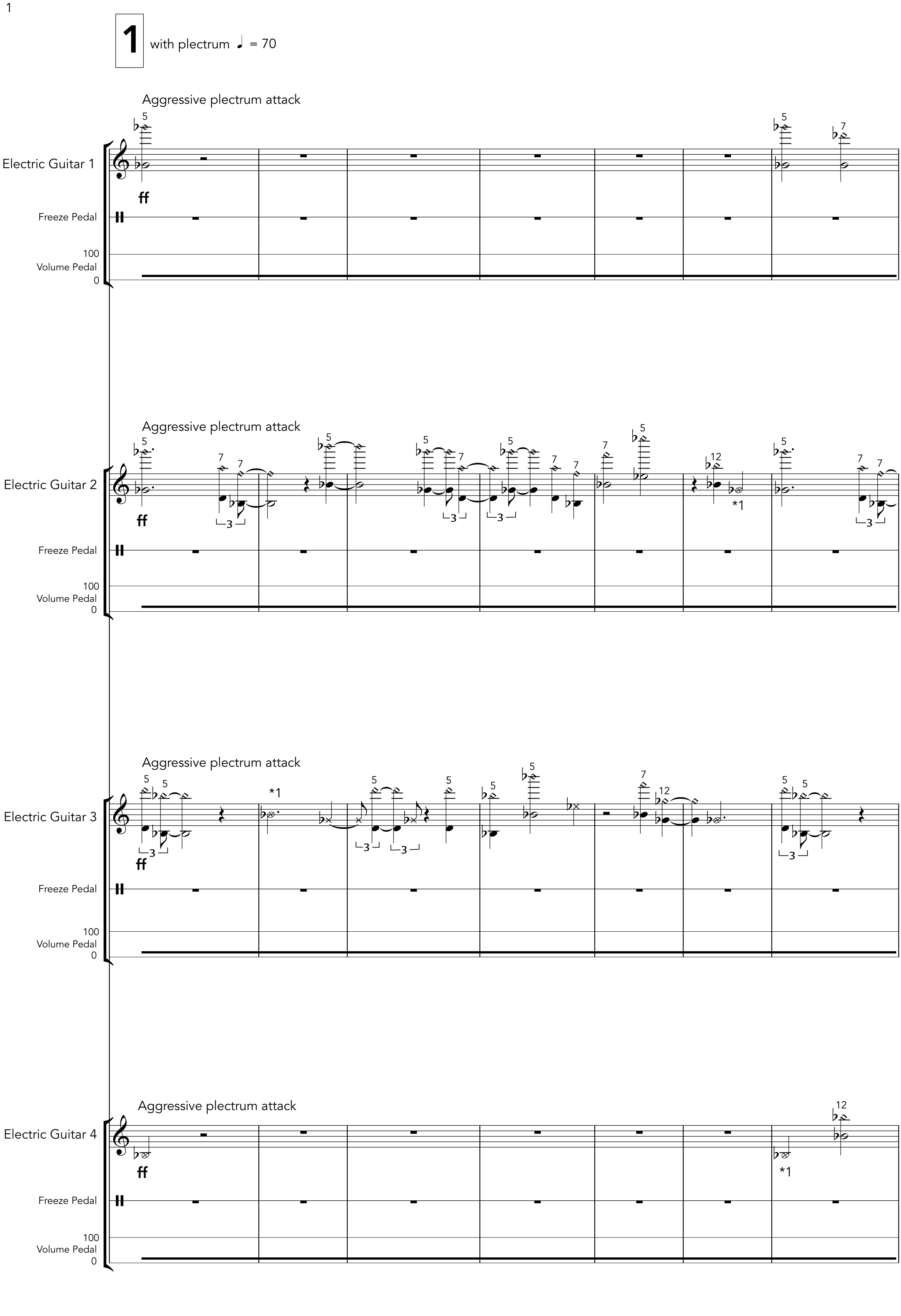


Harmonics are written showing the string used for the harmonic as a normal notehead, the fret number to create the intended pitch, and a diamond notehead to show the resultant pitch.

Pedals marked with a dotted slur line shouldn't be switched off at the end of the note; the freeze sound should run into the new freeze sound



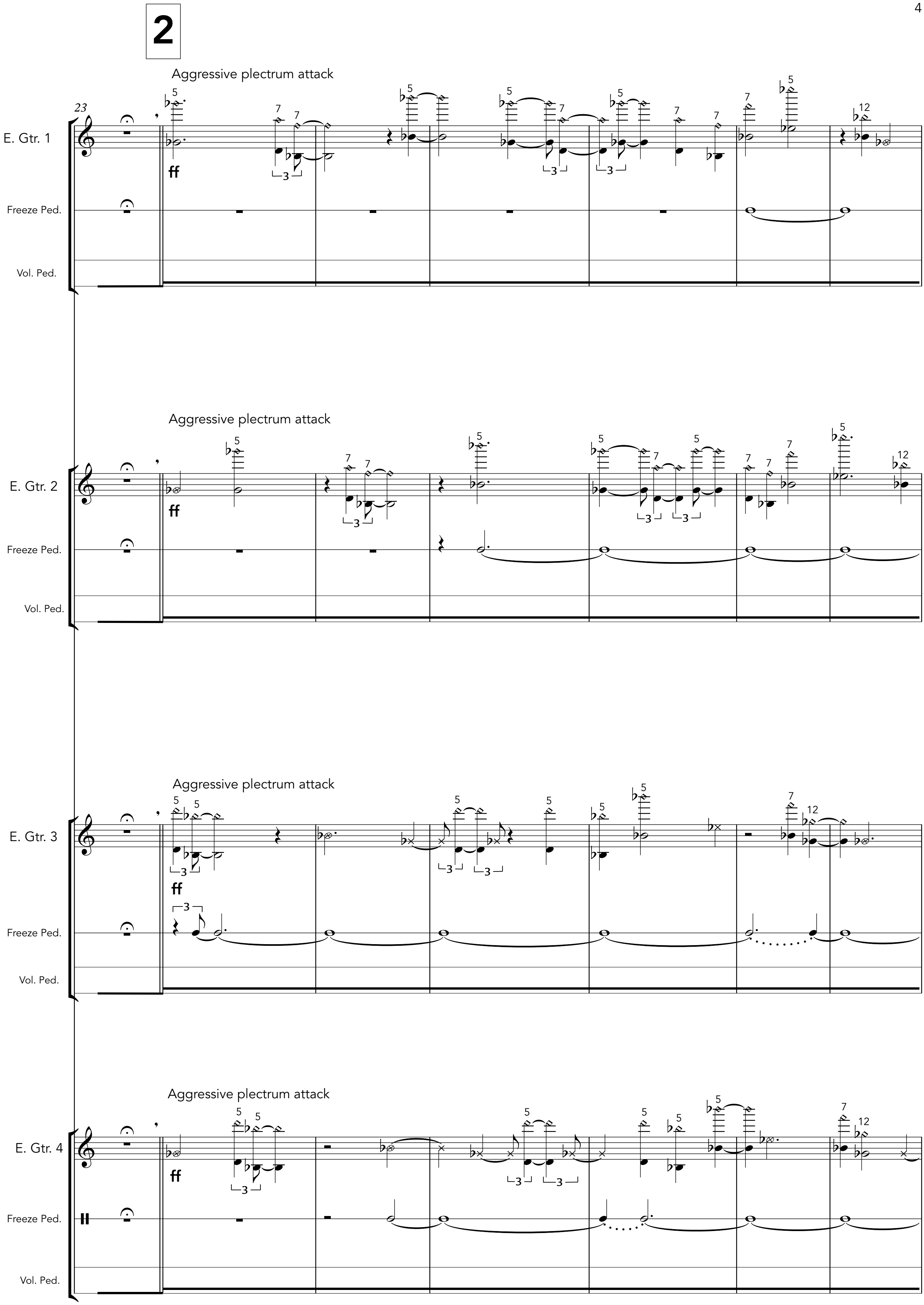
All four guitars are in scordatura.
String 6 = F2
String 5 = Bb2
String 4 = D3
String 3 = Gb3
String 2 = Bb3
String 1 = Eb4



*1 Play string behind the bridge or on the headstock


8
E. Gtr. 1
Freeze Ped.
Vol. Ped.
E. Gtr. 2
Freeze Ped.
Vol. Ped.
E. Gtr. 3
Freeze Ped.
Vol. Ped.
E. Gtr. 4
Freeze Ped.
Vol. Ped.

*2 Volume pedal is fully down and muted


2
23
Aggressive plectrum attack
E. Gtr. 1
Freeze Ped.
Vol. Ped.
ff
Aggressive plectrum attack
E. Gtr. 2
Freeze Ped.
Vol. Ped.
ff
Aggressive plectrum attack
E. Gtr. 3
Freeze Ped.
Vol. Ped.
ff
Aggressive plectrum attack
E. Gtr. 4
Freeze Ped.
Vol. Ped.
ff

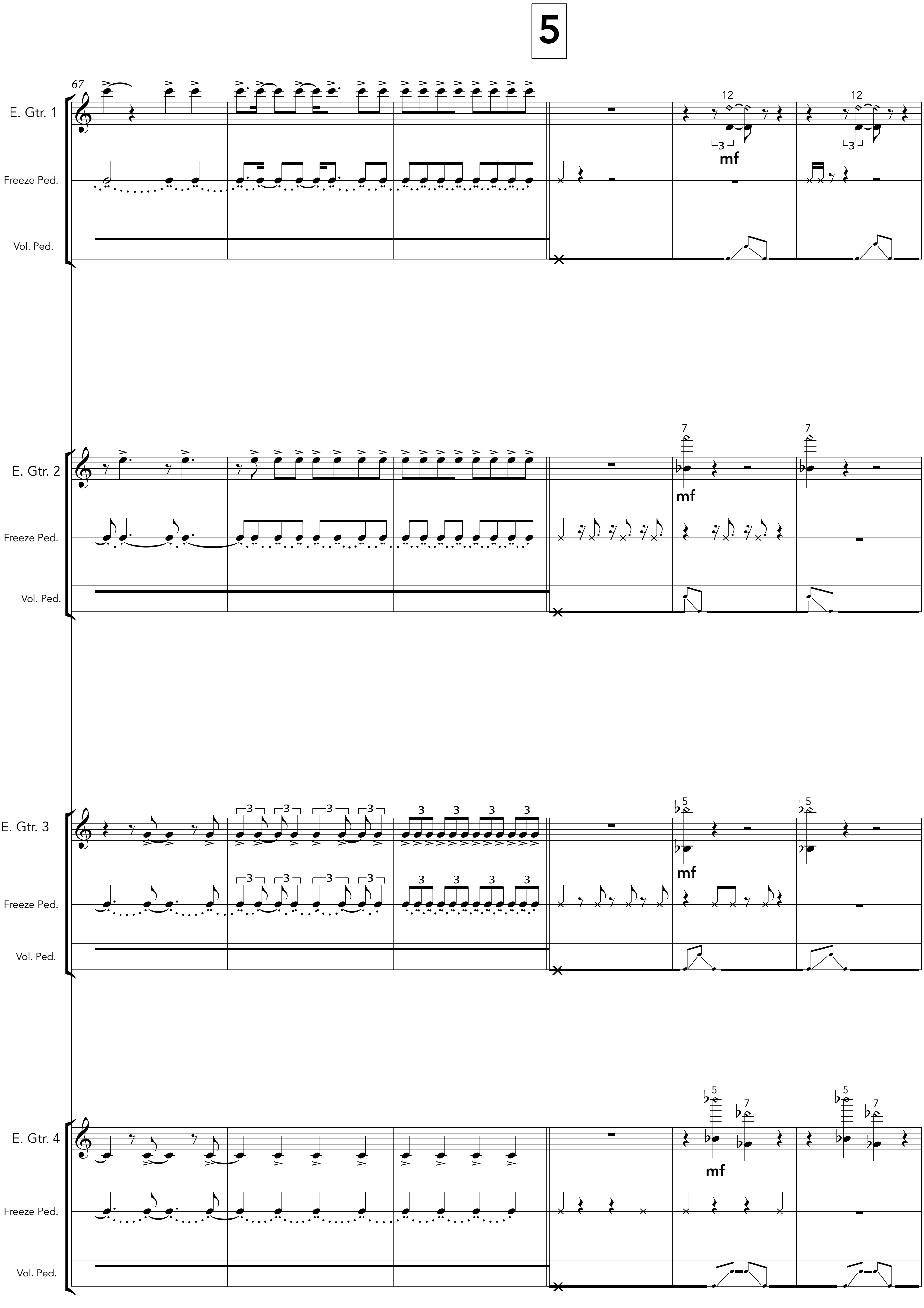

30
E. Gtr. 1
Freeze Ped.
Vol. Ped.
E. Gtr. 2
Freeze Ped.
Vol. Ped.
E. Gtr. 3
Freeze Ped.
Vol. Ped.
E. Gtr. 4
Freeze Ped.
Vol. Ped.

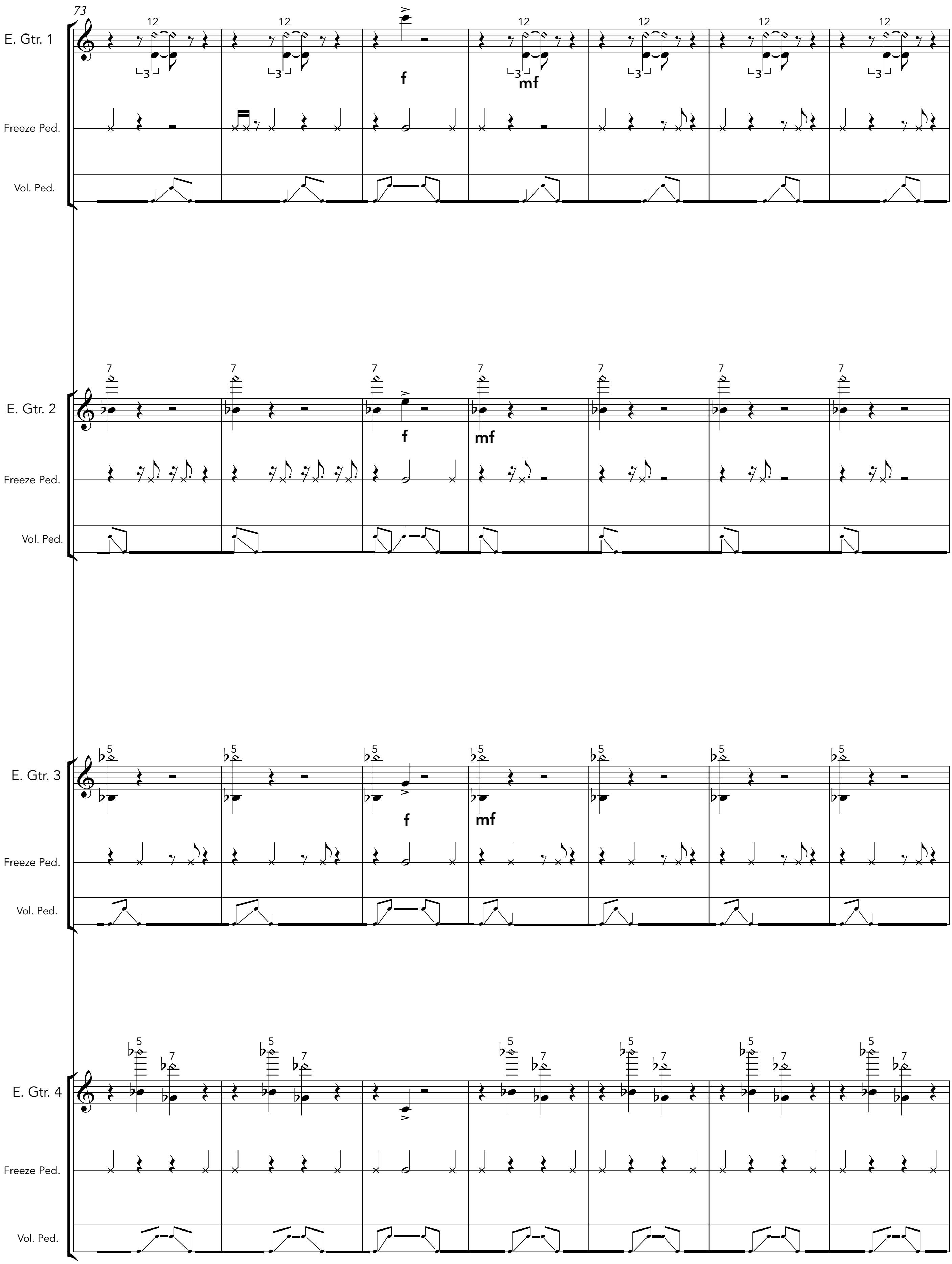

36
Continue dynamic and plectrum attack
E. Gtr. 1
Freeze Ped.
Vol. Ped.
Continue dynamic and plectrum attack
E. Gtr. 2
Freeze Ped.
Vol. Ped.
Continue dynamic and plectrum attack
E. Gtr. 3
Freeze Ped.
Vol. Ped.
Continue dynamic and plectrum attack
E. Gtr. 4
Freeze Ped.
Vol. Ped.


3
43
E. Gtr. 1
Freeze Ped.
Vol. Ped.
mf
E. Gtr. 2
Freeze Ped.
Vol. Ped.
mf
E. Gtr. 3
Freeze Ped.
Vol. Ped.
mf
E. Gtr. 4
Freeze Ped.
Vol. Ped.
mf


4
49
E. Gtr. 1
Freeze Ped.
Vol. Ped.
E. Gtr. 2
Freeze Ped.
Vol. Ped.
E. Gtr. 3
Freeze Ped.
Vol. Ped.
E. Gtr. 4
Freeze Ped.
Vol. Ped.
12"
8"
[Gtr 4.]
f


58
E. Gtr. 1
Freeze Ped.
Vol. Ped.
12"
8"
12"
4"
4"
20"
[Gtrs. 2, 3 & 4.]
E. Gtr. 2
Freeze Ped.
Vol. Ped.
12"
8"
12"
4"
[Gtr. 1]
4"
20"
E. Gtr. 3
Freeze Ped.
Vol. Ped.
12"
8"
12"
4"
[Gtr. 1]
4"
20"
E. Gtr. 4
Freeze Ped.
Vol. Ped.
12"
8"
12"
4"
[Gtr. 1]
4"
20"


5
67
E. Gtr. 1
Freeze Ped.
Vol. Ped.
12
mf
E. Gtr. 2
Freeze Ped.
Vol. Ped.
7
mf
E. Gtr. 3
Freeze Ped.
Vol. Ped.
5
mf
E. Gtr. 4
Freeze Ped.
Vol. Ped.
5
7
mf


73
E. Gtr. 1
Freeze Ped.
Vol. Ped.
E. Gtr. 2
Freeze Ped.
Vol. Ped.
E. Gtr. 3
Freeze Ped.
Vol. Ped.
E. Gtr. 4
Freeze Ped.
Vol. Ped.
f
mf


6
aggressive plectrum attack
Aggressive plectrum attack
Aggressive plectrum attack
Aggressive plectrum attack
80
E. Gtr. 1
Freeze Ped.
Vol. Ped.
E. Gtr. 2
Freeze Ped.
Vol. Ped.
E. Gtr. 3
Freeze Ped.
Vol. Ped.
E. Gtr. 4
Freeze Ped.
Vol. Ped.
6"
ff


88
E. Gtr. 1
Freeze Ped.
Vol. Ped.
E. Gtr. 2
Freeze Ped.
Vol. Ped.
E. Gtr. 3
Freeze Ped.
Vol. Ped.
E. Gtr. 4
Freeze Ped.
Vol. Ped.


95
E. Gtr. 1
Freeze Ped.
Vol. Ped.
E. Gtr. 2
Freeze Ped.
Vol. Ped.
E. Gtr. 3
Freeze Ped.
Vol. Ped.
E. Gtr. 4
Freeze Ped.
Vol. Ped.

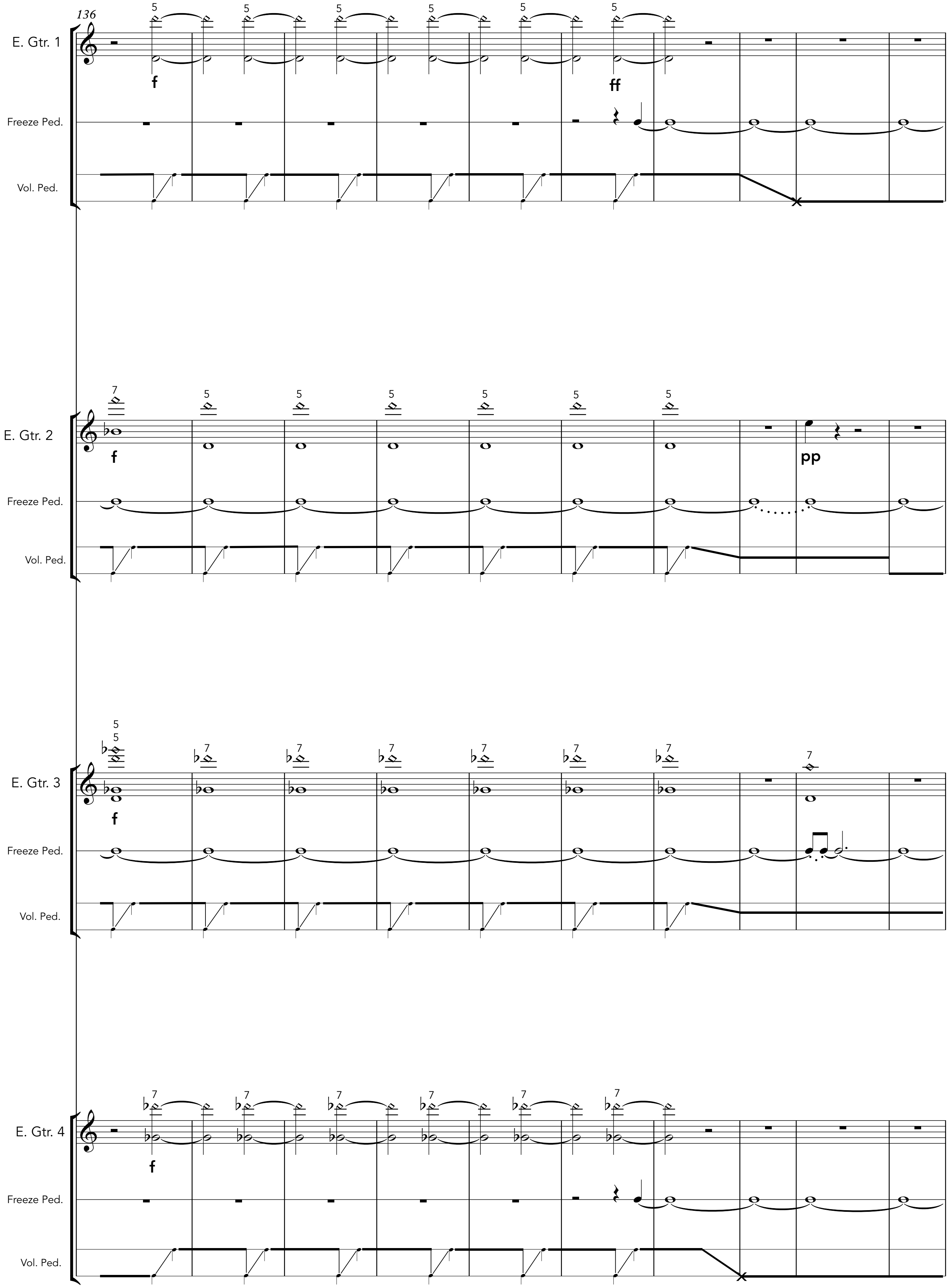
*3 Slide palms up or down the neck to agitate the strings

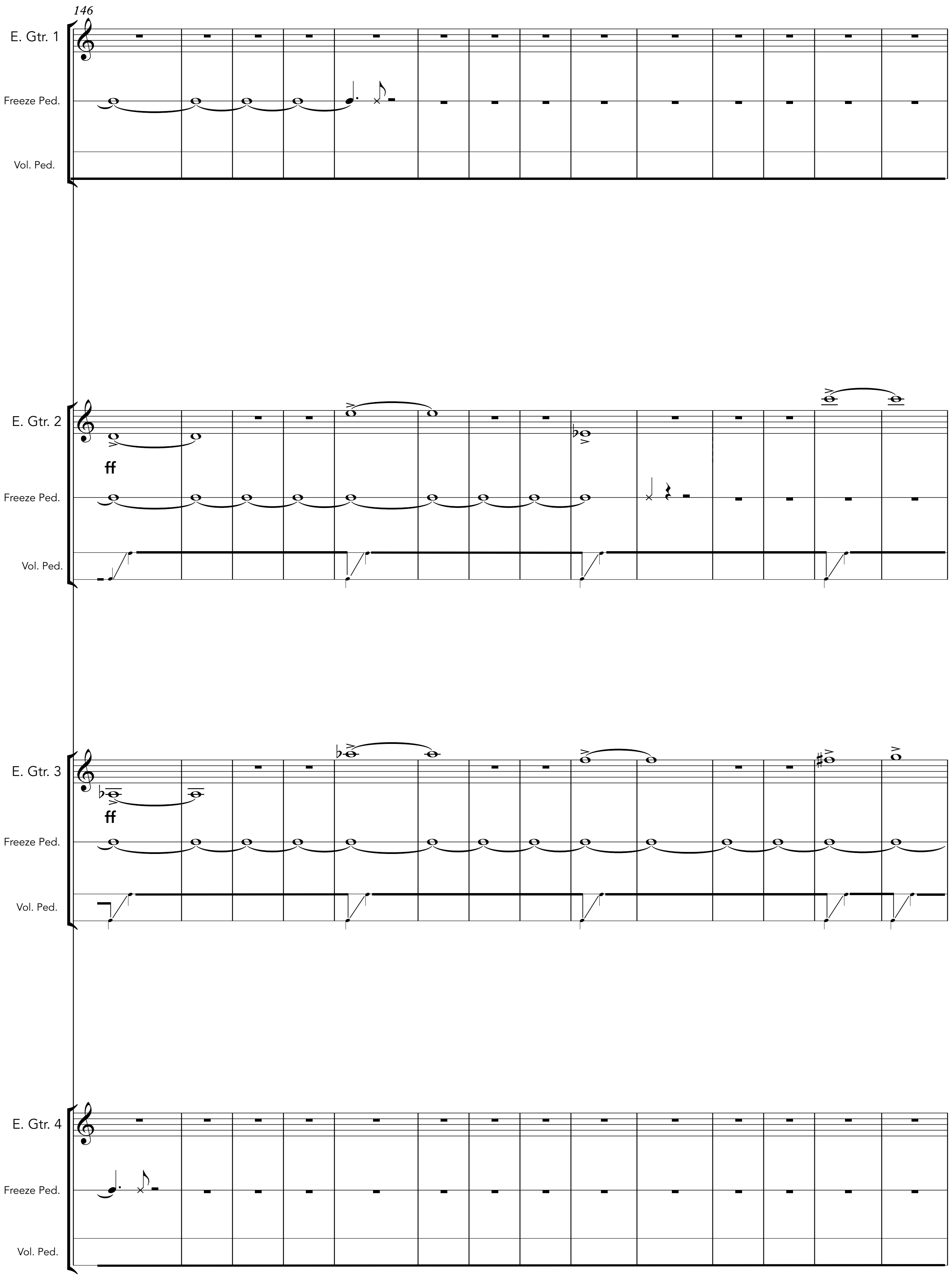

110
E. Gtr. 1
Freeze Ped.
Vol. Ped.
mf
f
mf
E. Gtr. 2
Freeze Ped.
Vol. Ped.
E. Gtr. 3
Freeze Ped.
Vol. Ped.
E. Gtr. 4
Freeze Ped.
Vol. Ped.

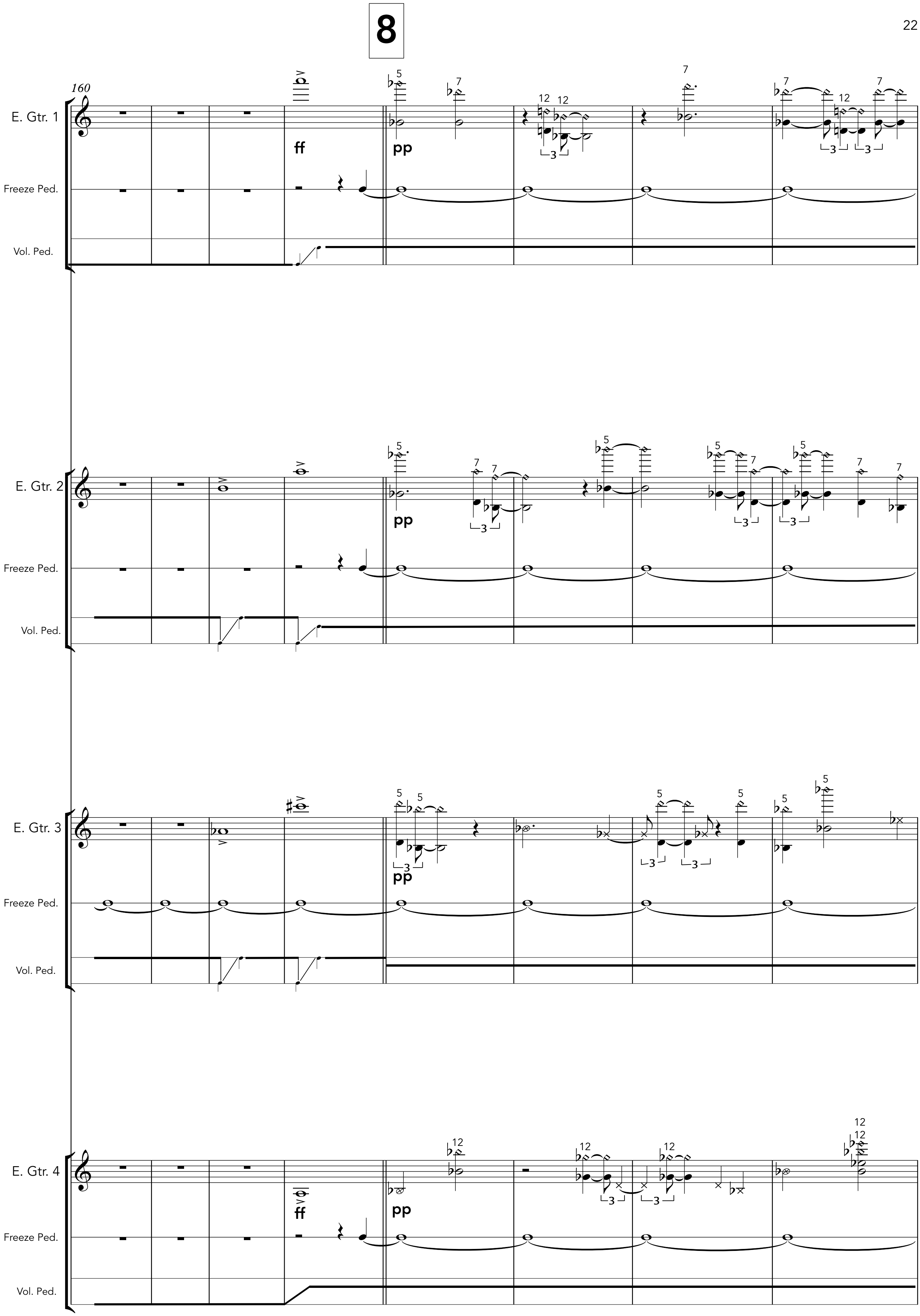

116
E. Gtr. 1
Freeze Ped.
Vol. Ped.
f
mf
E. Gtr. 2
Freeze Ped.
Vol. Ped.
E. Gtr. 3
Freeze Ped.
Vol. Ped.
E. Gtr. 4
Freeze Ped.
Vol. Ped.

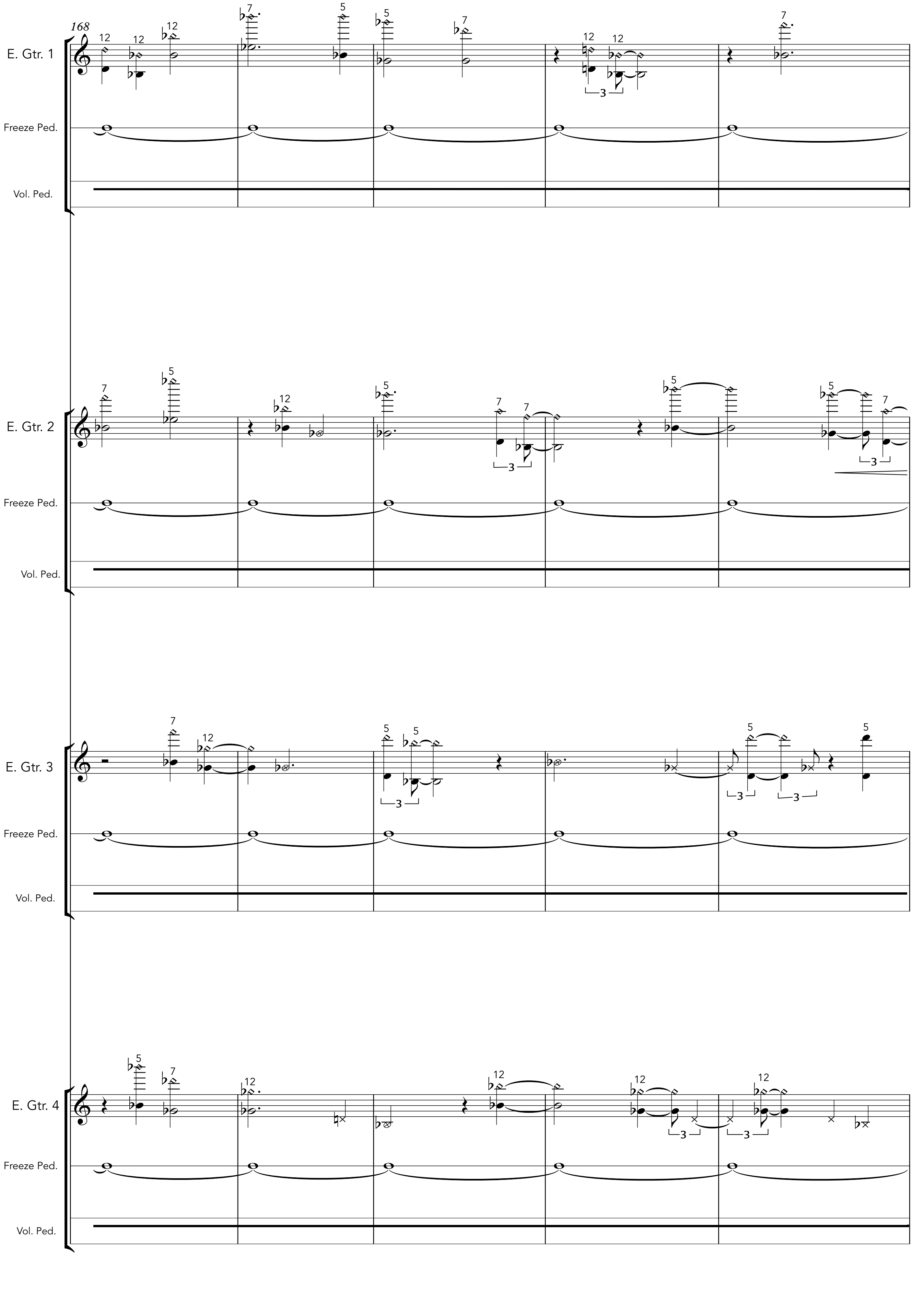

122
E. Gtr. 1
Freeze Ped.
Vol. Ped.
f
E. Gtr. 2
Freeze Ped.
Vol. Ped.
f
E. Gtr. 3
Freeze Ped.
Vol. Ped.
f
E. Gtr. 4
Freeze Ped.
Vol. Ped.
f


129
E. Gtr. 1
Freeze Ped.
Vol. Ped.
E. Gtr. 2
Freeze Ped.
Vol. Ped.
E. Gtr. 3
Freeze Ped.
Vol. Ped.
E. Gtr. 4
Freeze Ped.
Vol. Ped.
mf


136
E. Gtr. 1
Freeze Ped.
Vol. Ped.
E. Gtr. 2
Freeze Ped.
Vol. Ped.
E. Gtr. 3
Freeze Ped.
Vol. Ped.
E. Gtr. 4
Freeze Ped.
Vol. Ped.
f
ff
pp


146
E. Gtr. 1
Freeze Ped.
Vol. Ped.
E. Gtr. 2
ff
Freeze Ped.
Vol. Ped.
E. Gtr. 3
ff
Freeze Ped.
Vol. Ped.
E. Gtr. 4
Freeze Ped.
Vol. Ped.


8
160
E. Gtr. 1
Freeze Ped.
Vol. Ped.
E. Gtr. 2
Freeze Ped.
Vol. Ped.
E. Gtr. 3
Freeze Ped.
Vol. Ped.
E. Gtr. 4
Freeze Ped.
Vol. Ped.
ff
pp


168
E. Gtr. 1
Freeze Ped.
Vol. Ped.
E. Gtr. 2
Freeze Ped.
Vol. Ped.
E. Gtr. 3
Freeze Ped.
Vol. Ped.
E. Gtr. 4
Freeze Ped.
Vol. Ped.

Total duration: c. 12'30

University of Southampton

Faculty of Humanities

Music

Alias States: Composing (for) Electronically Enhanced Set-ups

Volume 8 of 8

by

Oliver Arthur Ashworth Sellwood

ORCID ID 0000-0003-2674-4481

Thesis for the degree of Doctor of Philosophy

May 2022

Piano Nudes

for solo piano and electronics

Olly Sellwood

2020-21

for Yshani Perinpanayagam

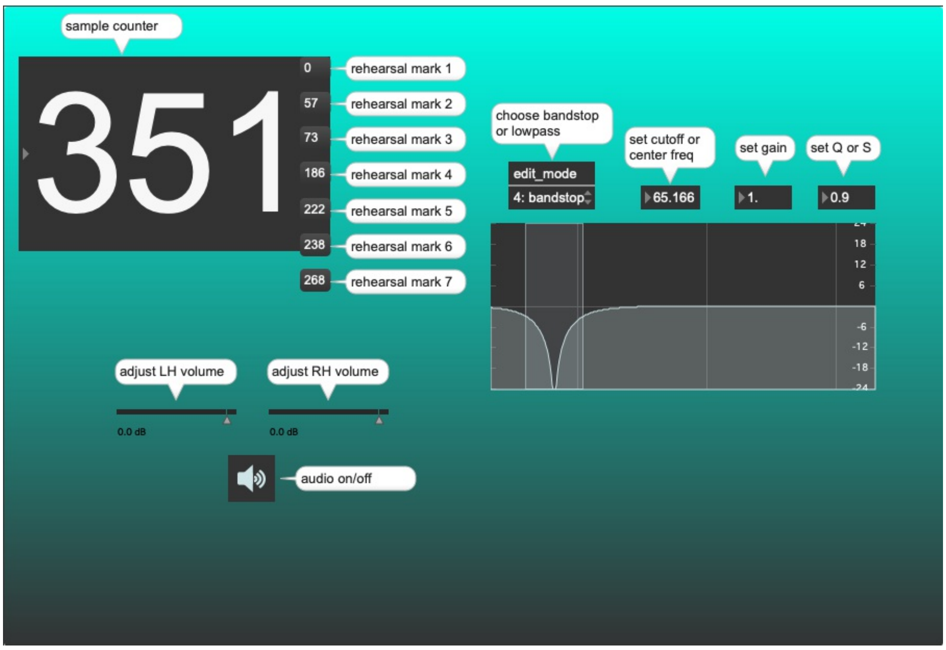
Set-up Instructions

Equipment:
> Grand piano
> Laptop running Max/MSP
> The *Piano Nudes* Max patch and samples.
> Audio interface
> Speaker
> MIDI footpedal (preferably one shaped like a piano footpedal). The footpedal shouldn't make a sound once depressed.

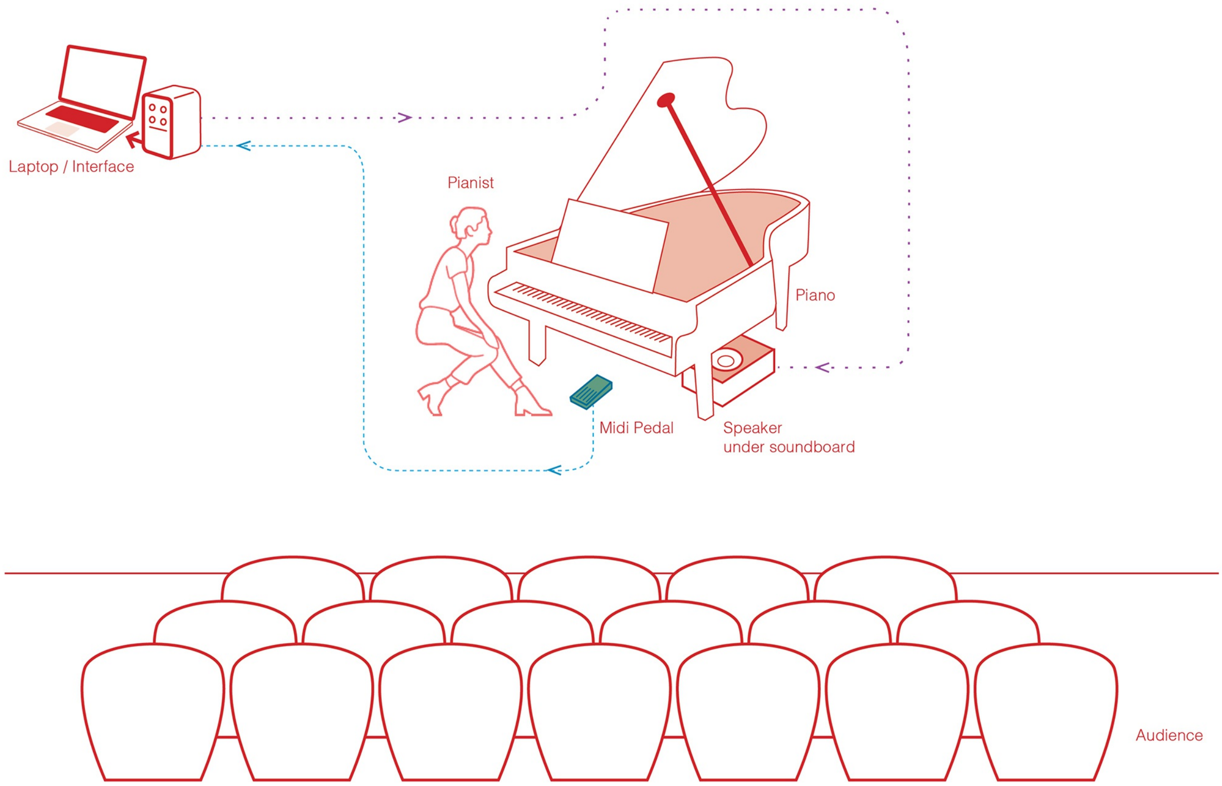
Hide the laptop and soundcard from the audience. Place the speakers close enough to the piano so that their output resonates the sound board. Plug the MIDI footpedal into the laptop.

The Max patch and samples are available here:
> Movement 1: https://www.dropbox.com/sh/qtj9nol7i622448/AABJ9YsY9tFWy6BWm7zLdyPZa?dl=0
> Movement 2: https://www.dropbox.com/sh/x46n15axbyi4pll/AACxF2eNh75PengCTID6i9MTa?dl=0
> Movement 3: https://www.dropbox.com/sh/dqsukqs5kvnm0y2/AADqysiD1gyKrXC_TlXY1VxPa?dl=0

> Open the Max Patch.
> Set the audio drivers for your soundcard.
> Switch on the audio.
> Adjust the volume of the samples so that samples one to twenty are at a mezzo-piano volume.
> If necessary, use the EQ setting on the right-hand side to calibrate the sound for the speakers.



Stage Set-up


Laptop / Interface
Pianist
Piano
Midi Pedal
Speaker
under soundboard
Audience

I

*1 Sample numbers are given at rehearsal marks

*2 The pedal duration should always be short. Other rhythmic values are used for clarity


2
25
Pno.
Ped.
57
58
30
c.2"
pp
59
33
3
♩ = 60 (♪ = ♩)
mp
64
69
74
36
mp
mf
f
84
94

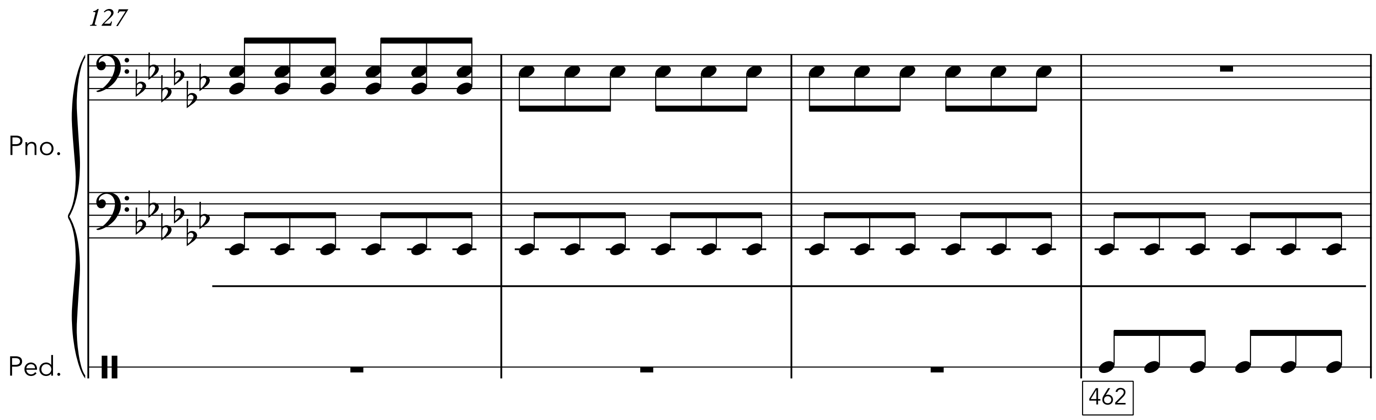

38
Pno.
mf
Ped.
104
116
40
LH
f
mp
Ped.
136
126
42
147
159
171
4
RH match volume of samples
45
mp
p
183
187
197
207

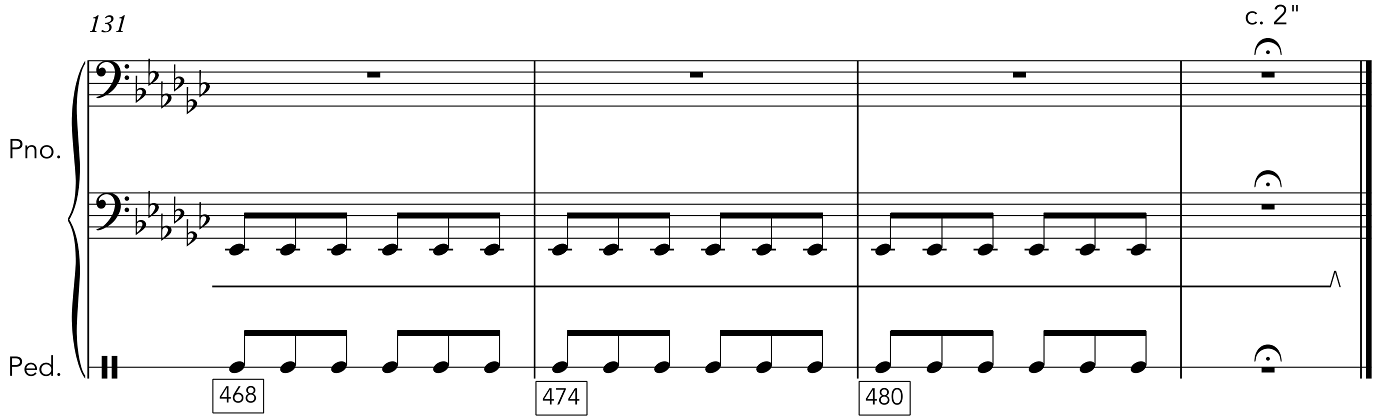

49
Pno.
Ped.
217
5
52
p
mf
223
54
6
♩. = 60
pp
224
229
234
mp
59
the piano f should match the loud samples
f
239
240


64
Pno.
Ped.
mf
mp
mf
mf
243
245
247
248
249
69
Pno.
Ped.
mf
mf
mf
251
252
253
254
255
74
Pno.
Ped.
mp
mp
257
258
259
260
261
79
rit.
4
4
Pno.
Ped.
mp
mp
mf
262
263
264
265
266


7
a tempo
match volume of samples
84
4
4
4
4
Pno.
Ped.
267
268
mp
ff
269
89
mp
275
281
287
293
299
95
ff
305
311
317
323
329
101
335
341
347
353
359


106
Pno.
mp
p
Ped.
365
371
377
383
389
111
dim.
395
401
407
413
419
116
425
431
437
443
449
121
pp
455
461


127
Pno.
Ped.
462


131
c. 2"
Pno.
Ped.
468
474
480

II


2
♩ = 70
12
Pno.
ppp
Ped.
45
49
14
53
57
3
♩ = 80
16
pp
p
61
18
mf
65


4
20
Pno.
pp
Ped.
66
70
74
23
accel.
76
80
5
♩ = 80
25
mp
6
molto rall.
84
89
7
♩ = 80
27
mf
mp
94
98


8
accel.
29
Pno.
cresc. [to bar 33]
Ped.
102
108
9
♩ = 100
31
113
118
33
mf
ff
10
124
128
♩ = 75
35
mf
133
♩ = 50
mp
138


11
37
Pno.
pp
p
Ped.
143
147
39
151
155
41
12
♩ = 80
pp
159
161
165
44
169
173
177

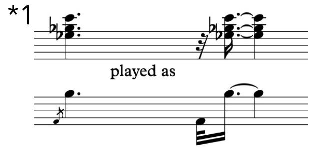
13
47
Pno.
mp
Ped.
180
185
189
50
193
197
201
14
53
204
207
210
56
15
ff
f dim. [to bar 64]
213


58
Pno.
Ped.
216
217
60
Pno.
Ped.
218
219
molto rall.
62
Pno.
Ped.
221
222
64
p
Pno.
Ped.
224
226
227


67
♩ = 50
Pno.
Ped.
230
231
233
71
16
pp
Ped.
234
237
240
243
246
78
250
254
258
262
266
269
84
273
277
281
285
289


89
Pno.
Ped.
293
296
299
302
93
305
308
311
313
rall.
97
mf
317
320
323
326
101
329
333
337
341


Very slow ♩ = 20
105
Pno.
pp
Ped.
345
346



III


24
Pno.
Ped.
mf
ff
pp
ff
tr
25
27
29
30
31
30
32
33
34
3
35
ff
39
43
39
mf
ff
46
47
48
49
50
51

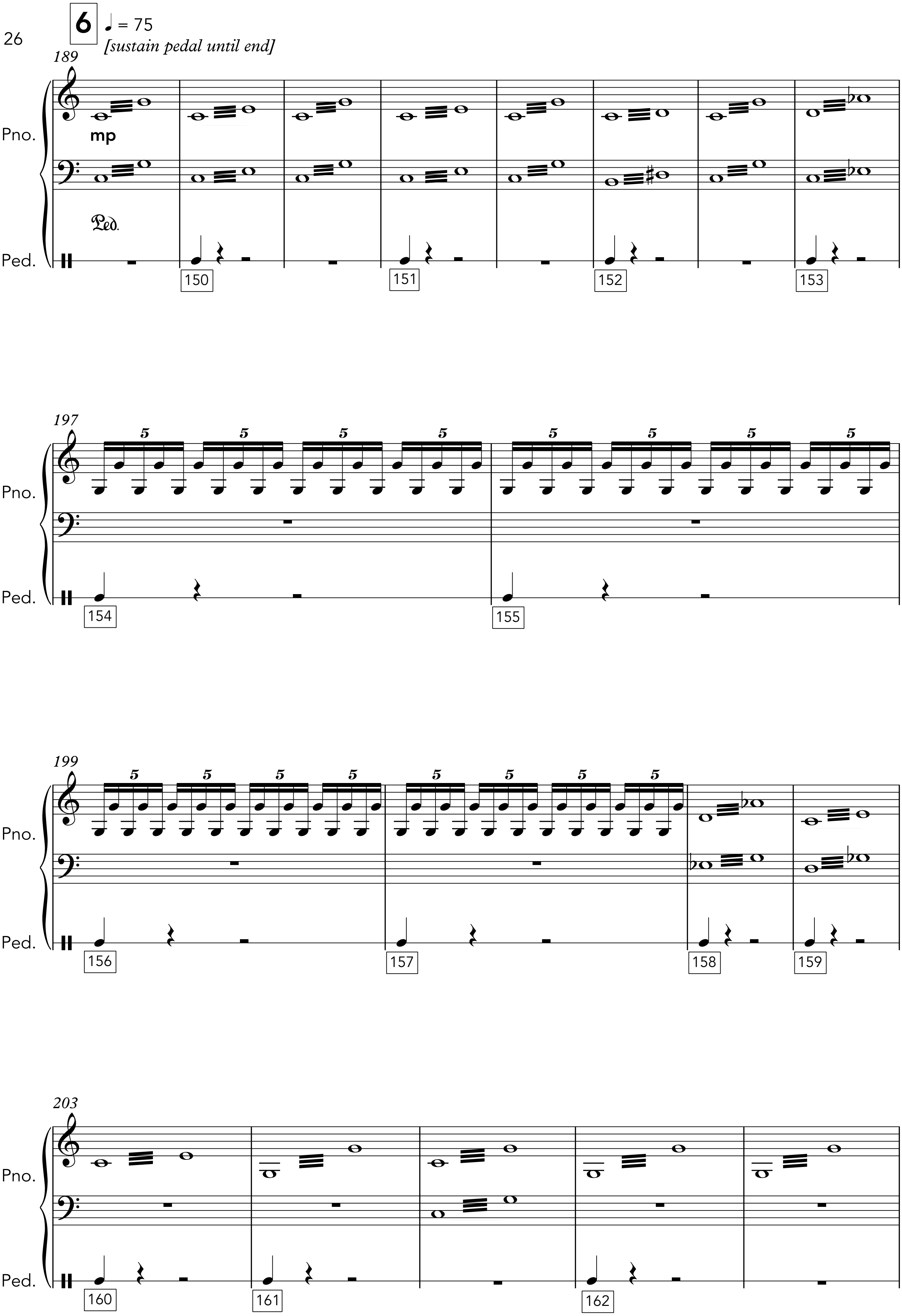

46
Pno.
Ped.
52
53
54
55
56
57
58
55
Pno.
Ped.
59
60
61
62
64
65
62
f
ff
Pno.
Ped.
66
67
68
69
70
71
72
70
f
ff
Pno.
Ped.
73
74
75
77
78

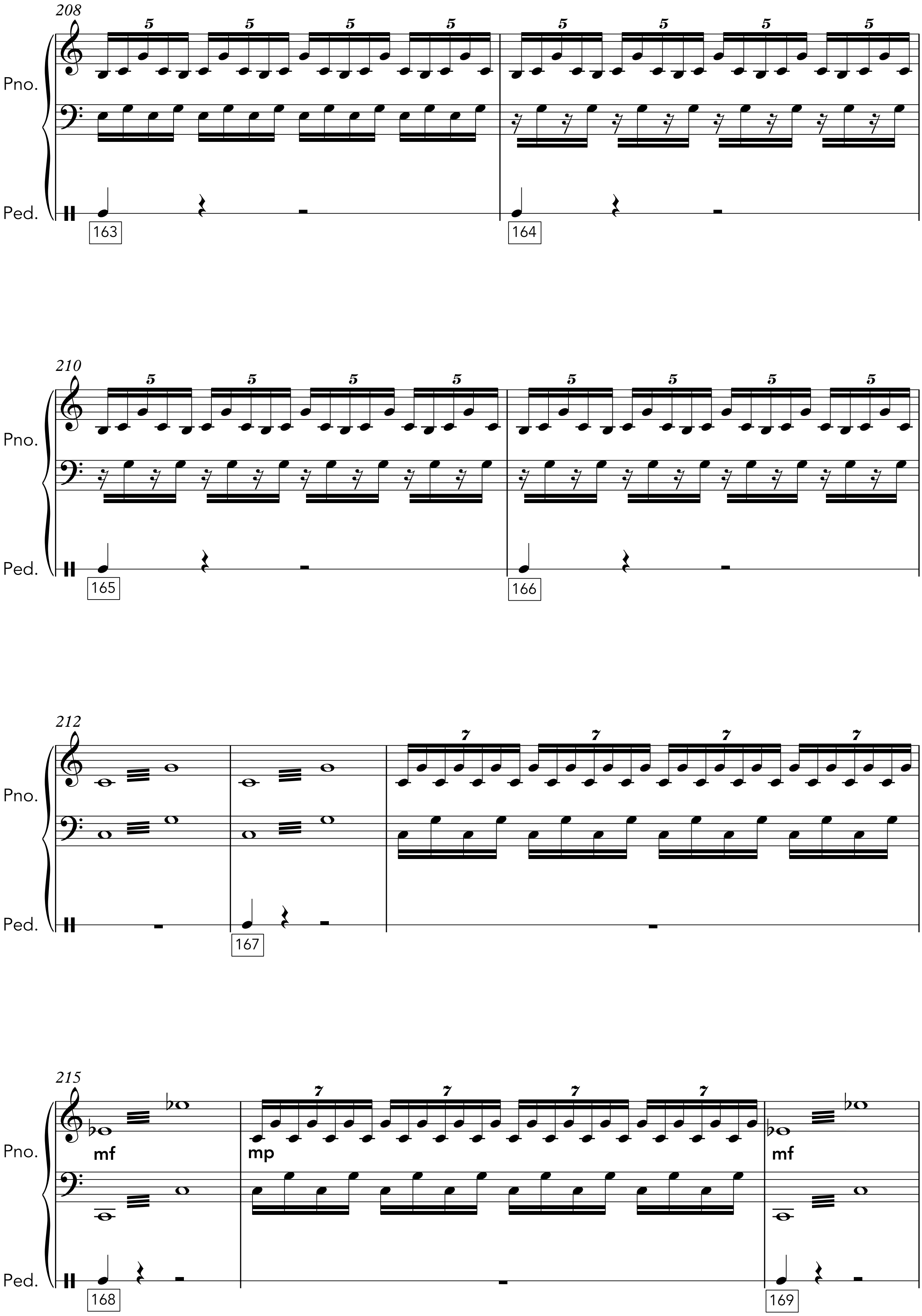

4
Pno.
Ped.
p
pp
mf
79
80
81
82
83
84
85
86
87
88
89
90
92
93
94
95
96

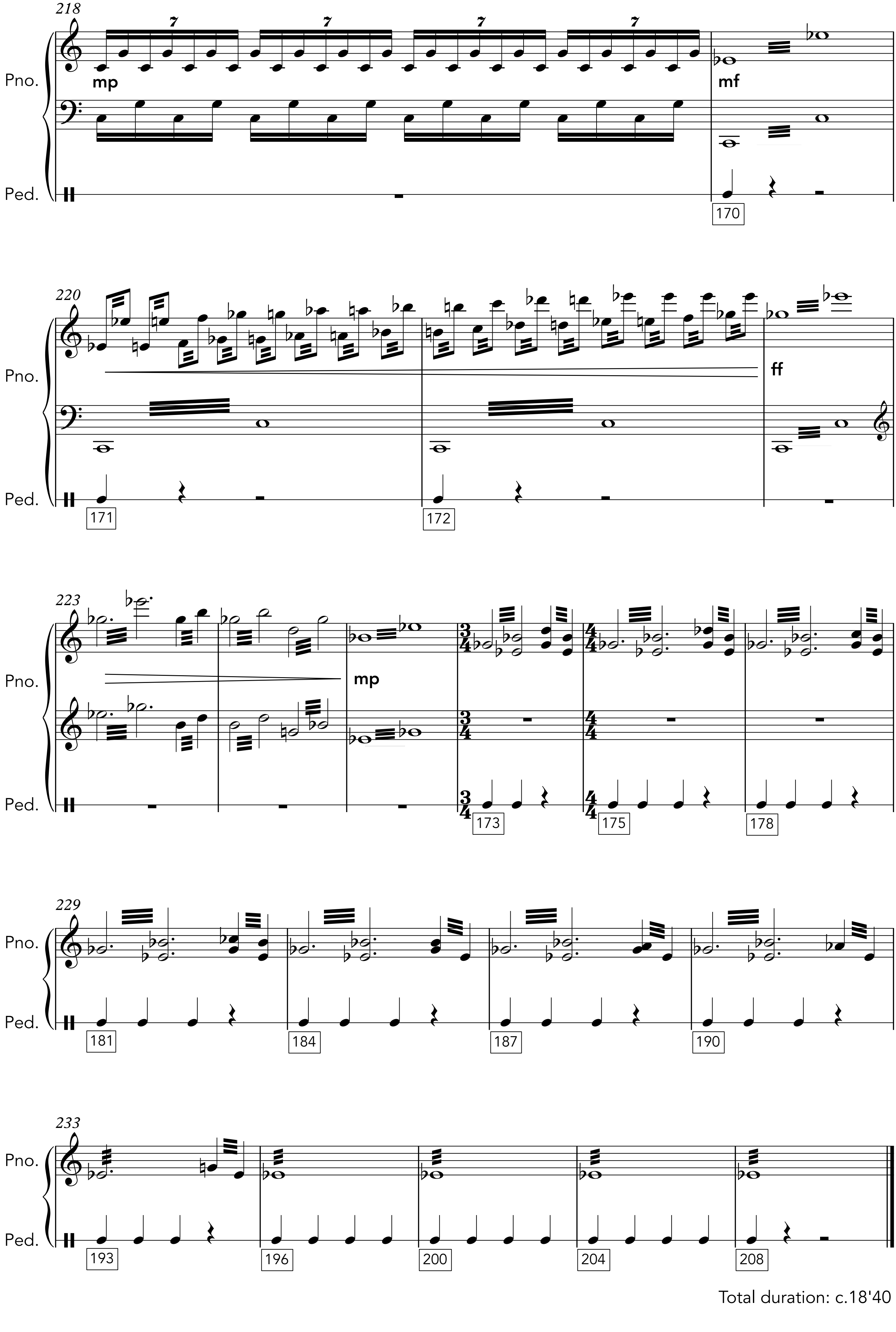

98
Pno.
Ped.
97
98
99
102
pp
mf
p
100
101
102
103
107
pp
mf
p
104
105
106
107
108
112
pp
f
p
f
109
110
111
112


117
Pno.
Ped.
pp
f
113
114
115
116
117
118
119
120
126
121
122
123
124
125
133
mp
5
p
f
126
127
128
129
130
142
131
132
133
134
135
136


152
Pno.
Ped.
p
mp
137
138
139
140
141
161
142
143
144
145
171
146
147
148
179
149


6
♩ = 75
[sustain pedal until end]
189
Pno.
mp
Ped.
Ped.
150
151
152
153
197
5
154
155
199
156
157
158
159
203
160
161
162


208
Pno.
Ped.
163
164
210
165
166
212
167
215
mf
mp
mf
168
169



Total duration: c.18'40