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Co-composition processes:

Form, structure and time across sculpture and sound

Volume I

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Doctor of Philosophy
The University of Edinburgh
2018

Declaration

I declare that this thesis was composed by myself, that the written and practical work contained and discussed herein is my own, except where explicitly stated otherwise in the text, and that this work has not been submitted for any other degree or professional qualification.



Eleni-Ira Panourgia

27 May 2019

Abstract

This practice-based research employs sculptural and sound practices, and their mediation through representation, notation, technologies and performance, to develop an innovative compositional process named *co-composition*, in which physical and sonic material can be concurrently produced, rearranged and transformed.

At the core of this thesis is a multi-layered mode of thinking, informed by an understanding of emerging morphologies and the relationships formed between and across the two modalities of sound and sculpture. Taking as starting point materials and their qualities, while engaging with aesthetics and theories of minimalism and sound studies, this research seeks to introduce a co-compositional mode of creative and critical engagement, as the main research tool. Central themes are action, process, trace and time.

Moving beyond an approach of forming analogies between modalities, this research explores a mode of navigating across dimensions of sculpture and sound through a dialogue between theory and practice. The methodological approach is reflective and generative, borrowing from both traditions to develop new methods through practical exploration which emerge as part of the research process. Furthermore, analytical tools and technological mediation are employed to inform and expand how co-composition takes place in a solo environment and how this process is experienced by both the artist-performer and audience.

The thesis comprises a series of practical works and experimentations on co-composition, and a written text, which is critically engaging with the concepts and the progression of the research.

Lay Summary

This practice-based research explores the combination of sculptural and sound practices with the aim to develop an innovative creative process named *co-composition*, in which physical-sculptural and sonic material can be simultaneously produced, rearranged and transformed. This objective is achieved through a dialogue of theory and practice that is based on the relationships between and across sculpture and sound. The research centres on materials and their qualities, and the creative process engages with aesthetics and theories of minimalism and sound studies to introduce a co-compositional mode of thinking and making, as the main research tool. Central themes are action, process, trace and time.

Moving beyond analogies between sculpture and sound, this research explores a mode of navigating across the two in a live and performative way. Bringing together methods from both traditions this research develops new ones, specific to this topic. Analytical tools and technologies are used to support the solo environment of the proposed practice and to inform and expand how co-composition is manifested, and how it is experienced by both the artist-performer and audience. The thesis includes a series of practical works and experimentations, and a written text, which reflects on the concepts and the progression of the research.

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In memory of Thimios Panourgias

Chapter 1

Prologue

1. Prologue

This practice-based research focuses on the combination of sculptural and sound practices. It involves sculptural practice through the making of objects from materials such as wood, steel, marble and explores sound and its transformation through object-material-action relationships. Sound is approached in relation to physical material manipulation at times regarding its structure and at times its texture through scoring processes, real-time and non-real-time sound processing and sound synthesis. The core of this research is the development of a process, named *co-composition*, in which such physical and sonic material can be concurrently produced, rearranged and transformed.

This research is a continuation of my previous studies. My music education began at an early age, which along with growing up in a family of sculptors and being trained as sculptor, contributed significantly to combining the two in my later artistic practice. The first exploration and experimentation on the subject was realized during my previous studies in Athens School of Fine Arts and the École nationale supérieure des Beaux-Arts de Paris through solo and collective multimedia and installation works. This led to introducing a multi-modal aesthetic in my work that involved movement, animation, sound and sculptural forms. The developing interactions between these modalities, their combined, complex morphologies and the relationships formed contributed in identifying new paths of inquiry and acted as catalysts for undertaking this research.

This thesis centers on a multi-layered mode of thinking concerning the proposed creative process and the development of an understanding of emerging morphologies and the relationships formed between and across the two modalities of sound and sculpture. This mode of thinking is based on materials and their qualities, as well as the artistic decisions realized during the creative process. My focus centers then around the process and material traces rather than a final object, drawing from minimalist traditions, process art and performance. Processes, morphologies and relationships between the multiple

elements of co-composition are questioned through experimenting, analyzing and reflecting based on theories and mediation.

Practices that employ various ways of combining the use of three-dimensional objects, with physical manipulation of materials and sound are particularly relevant to this research by providing conceptual and methodological tools for the understanding and development of co-composition. Aspects of minimalism, process and processual art, performance art, and sound practices inform my exploration and contribute to the formation of a new contextual background for situating co-composition.

1. 1 Position, Aims and Methods

My intention in this research is to combine the two artistic modalities of sculpture and sound. I work in the area of minimalist and process-based sculpture, with an interest in the actions of making, the clarity in the geometry of sculptural objects and their material qualities. These objects concern irregular polyhedrons presented as unitary forms, which focus on relationships between their sides¹. I am exploring ways for working with the one modality informed by aspects of the other. I am looking at the direct response of the materials to my actions and in mapping the actions of my making in ways that can inform new actions through sound. I am interested in the texture and time of sound, in approaching sound from a sculptural perspective, thought “through the materials of their making...the physical materials that create the sound-producing event” (Kelly, 2018). I am examining how sound could be related to sculptural making processes and three-dimensional objects and how these two can be integrated into one practice. I am employing methods of notation, graphic, verbal and

¹ Minimalist sculptor Robert Morris discussed such relationships over a range of levels of simplicity and complexity, and mentioned that “simplicity of shape does not necessarily equate with simplicity of experience. Unitary forms do not reduce relationships. They order them. If the predominant, hieratic nature of the unitary form functions as a constant, all those particularizing relations of scale, proportion, etc., are not thereby cancelled. Rather they are bound more cohesively and indivisibly together” (Morris, 1993, p. 8).

traditional Western notation, sound processing and live performance setups, aiming to create crossings from one modality to the other. To denote the particular relationship between sculpture making and the sounds produced by physical material manipulation I am using the term 'intrinsic sound'.

I focus on the nature of the materials and the processes of making through what painter Paul Klee described as "genesis, growth, essence [...] form as movement, as action, as active form [...] Form is the end, death. Form-giving is movement, action. Form-giving is life" (Klee, 1973, p. 269). Klee focused on the process of making itself, on the activity of composing, on the actions that generate the work. Following this strand of thinking, I explore my actions of making sculpture in a temporal manner, through sound recordings from the environment of the workshop in order to understand the actions' outcomes and "energetic characteristics" (Croft, 2007, p. 60). In my practice, processes and concepts are evolving and transforming as the one is informing the other and jointly, in both modalities. My aim is to explore how aesthetic decisions could be articulated from one medium to the other within a single artistic process. I am looking then at material through traces of material manipulation; what anthropologist Tim Ingold named their "stories", meaning "what they do and what happens to them when treated in particular ways" (Ingold, 2013, p. 31).

The aims of this research are:

- To engage critically and contribute to processes and ontologies of contemporary sculpture and sound practices.
- To deepen the understanding of sculpture making processes that involve the use of physical materials and sound, and of sound practices that use physical material manipulation as a process for producing sound.
- To consider sound as an intrinsic aspect of sculpture making and explore how it could inform the creative process.
- To investigate the potential of the proposed co-compositional creative practice, and to facilitate its understanding.
- To develop artistic methods for the proposed process of co-composition.

- To question the understanding of knowledge and meaning that is created through such co-compositional processes.

The methodological approach of this practice-based research is generative and reflective. The theoretical exploration undertaken is reflected through the practical work and vice versa, creating the path of this research journey and questioning the outcomes at each stage. According to Robert Nelson, in practice-based research “critical reflection on process is an integral part of the research inquiry, as it might well be in the making of artwork” (Nelson, 2013). Carole Gray and Julian Malins discussed the aspect of reflexivity informed by Schön’s concept of “reflection-in-action” as a way for reconsidering and “reshaping action while we are doing it” (Gray and Malins, 2004, p. 22). Candy and Edmonds characterized the “‘process of practice’ as an integral part” of practice-based research methodology (Candy and Edmonds, 2018, p. 65). Quoting Frederick Steier, Gray and Malins stated that the activity of reflection-in-action concerns a form of awareness and understanding of research by “telling ourselves a story about ourselves” (Steier, 1992, p. 3 as quoted in Gray and Malins, 2004, p. 22). Scrivener mentioned that according to Schön, this “entire process of reflection-in-action which is central to the ‘art’ by which practitioners deal with situations of uncertainty, instability, uniqueness, and value conflict”² (Scrivener, 2000). Through an example of contrast between theory and craftsmanship, Ingold referred to visual art writer Peter Dormer and curator-theorist Glenn Adamson and questioned the space between making and thinking:

We cannot make the future...without also thinking it. What then is the relation between thinking and making? To this, the theorist and the craftsman would give different answers. It is not that the former only thinks and the latter only makes, but that the one *makes through thinking* and the other *thinks through making*. The theorist does his thinking in his head, and only then applies the forms of thought to the substance of the material world. The way of the craftsman, by contrast, is to allow knowledge to grow

² Scrivener described the structure of reflection-in-action as: “the practitioner finds that problem cannot be solved as it has been initially set, so the framing of the problem must be surfaced and criticised, and the problem reframed: a way of shaping the situation to a new frame must be found. The reframed problem becomes the basis for experimentation to discover what consequences and implications follow from it, and the situation is made to fit the frame through moves that adapt the situation to the frame” (Scrivener, 2000).

from the crucible of our practical and observational engagements with the beings and things around us (Dormer, 1994; Adamson, 2007). This is to practise what I would like to call an *art of inquiry*. In the art of inquiry, the conduct of thought goes along with, and continually answers to, the fluxes and flows of the materials with which we work. These materials think in us, as we think through them. (Ingold, 2013, p. 6)

My position in this research stands in-between the two approaches outlined by Ingold; I am considering “*the act of making as a form of critical reflection and theoretical inquiry*” (Pérez, 2011, p. 379). The artistic practice in question involves thinking through materials, their properties and qualities, while responding to the employed processes, concepts and methods, as well as theorizing through them in relation to other traditions and theories. Practical explorations are undertaken to understand the evolving processes of co-composition; as articulating “knowledge takes the form of statements *about* the known, personal knowledge both grows *from* and unfolds in the field of sentience comprised by the correspondence of practitioners’ awareness and the materials with which they work” (Ingold, 2013, p. 111).

The tools of this research are embedded in and emergent from critically reflective sculptural and sound practices. The methods used are both creative and analytical, and further reconsidered and designed for this specific topic; touching upon what Gray and Malins referred to as “personal construct methods – making sense of ourselves in our world” (2004, p. 30). The chosen methodology includes exploration through practical experimentation with materials and creative processes, reflection-in-action and observation – both as a maker and from the audience’s perspective, modelling and mapping, reflective documentation through filming, recording and writing, research journals and note-taking during the creative process (Appendix 1, pp. 101-103), as well as the review of relevant literature and practical works (Gray and Malins, 2004, p. 30; Candy and Edmonds, 2018). Such methods contribute to providing transparency in the research process through the systematic documentation and analysis. According to Sophia Lycouris (2000), “documentation can be understood as both a record and a tool of making decisions about the nature of the work”.

I am exploring the questions of this research through the development of forms of notation, sculptural objects and sound pieces, performance setups, their rehearsal, documentation and public realization. These are complimented by qualitative research methods of observation and questionnaire-based interviews, named by Gray and Malins as methods of “exposition and peer feedback/review” (2004, p. 30). Performances are considered as experiments for exploring what co-composition might be. Software devices were developed for exploring co-composition. By employing what Gray and Malins called methods of “observation and related notation” and “visualization-drawing” I explore visual representations of both modalities as a method for co-composing (ibid.). I have been using visual and textual glossaries in the form of digital repository through an online blog (Appendix 1, pp. 104-108).

As part of this study, I undertook archival research in Paul Sacher Foundation and Tinguely Museum’s Archive in Basel, Switzerland, for reviewing works and compositional processes that combine sculpture and sound, graphic scores and composition sketches (Appendix 3, p. 143). This visit was made possible by the Postgraduate Research Expenses Fund of Edinburgh College of Art. I also completed advanced training of the software AudioSculpt in IRCAM in Paris, France, supported by the Digital Scholarship programme of the College of Arts, Humanities and Social Sciences of the University of Edinburgh.

My practice is evolving through the review of other works, both theoretical and practical, to inform and direct the investigation throughout the process of this research. As a framework for thinking about co-composition is the notion of process, which is viewed from mainly an artistic perspective but also in a theoretical level, and exists as a thread in this thesis and in the practical work. Thinking in a co-compositional manner became in itself a method, a way to navigate through the complexity³ of including multiple modalities in a solo

³ In the words of Roderick Lawrence, “dealing with complex subjects...it is necessary to shift from mono-disciplinary to interdisciplinary and transdisciplinary concepts and methods” (Lawrence, 2010, p. 126). In this research, practices, methods and traditions from sculptural and sound contexts are brought together for generating new knowledge and practical outputs.

creative practice. The research process toward co-composition has been intensively self-reflexive with regard to the interaction between the two modalities – both being produced and controlled in a solo environment. This state of interdependence introduced challenges due to its multi-tasking and multi-skilled nature. In pursuing an understanding about sculpture through sound and about sound through sculpture, tensions between the two were introduced and were further interwoven within the research process. Skills were developed and adjusted according to such challenges as the research progressed. Ways for navigating between and across the two modalities-traditions draw from interdisciplinary approaches of “creating common ground”⁴ between the two for generating what Repko, Szostak and Buchberger discussed: “a more complete understanding of the problem by integrating...elements of competing concepts, assumptions, theories, or methods” (Repko, Szostak and Buchberger, 2017, p. 170).

During this research, my creative practice has evolved in many ways, which are articulated through this thesis. The writing of the thesis is informed by the practical work and reflects critically, the path of this research. It is itself a method, which provides with an apprehension of the research topic and of new knowledge. Sociologist Patricia Leavy stated that the relationship between art practice and textual expression formed a condition of “hybrid or ‘third space’ created as art and inquiry” (Leavy, 2015, p. 245). This thesis involves the communication of the “knowing how” mentioned by Donald Schön (1983) and further discussed by Gray and Malins (2004, p. 22) and more recently, by Candy and Edmonds (2018) through a dialogue with theory. Writing is happening in a chronological yet co-compositional manner, because practice and writing have shaped each other during this research.

⁴ In bringing together Newell’s with Clark’s and Bromme’s definitions of “common ground”, Repko and Szostak stressed that “common ground is that which is created between conflicting disciplinary insights, assumptions, concepts, or theories and makes integration possible” (Repko and Szostak, 2016, p. 18 as quoted in Repko, Szostak and Buchberger, 2017, p. 169). It is not my intention here to deepen this exploration from a cognitive perspective, but to recognize the influence of such an interdisciplinary take within co-compositional thinking and my navigation across the two traditions.

1.2 A Note on Terminology

As this inquiry is informed by two different traditions – these of sculptural and sound practices – the complexity of the notion of co-composition creates a challenge in the way it is articulated. Terms such as composition, object and notation bear different meanings within each tradition⁵. In this part, I briefly mention the use of relevant terms and my understanding upon which I wish to expand later in this thesis. Thinking about how to express verbally the co-compositional process, its functions and characteristics, I wish to draw attention to the artistic decisions taken in real-time, during the process of the proposed type of work. For this, I chose the term *co-composition*, which aims to describe the act of generating, rearranging and transforming jointly, sculptural and sonic material. Co-composition concerns the objective of this research and it is considered as a consequence of the outcome.

Composing is regarded as the shaping of something in time, as making and structuring. Structuring signifies “how a thing is put together” (Morris, 1993, p. 11) and reflects on what David W. Bernstein noted about indeterminacy in Cage’s work: “a composition is no longer an object, but a process through which the performer creates a piece” (Bernstein, 2015, p. 557). Composing is also viewed in a sculptural context as both visual and “functional” composition (Tucker and Monte, 1969, p. 27); functional as bound to physical material properties such as in terms of gravity, and visual concerning its appearance (George, 2014; Morris, 1993). Composer Eva Reiter, considered the activity of composing “in itself, a ‘state’”:

...working with sound material and recognising the quality of the perception that is immanent to the particular material. It comprises an “understanding of listening” as a

⁵ This is discussed by Repko, Szostak and Buchberger (2017, p. 243) as “working with concepts” in an interdisciplinary manner, “how the *same concept* may have different meaning when used by different disciplines within the context of the *same problem*...distinguish between cases in which...different concepts refer to *quite different things* and cases where different concepts have *overlapping meanings*...From these, it is often possible to identify one concept that can be modified by redefining it. This interdisciplinary move brings out its common meaning, making it applicable to different disciplinary texts and contexts.”

multi-layered phenomenon and the recognition of one's own preconditions and attitudes. This refers to the insight and the questioning of one's own perspective, which entails the expectation and the desire of the potential "sound-to-emerge". (Reiter, Rutz and Nierhaus, 2015, p. 61)

In bringing together the two modalities, my approach is informed by sculptor and composer Oscar Wiggli, who considered composing as "...structuring the time that flows" and focused on the temporal aspect of both sculpture and sound (Keller et al., 2010, p. 24). In this research, co-composing expects one modality to inform the making of the other. The use of this term also aims to expand and specify the notion of crossing-modalities – composing across modalities in this proposed context as discussed by sound artist Mike Blow (Blow, 2014).

Object in this research, is a notion that refers to the outcomes of sculptural processes. Artist Erick Beltrán suggested that "an object...can be understood as part of a series of operations..." (Beltrán, 2014). The meaning of *object* has been shifting throughout the research at times informed by minimalist notion of objecthood⁶, and in other moments embracing process and performative approaches. Sound is not considered here as an object but an event; what composer Agostino Di Scipio discussed "as a phenomenon of human experience, sound is never really object and is always event. We can always attend to it as the audible manifestation of relations and interactions in the space-time unity of experience, in the here-and-now"⁷ (Di Scipio, 2013-14 as quoted in Solomos, 2014, p. 2). During the first stages of the research, *form* referred to the way something is shaped such as the geometry of the sculptural objects. Throughout the progress of this inquiry, the meaning of form shifted to the process of creating relationships and interactions between the modalities, referring in this way to

⁶ Robert Morris characterized *objects* "generally small in scale, definitively object-like, potentially handleable, often intimate" (Morris, 1993, p. 25). Quoting Donald Judd's comments on his own work, art historian Michael Fried observed that "the shape *is* the object: at any rate, what secures the wholeness of the object is the singleness of the shape" (Fried, 1998, p. 151). Marc Botha brought both approaches together by claiming that "minimalist objects...clarify questions of form, scale, and process, constituting works that evade the usual mimetic economy of art – the imperative to reflect or represent reality – focusing instead on immanence itself" (Botha, 2017, p. xvi).

⁷ From Chapter 3 onward, this approach to sound is viewed in relation to what Kendall described as an "...embodied basis of 'event', the application of bodily force (typified in the manipulation of an object) serves as the embodied basis of causality" (Kendall, 2008).

how these evolved in their combination: “not a condition, but the result of an ongoing process” (Müller, 2017).

The term *process* in this research, refers to a situation during which, series of actions are realized for the making of sculptural and sonic material. Process centers on temporality, the notion of liveness, and fluidity, and it is approached from both physical and conceptual perspectives drawing from works of process art and performative approaches⁸. Process was defined by composer and media artist Roger Alsop as “something that the maker is in when making” (Alsop, 2011, p. iv), which is directly related to Reiter’s “state of composing” (2015). The term process also aims to debate the distinction between the performance of an already composed work as the output of a process and the process as the work itself, in terms of real-time decisions, of nowness (Hoffman, 2012).

Throughout the process of this research, the term *notation* has been problematic concerning its scope and function across sculpture and sound, which ranged from scoring processes, to graphic representation, drawing and graphic notation, as well as verbal notation as instructions. Notation functioned both in a post-composition manner and as a tool for initiating composition. Post-compositionally, it has been concerned with communicating already composed ideas and not with the process of composition in real-time; to initiate the creative process, it has been used in a way similar to how sculptor Richard Serra has used verbs to define actions which generate sculptural objects in *Verb List* (1967-68). Serra’s verbs exist in a list, which has become an artwork in its own right. In Chapter 2, I address notation from the perspective of scoring processes and graphic notation, as a tool that contributes to the formation of analogies between three-dimensional objects and sound. Verbal notation is used in Chapters 2 and 4 to describe the actions of my making and the sounds produced echoing Richard Serra’s *Verb List* and Oscar Wiggli’s verbal scores⁹. I further expand upon this

⁸ Greg Pope’s work *Cipher Screen* as a “reductive physical process” (Griffith, 2010) and Serra’s *Verb List* as a conceptualization of process (Philips, 2012).

⁹ Wiggli’s verbal scores included verbs that describe sound qualities and refer to actions that produce them (Keller et al., 2010, p. 120).

approach in Chapter 5 through ideas of instructions, which are incorporated in a computer programme for enabling interactions among materials-actions-processes. I consider notation as a tool for the generation of new actions and material ¹⁰; as an artistic tool that serves within the creative practice and not as a tool for the communication of the work to other performers.

Mapping refers to the establishment of analogies and select relationships from sculpture to sound; what Roger Alsop defined as “the association or translation of information presented in one form to information presented in a different form” (Alsop, 2011, p. iv). The level of control and precision of mapping can vary. In this research, mapping happens at a range of levels, in a more flexible way through analogies, to an approach of parameter mapping. In Chapter 2, I explored analogies based on ideas of notation and *calculation* ¹¹, whereas parameter mappings are explored in Chapter 4 through the practical exploration in *Digital interactions*.

The above discussed terms are intertwined with each other and share qualities highlighting the tight relationships, which exist among the elements of co-composition.

1.3 Background

The contextual background of this research is brought together from a range of artistic practices and theories and evolves along the progress of the research directly informed by the practice. Drawing from minimalist and post-minimalist practices and theory, process and performance art, sound art, sound performance and installation, aspects of generativity and interactivity, together with process-

¹⁰ Drawing from Cooke’s reference to *Verb List* (by quoting Rosalind Krauss) as “the transitive verbs function as “generators of art forms”” (McShine and Cooke, 2007, p. 77).

¹¹ Marc Botha defined the notion of calculation as a “quantitative expression of minimalism...which manifests principally in terms of seriality, incremental repetition and self-referential expansion” (Botha, 2017, p. xvi).

and material-related theories, and elements of sound studies and liveness, this research aims to create a new contextual area for exploring co-composition. Within this diverse area of inquiry, the discussed theoretical and practical works are viewed from a range of perspectives: at times from a sculptural viewpoint, at times from sound and performance angles¹². The following section provides a brief, introductory outline into the contextual path of this research, which is further expanded in the next chapters.

1.3.1 Minimalist trails

Minimalist theory and aesthetics of minimalism are revisited from a co-compositional position. These exist as threads throughout my work and are approached from a range of angles and historical time in this thesis, as “a general and pervasive condition”¹³ (Fried, 1998, p. 149). Central to my sculptural practice are the notions of self-reference, reduction and process, which were explored by minimalist artists in the 1960s and still are, in a contemporary post-minimalist context. Writer and art historian James Meyer noted that minimalist works do not imply any other elements apart from their existence in the physical world and present “materials appear as materials” (Meyer, 2000). What has been discussed by art theorist Marc Botha as “autotelic”:

¹² Repko, Szostak and Buchberger (2017) discussed the combination of different perspectives in the exploration of an interdisciplinary topic and their integration as “fundamental” for acquiring new knowledge by quoting William H. Newell: ‘beyond a “single perspective; interdisciplinarity is characterized by an identifiable process that draws explicitly on disciplines for insights into the substantive focus; those insights must be integrated; and the objective of integration is instrumental and pragmatic – to solve a problem, resolve an issue, address a topic, answer a question, explain a phenomenon, or create a new product.” (Newell, 2010, p. 363 as quoted in Repko, Szostak & Buchberger, 2017, p. 38).

¹³ Botha approached minimalist aesthetics from two perspectives: a historical one in reference to the minimalist reality in historical terms, and another as “*existential modality...a way of existing in the world*” (Botha, 2017, p. 1). He argued that the combination of these two strands would generate a “transhistorical” approach to minimalist aesthetics “across the times and locations of different cultural histories” (ibid, p. 5). This thesis brings aesthetic concerns of minimalism that exist “across the times” into a dialogue with a co-compositional thinking. However, I do not approach this inquiry as a historical review of minimalism but for highlighting how my thinking is informed by minimalist ideas and how these contributed throughout the progress of this research.

A work is *autotelic* when its elements – whether sonic, verbal, visual, or conceptual – establish that the generative force which underpins the work's progress is simultaneously self-referential and self-productive. The shape of such minimalism is determined by the immanence of process to its initial material, so that what drives the work – the evolving relationships of its elements, and the progressive constitution of its form – is also its most intimate potential. (Botha, 2015, p. 761)

The main idea behind the work of this research is regarding *material as material*, which is manifested in a self-referential manner. Yet my interest lies not only at the very nature of the materials themselves, but also at the traces produced by their manipulation. The purpose of this is to focus on the act of co-composing itself and the transitions between the two modalities.

My work is informed by the way proportionality and materiality are addressed in the work of sculptor Carl Andre (Rider, 2011), Robert Morris's "simplicity" in shape and his experimentation with sound and the creative process itself, as well as the geometric variation and instruction-based art of Sol LeWitt (Meyer, 2000). These concepts are further elaborated and expanded in current practices such as in the work of sculptor Iran do Espirito Santo (Collins, 2007). His series *Corrections* are characterized by the clear geometry of the objects' shape and material transformation based on its properties and a reductive process of making (The New School, 2013). This approach informed my work in terms of pursuing clarity "through processes of reduction", while exploring material qualities under co-composition's interdependent state (Botha, 2017, p. xvii). I am concerned with how sculptural "objects exist in an intermediary state", as noted by Marc Botha, with reference to their process of becoming co-composed (*ibid.*, p. 58).

Concerning sound, James Saunders discussed the serial aspects within the work of the Wandelweiser composers in relation to visual art contexts (Saunders, 2011). I explore links between the structure of three-dimensional works and sound through the notion of calculation and discuss how serial ideas lead co-composition to a process-oriented thinking, in performing the work. Following the research shift toward sounds produced by physical material manipulation, I focus on ideas of process in relation to sound based on Morris's *Box with the*

Sound of Its Own Making. I look at sound works that are stretched over time in a hypnotic, soundscape-like manner with reference to Thomas Köner's and SleepResearch_Facility's work – yet I am concerned with sound qualities specific to a process that involves physical material manipulation such as in the work of composers Oscar Wiggli, Nicola Giannini, Mark Applebaum and Test Dept group.

Following this brief introduction and contextualization of this research in relation to minimalist theories and practices, two main strands can be distinguished: a temporal approach through sound and performance, and a visual that concerns shape and materials of three-dimensional sculptural objects. In untangling co-composition my aim has been to merge the discussed notions and ideas through both strands as a mode of thinking behind co-composition.

1.3.2 Process and performative approaches

In looking at the process of making through actions in relation to materials, my exploration shifted toward a time-based perspective, which ranged from action painting and process art to performance art, as well as sound performances. Paul Klee's writings on process were discussed by Tim Ingold who argued that "the processes of genesis and growth that give rise to forms in the world we inhabit are more important than the forms themselves" (Ingold, 2009, p. 91). This mode of thinking informed the merging of processes and materials with the above-mentioned aspects of minimalist practices. This discussion is further expanded through a reflection on Ingold's theoretical work concerning material and historicity, reflection-in-action, tools and skill as an open-ended situation.

Drawing from Robert Morris's *Box with the Sound of Its Own Making*, I am interested in the relationship of object and the sounds produced from its making, and the role of sound in that process, which introduced a way to communicate the process behind the final object. Ulrich Rückriem's work *The Last Fifty Years* (2015) was about processes of making that have been happening for the last fifty years of his career by exhibiting materials and tools he has been using (Churner,

2015). Barry Le Va's early work was focused on process, both from a performative perspective and as Rückriem, exhibiting the remaining of it. His work *Switch* (1967) part of his *Continuous and Related Activities; Discontinued by the Act of Dropping* (1967) and *Shatterscatter* from the *Series of Layered/Pattern Acts* (1968-1971), employed a thinking of materials in space as a result of a process. Building upon an "aesthetic of labor and production", which according to art historian Benjamin Heinz-Dieter Buchloh (2007, p. 56) was present in Richard Serra's work, I am examining how physical material qualities and actions inform co-composition.

I am looking at a process-led manipulation of material and the constant flow of events within my making through a performative approach. New York-based B-Team realized performances of live manipulation of hot glass exploring "the beauty of the raw material" and the temporal aspect of making (Adamson, 2010, p. 54). Their actions have been described by artist Roddy Hunter and curator Judit Bodor to operate "in spaces of 'in-betweenness' and 'overlap' and emerges from a range of artistic and cultural perspectives" (Hunter and Bodor, 2012, p. 65). Common ground between performance art and music performance elaborating acts such as in the work of composers John Cage, Hans-Joachim Hespos, Mark Applebaum, and the group Test Dept could be found through what Beth Hoffman mentioned about *live* as a "particular set of ontological parameters – happening in the here and now, presentness – and 'time' functions as a fundamental dimension of this ontology" (Hoffman, 2012, p. 37).

The approach to physical-sculptural material discussed above also applies to the way I work with sound. Within my practice, I approach sound in the same way as physical material by looking at aspects of texture and source. As Hofer stressed,

...imagining and conceiving of sound as tactile, rather than utilising or developing a musical language/theory, and treating sound as a material, like cloth, film frame, paint or sand, evokes different associations and practices for creators and listeners. (Hofer, 2014, p. 298)

I am interested in the way sound is produced through material processes such as in works of media artist and filmmaker Greg Pope's *Cipher Screen* and *Scoreline*, composer Mark Applebaum's work *Echolalia* and artist Peter Zegveld's *Scherzo Mechanica*. London group Test Department used actions of metalwork in a sound context:

Their records [Test Dept.] cross-pollinated innovative proto-sampling techniques with an aggressive percussive bombardment wrung mostly from non-musical metal objects retrieved from scrapyards and disused power stations. (Peacock, 2015)

This research draws from, and expands on compositions of extreme/extended techniques and continuously changing dynamic contrasts such as Hans-Joachim Hespos's *Tightrope Dance, -Z... ()* and *p s i* (Hespos, n.d.) and in the performances of Test Department (Test Dept, 2014). Greg Pope's performance work *Cipher Screen* involved a reductive physical process, with which he manipulated physical and sonic material, simultaneously. Sound was produced and transformed through the manipulation of loops of leather – yet it was designed by a collaborator (de Bruyn, 2013). In his work *Inner Out* (2015), Nicola Giannini worked with blocks of ice and live sound that was produced from performative actions and the tools used, as well as the material state and properties during the performance (Giannini, 2015).

The notion of process is explored in this research in a range of levels of control and complexity; from decisions in real-time during the making to setups and predefined instructions that control parts of the process and the way material is being transformed. I am discussing aspects of generative (Galanter, 2003) and processual art (transmediale, 2010; Damm, 2018) for controlling my process through the use of instructions and software. Aspects of liveness and intermediality are discussed based on performance art practices and theory, while aspects of instrument building and sound performances and installations, through the real-time interaction of the performer with tools-objects-custom-built instruments for producing sound. As for example, in Peter Zegveld's *Scherzo Mechanica* (Zegveld, 2014) and *ke i te ki* by Akio Suzuki and Aki Onda (The Lab

SF, 2015). Such works are structured based on actions of handling and manipulating everyday objects.

Field recording and sound design practices that are concerned with sound produced by actions of physical material manipulation such as in the work of Tim Prebble, Chris Watson and Justin Boyd, are viewed in terms of co-composition. Non-musical objects, non-traditional musical instruments and extreme-extended techniques are discussed in relation to co-composition and are expanded through interactive setups. This discussion is supported by sound studies and theories that focus on physical material manipulation as a method for making sound (Kelly, 2018). Aspects of causal listening, ergo-audition and spectromorphology, are used in this research toward an alternative interpretation of sound generated by sculptural actions.

1.3.3 Sculptural objects and sound in combination

This research looks beyond hybridity as it seeks to provide spaces for transition across the different media, and beyond creating a single form, rather an active process of thinking and making. At this point, it is worth referring to a distinction between the combination of the two modalities within a solo practice and through collaborations. This research focuses on the first strand but also draws methods from the second. Concerning solo practices that combine three-dimensional objects and sound¹⁴, Oscar Wiggli explored relationships between sculpture making and sound by reconsidering the one modality through qualities of the other (Keller et al., 2010, p. 16). He developed a range of methods in his creative process including notation (*partitions forgées, graphiques* and *verbales*), music drawings (*Sound-Lavis*), verbal scores (*Sound-Voc*) and *Sound-Reliefs* (sculptural reliefs acting as sonic ideas). Using samples from his sculpture making and sound synthesis techniques, Wiggli established relationships across

¹⁴ Kinetic sculptures that produce sound such as Zimoun's, Lye's and Jean Tinguely's work could seem at a first glance relevant to this inquiry, but as the research progressed ideas of action and response came at the core of co-composition, which made mechanical movement not directly relevant.

sculpture and electroacoustic composition. Mike Blow's work *Bleigiessen* focused on the sounds produced by physical material transformation and the sound's manipulation (Blow, 2014). However, in contrast with Wiggl's practice, Blow was not concerned with the visual/sculptural outcome of the physical material transformation. Following these two examples, another distinction could be made between a 'one-way' compositional process in which one modality is more important than the other and is developed as a response to the first, and a 'two-way' one in which both modalities are of the same importance and inform each other's making at an equal level.

Steve Roden's work included sculptures that elaborated musical systems and were developed based on "sets of self imposed rules, much in the spirit of the systematic approach of early conceptual minimalism, and then folds highly intuitive strategies into its process" (Susanne Vielmetter Berlin Projects, 2007). Marc Berghaus created sculptures, which he considered as three-dimensional notation that he used to translate the sculptures into music (Berghaus, 2011). From a similar perspective, Herndler's works *Notationsobjekt* included sculptural objects developed based on music notation (Herndler, n.d.). Tom Johnson realized a music interpretation of the work *Incomplete Open Cubes* by Sol LeWitt based on notions of equal and complete, and symmetry as a commonplace across sculpture and musical harmony (Johnson, 2015). Drawing and graphic notation have been used by composers such as Chiyoko Szlavnic, Steve Roden, Jon Sigurpalsson, Peter Zegveld and Christoph Herndler for transitions between visual and sonic¹⁵.

Existing works and methods that combine the two modalities informed my initial exploration into co-composition and their questioning led to the continuation and

¹⁵ Such analogies between spatial dimensions and sounds were informed at the early stage of this research by practices that combine architecture and music, and ideas of just-intonation ratios mapped to spatial dimensions and vice versa drawing from practices that employ such a proportional-numerical approach based in some cases on ancient Greek music theory (see for example, Barker, 2007; Biris et al., 2011; Martin, 1994; Archimusic, 2018; Morris, 1995-1996; Kagel, 1960; Zuk, 2013; Xenakis and Kanch, 2008). As the research progressed and the *process of making* became central to my approach, analogies and 'translations' across music and architecture were no longer at the core of this exploration.

development of this research toward a process-driven approach. Blow's consideration of three-dimensional objects and sound as perceived together, Wiggli's way of thinking through both modalities concurrently, and his methods for achieving to compose the one based on the other, Roden's, Berghaus' and Herndler's consideration of sculptural objects as music notation and vice versa, have created a potential that has offered a space for this research to grow further. Blow's and Wiggli's work are the closest to this inquiry, however, they do not operate along the lines of co-composition in terms of the way transitions are happening across the two modalities due to the absence of a real-time response to that joint compositional process.

1.4 Outline

The structure of this thesis follows a chronological approach that reflects the progressive development of the research journey. The terms used as chapter and section headings, are directly related to the process of this research and refer themselves to concepts and actions. *Prologue* as drawing the territory of this research by identifying its components, structuring questions and outlining challenges. *Crossing* the modalities creates common ground between the components. An inward disposition toward an exploration of sounds produced by physical material manipulation is followed by *acting* based on this mode of thinking. *Process/Procedure* refers to how a multi-layered artistic work that is performed live whilst leaving traces emerges as an articulation of methods, activities and reflection informed by both the theoretical knowledge and practice produced in the previous stages of this research. *Afterword* reflects on and writes after the process of this research. A selection of images and diagrams is included in the body of this thesis, and an appended portfolio contains additional documentation, which offers a more detailed insight to the work discussed in the text.

Chapter 2, 'Crossing modalities', gives an account of the first approach to the research topic both from theoretical and practical perspectives. I discuss the combination of sound and three-dimensional sculptures through the development of a co-compositional syntax based on notions of proportionality, seriality and actions using methods of notation and mappings. This chapter centers on the first practical explorations of this research, *Sounding Stile* and *Sides*, which involved the making of sculptural objects, the mapping of visual representations of their shape to sound through notation and vice versa. I discuss how minimalist sculpture and works that combine sound-notation-visual/spatial dimensions informed this series of explorations. I then expand the research question toward an action-oriented approach from sculpture making to verbal scoring processes through the practical experimentation *Actions in sound*. I discuss and question the approach, the outputs and the morphologies of the above explorations focusing on the relationships and tensions that are formed between the two modalities.

Chapter 3, 'Intrinsic sound', expands the topic in a new area of practice in which sound is intrinsic to sculpture. I discuss sound produced by physical material manipulation informed by the works of artists such as Robert Morris, Mike Blow, Oscar Wiggli and Greg Pope, by field-recording practices, as well as sound studies and theories of listening. I give an account of the practical exploration that involved mappings of sound recordings from the sculpture making process into animated digital 3D models. At this point, I am reconsidering the practical work presented in Chapter 2, while regarding the notion of process central to the co-compositional practice. Materials, processes and techniques are reviewed based on notions of causality and spectromorphology through the analysis of sound samples recorded in the sculpture workshop. I investigate their relationship to materials and actions and propose an alternative understanding of sculpture making through sequences of sound. A key question that arises from the first series of practical work presented in Chapters 2 and 3 is, in what ways could such mappings be introduced as simultaneous layers within the making process?

Chapter 4, 'Actions – materials – processes', focuses on the themes of materiality and process, approaching the creative practice from an action and process-driven perspective. I am reflecting on works that focus on the idea of process such as Richard Serra's *Verb List*, Greg Pope's *Cipher Screen* and Oscar Wiggli's verbal scores, which offer practical and conceptual tools for developing the understanding of structures and actions in a process-driven practice. Sound performance works that explore sound in relation to physical material manipulation are investigated from a co-compositional perspective. Discussing an 'aesthetic of effort', I refer to my decision to involve the artist's body in the creative process and consider the skilled practice in relation to physical effort¹⁶. In looking at ways for processing the sounds of the making, the series of practical experimentations in this Chapter are revisiting the notion of causality discussed in Chapter 3 in relation to actions for material manipulation. I argue that actions could function as the link between modalities and introduce a process-oriented and temporal approach to co-composition. I am further exploring actions and processes digitally, through 3D animation and sound synthesis in a processual manner. At this stage, I started thinking about co-composition through action-feedback relationships and responsiveness in a performative manner based on the transformation of sounds of working. I pursued then an understanding of sculpture making actions through sound manipulation and explored how this process of reflection-in-action would influence the decisions to follow. I further question how to develop a live co-compositional process.

Chapter 5, 'Process/Procedure: Performance', brings together what has been explored so far, through the final practical work of this research: a responsive and mediated performance of co-composition. This work engages compositional and mediation strategies to achieve the combination of sonic and sculptural modalities. I outline process and performance art, and discuss how they relate to the proposed mediated creative process. I discuss the development of this work

¹⁶ An "aesthetic of labor and production" was mentioned by art historian Benjamin Heinz-Dieter Buchloh (2007, p. 56) to describe Richard Serra's exploration of a "kind of sculpture [that] could still be credible under the conditions dictated by spectacle...insisting on a kind of bodily reinscription".

and of a co-compositional interface, as well as a performance-based approach of the research question. I give an account of the work and its co-compositional aspect, which seeks to introduce a multi-layered exploration of actions, physical material and sound, embodying elements of the previous practical work realized in this research. I question the aspect of having multiple outputs from this creative process and discuss their morphologies and relationships.

In Chapter 6, 'Afterword', I review the research journey and its outcomes. I reflect on my position in the field and mention potential developments. I discuss the impact of this research and ways in which it can be further expanded in future projects.

Appendices are presented in *volume II* and are meant to be read together with the written thesis in *volume I* as indicated through references in the main body. Appendix 1 includes further images and text: scores, graphic notation, diagrams, spectrogram analyses, photographic documentation of the performances, the sculptural objects and the making processes, installation plans and thermal imaging. It also contains questionnaires, interviews, consent form templates and the health and safety assessment for the performance series *Process/Procedure*. Appendix 2 (USB drive) includes multi-media files: videos from animated 3D models, sound files, video documentation of the creative process, software, rehearsals and performances. A list of the files can be found in *volume II*. Files are organized in folders for each section of the thesis. Appendix 3 includes published material and research activities.

1.5 A Note on Ethics

The first version of the software for *Process/Procedure* was developed with the assistance of Owen Green and Dara Etefaghi, and the second with the assistance of Dara Etefaghi; both were not specifically contributing to my research. *Digital interactions* was a project led by myself and realized in collaboration with Finbar Wheelaghan and Xue Yang who were not specifically contributing to my research.

For *Process/Procedure*, I completed a risk assessment according to Edinburgh College of Art's Health and Safety regulations, produced a consent form and information sheet for the audience (Appendix 1, pp. 31-34). Excerpts from interviews of the audience used in the written thesis are kept anonymous.

Chapter 2

Crossing Modalities

2. Crossing Modalities

...a forged form can be considered as symbol of a sonic structure. (Keller et al., 2010, p. 26, own translation)

Sculptor and composer Oscar Wiggli considered his sculptural work as a source of ideas for developing sound compositions. Analogies between qualities and dimensions of sculpture and sound were at the core of Wiggli's practice: an approach, which is associated to a mode of thinking about sound visually, and about the visual aurally. It is from this idea that I began to approach this co-compositional inquiry. During the first stages of this research, my main concern was to explore and develop methods for bringing together three-dimensional objects and sound, as well as methods that could allow their joint composition. To consider these two modalities together in a single artistic practice is therefore to think about the one through the qualities of the other. Thinking in this way led to experimenting with methods for making sculpture based on sound and vice versa, and methods for representing such transitions through forms of notation.

In this chapter, I explore a syntax across sculpture and sound through a series of practical works. I look at ways for moving from sculpture to sound and vice versa through couplings between qualities, such as shape to pitch and visual proportions to intervals, as well as by considering the one modality as the starting point for the development of the other. This exploration is informed by artistic practices, which involve graphic notation, three-dimensional notation and notation objects¹⁷, drawing or graphic representation, methods for working with sound based on sculpture and vice versa. I consider the common properties of the qualities of both modalities as a link, and I discuss ways for applying such analogies in structuring a co-compositional practice. At this first stage of the research, my work was guided by minimalist ideas of calculation, proportionality and seriality and used methods of graphic and verbal notation, graphic

¹⁷ Christoph Herndler described his work *vom Festen, das Weiche*, which used music notation in the form of a three-dimensional sculpture, as a *Notationsobjekt* (Herndler, n.d.).

representation and sculpture making processes. In this chapter, I outline the context and development of analogies, the ways they informed this practice-based research into co-composition, as well as how they have shaped the next stages of this research.

2.1 Representation as Mediation

Composer Michel Chion stated that “notation aims to solve via spatial symbolization the vexing problem of studying an object that is tied to time” (Chion, 2016, p. 215). Composer Christoph Herndler suggested that “due to the separation of form and material in most notations, these can be realized not only by means of other instruments [...] but also by non-musical media, such as dance and film” (Herndler, n.d., own translation). He spoke of three types of notation: a type that includes “purely geometric form without additional interpretation”; a type that is based on instructions concerning geometric form and material; and notation that looked at “geometric form with a specific reading and specific material” (ibid.). Following a combination of the second and third types, I began approaching co-composition through the graphic representation of sculptural objects and sounds as notation using proportionality as a commonplace. Such an approach aimed at working across both modalities based on their structure. I was interested in developing an underlying systematic organization of my material as it existed in works of minimalist sculpture and just-intonation ratios. This approach to proportionality was not only thought of visually, but it also aimed to create a situation of presenting the artwork as an object for investigation; to direct the audience focus on ideas and concepts as they appear through this attempted crossing of modalities.

2.1.1 *Sounding Stile*

Marc Botha argued that “the internal relation of parts to one another, or parts to the whole of a work, determines the internal sense of scale...[which] is often

grasped in terms of proportion” (Botha, 2017, p. 63). My interest in proportion centers around ways for organizing visual and sonic dimensions in a systematic manner and controlling relationships within the work. Carl Andre embraced visual proportions for the making of his works and also for their arrangement in space (Rider, 2011). *Sounding Stile* (2015) is a reconsideration of the sculpture *Stile* by Carl Andre (1975) (Figure 2.1) for a sound context. In this work, I look at proportionality as it exists in Andre’s *Stile* in relation to just-intonation ratios aiming to generate sonic material based on the shape and the structure of *Stile*. According to art historian Alistair Rider, Andre focused on the notion of the elemental, strongly influenced by ancient forms of art (Rider, 2011).



Figure 2.1. *Stile* by Carl Andre, Western red cedar wood, 1975 (e-flux, 2011)

Andre’s approach informed the methods used in *Sounding Stile* by introducing a system of proportions and its relation to just-intonation ratios that referred to ancient Greek sculpture and music. Archaeologist Andrew Stewart suggested that ancient Greek sculptor Polykleitos used the Pythagorean system of proportions of just-intonation ratios in his practice as a network of measurements among the various parts of the body (Stewart, 1978; Thliveri, 2013). I question whether this could be considered as an approach of sharing common compositional methods between sound and sculpture making. My interest in this method is on the way it controlled relationships between the elements of a work and not in Polykleitos’s

figurative sculptural outcome¹⁸. Such a numerical approach of musical intervals transferred into spatial dimensions, is viewed here in terms of co-composition. From a similar perspective but in a contemporary context, the composition *Trichotomy (agent, patient, act)* by Mira Calix, was a “musical response” (Calix, 2015) to Conrad Shawcross’s sculpture *Three Perpetual Chords*, a three-dimensional material interpretation of the intervals of the octave, the fifth and the fourth. This work is an example of creating analogies between three-dimensional and sonic qualities based on proportions. Composer Chiyoko Szlavnic worked with just-intonation ratios for controlling microtonality. Stressing that the ratio system contributed to structuring a “network of interrelated pitches”, she believed that it offered great levels of complexity and potential (Szlavnic, 2006, p. 5). The ratio system was also included in her work visually using drawing as starting point for the generation of sonic material (Figure 2.2) (ibid.). Szlavnic’s drawings have a strong three-dimensional element, as cubic objects are drawn from multiple viewpoints.

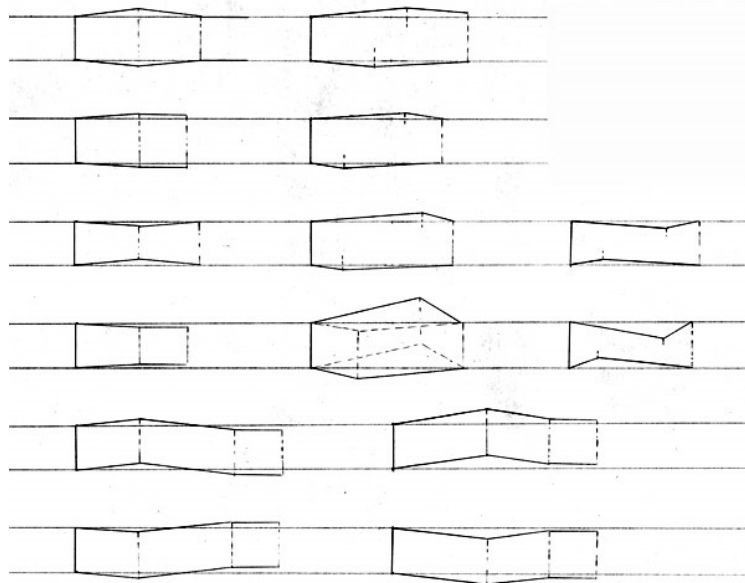


Figure 2.2. *Early Forms* by Chiyoko Szlavnic (2009)

¹⁸ As discussed by architect Tasos Biris, the Pythagorean scale was based on the proportions of the cube that are included in number four (Biris et al., 2011). The proportional relationships that exist in the Pythagorean system are derived from the number of the cube’s surfaces (six), the number of its vertexes (eight) and the number of its edges (12).

The first version of the method in *Sounding Stile* concerns the graphic representation of the four main viewpoints of *Stile*: the front, right, back and left sides. Informed by Szlavnic's approach, I developed graphic notation based on the sculpture's geometry¹⁹. This involved the drawing of the sculpture's outline for each of the main viewpoints and relating its proportions to graphic representations of just-intonation ratios. I consider then graphic representation as a form of notation for sculpture, progressing from left to right as in reading a musical staff. Following the shape's outline, each block was mapped to a voice and the spaces-in-between to pauses (Figure 2.3).

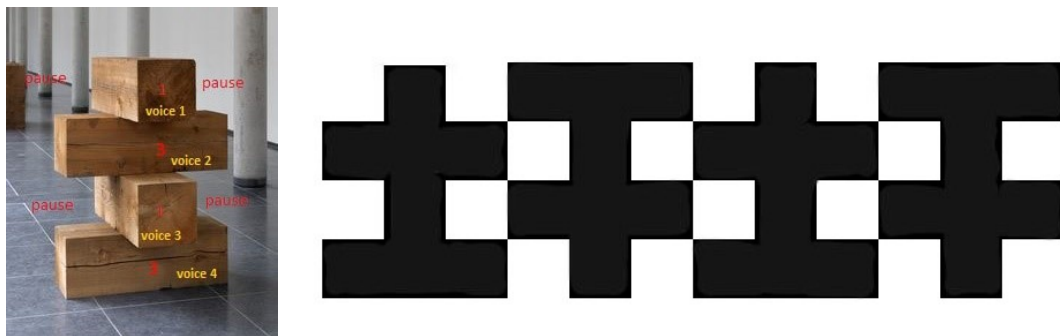
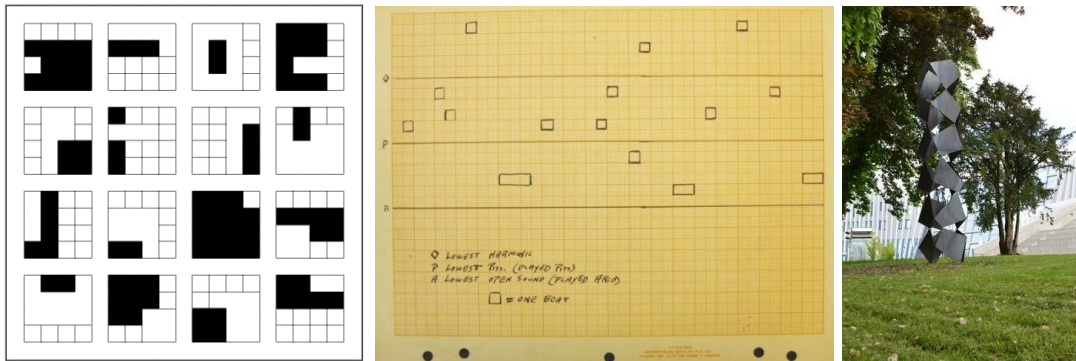


Figure 2.3. Graphic representation of *Stile*'s four main viewpoints

The overall shape of *Stile*'s wooden blocks was arranged into smaller parts based on the work *Überstreicht in Gleichen Zeiten Gleiche Flächen* by Christoph Herndler (Herndler, n.d.), which included square units as an abstraction of surfaces (Figure 2.4), and composer Morton Feldman's use of square units as rhythmic structures – to one beat (Figure 2.5) (Boutwell, 2012). In *Sounding Stile*, these two methods of notation were brought together. Each of the four cross-like shapes of *Stile* operates as one of the four main viewpoints of the three-dimensional object, while each square unit corresponds to one beat. Composer and theorist Henry Cowell discussed how ratios that generate just-intonation intervals could be used as time signatures (Cowell and Nicholls, 1996). He suggested that “the tone interval of a major third would be a time ratio of five against four notes” (Cowell and Nicholls, 1996, p. 51). Using the proportion of the longest units as a time

¹⁹ Andre's *Stile* included four identical blocks of wood of the proportions 1:1:3 placed on the ground the one above the other, alternating (Figure 2.1). *Stile*'s symmetrical structure gave the proportions of 1:3 and 1:1 to the sculpture's units depending on the viewpoint.

signature of 3/4 allowed for a rhythmic exploration of proportions, along with pitch and interval relationships.



Figures 2.4-2.6. Christoph Herndler, *Überstreicht in Gleichen Zeiten Gleiche Flächen*, score, 1998 (Herndler, n.d.) (left), Morton Feldman, undated score (Boutwell, 2012) (centre), Christoph Herndler, *Vom Festen, Das Weiche*, notation object, 2017 (Anton Bruckner Private University, 2017) (right)

Proportions in *Stile* were mapped to harmonic just intonation intervals – 1:1 to unison and 1:3 to an interval of twelfth (Pesic, 2013; Barker, 2007), as shown in the score in Figure 2.7 (Appendix 2, Folder ‘2.1.1 Sounding Stile’ file 01). In merging Cowell's and Feldman's approaches, a second variation of *Sounding Stile*'s scoring method examined note values by dividing each block of wood into square units. Each unit corresponds to one quarter (Figure 2.8; Appendix 2, Folder ‘2.1.1 Sounding Stile’ file 02).

Herndler's notation objects such as *Vom Festen, das Weiche* (2017) involved a transference of “compositional phenomena [referring to music]” to a sculptural work made from metal (Wagner, 2017, own translation) (Figure 2.6). Christoph Herndler interpreted sound qualities and sonic structures into three dimensions and regarded these as notation. *Sounding Stile* drew from Herndler's relationships between three-dimensional objects-sound-notation, however, it differed in that scoring processes were developed based on the sculptural object and not vice versa.



Figures 2.7 & 2.8. *Sounding Stile's* interval method with dotted halves (left) and with quarters (right)

Likewise, Berghaus worked with three-dimensional objects, which he regarded as notation in physical space. He stressed that the dimension of depth was an important value for the generation of “more complex musical processes” (Berghaus, 2011). In his work *Guitar Duet #2*, the dimension of depth was incorporated in the work's notation as staves of 25 lines in the form of a square. Three-dimensional objects were translated to music notation based on their shape and structure in space; an approach that was key to *Sounding Stile*. From a similar perspective, Steve Roden's *Turning Music Into Mountains* employed a system of analogies between spatial/visual and sonic values (Susanne Vielmetter Berlin Projects, 2007). This method also used musical staves and operated based on space-pitch relationships such as the height of each three-dimensional structure corresponding to pitch.

Sounding Stile's first version explored transitions from graphic notation to music notation to sculpture, and sound to graphic notation to sculpture based on proportional relationships, which introduced limitations of analogies. Finding this problematic, I took distance from proportional thinking and I directed my focus on the way Andre's wooden blocks were placed in space. Their arrangement introduced elements of seriality, which could be related to both minimalist

sculpture and music practices. James Saunders discussed the notion of seriality as it existed in the structure and organization of the compositions by the Wandelweiser composers in relation to the notion of seriality in visual arts context (Saunders, 2011). The work *3 Jahre – 156 Musikalische Ereignisse – eine Skulptur* by Carlo Inderhees and Christoph Nicolaus involved a sculpture of 96 stone cylinders “arranged in parallel in two separated groups” (Saunders, 2011, p. 505). In this work, sculpture was regarded as “a more constant element” (ibid.) whose parts informed the sonic outcomes.

Composer Tom Johnson realized a music interpretation of Sol LeWitt’s work *Incomplete Open Cubes* focusing on the concept of permutations and the notion of equal and complete in relation to symmetry (Johnson, 2015). Sol LeWitt’s process of making involved concepts of seriality, which were used by Tom Johnson in a similar manner for composing music. As Yanhua Zhou noticed, LeWitt used “a mathematic schema to calculate the possibilities of the missing edges in a skeletal cube” (Zhou, 2015, p. 152). Johnson’s approach was informed by the 12 minor triads, which he related to LeWitt’s *Incomplete Open Cubes* with reference to the cube’s 12 edges. In this way, spatial and geometric qualities were mapped to musical ones. Johnson did not represent the visual as the initial methods of *Sounding Stile* did, but he was concerned with the sculpture’s structure and the concept behind LeWitt’s work. This idea was articulated by Johnson through a diagram, which is not a form of a score, but communicates visually, a method that combines a three-dimensional object and music composition²⁰. Johnson developed then a compositional method that used a system for making sculpture as a starting point. He worked with sequences for exploring relationships between chords, which he later arranged into a chain. The outcome generated by the chain had the form of a loop (Johnson, 2015).

The second version of *Sounding Stile* followed a similar path to Johnson’s. I argue that the order of the sculpture’s blocks could inform a method for organizing

²⁰ Personal notes from the MaMuX seminar *Other Harmony* March 6, 2015 at IRCAM Centre Pompidou, Paris. Participants: Emmanuel Amiot, Tom Johnson, Franck Jdrzejewski (Ircam, 2015).

sonic material. Drawing from Johnson's approach, the serial thinking of the Wandelweiser group and Schoenberg's twelve-tone technique (MacDonald, 2008; Perle, 1962), I investigate the development of a serial method through forms of graphic notation generated by the four main viewpoints of *Stile* (Figure 2.9; Appendix 2, Folder '2.1.1 Sounding Stile' files 03 and 04). The chromatic scale was employed as the main row and a transformation row occurred from the sculpture's four main viewpoints. The wooden unit placed on the ground corresponded to the first note of the chromatic scale, the unit above to the second and so on, as shown in the figure below.

duration in quarters: each unit (1:1) equals one quarter

D sharp 1:1

D 1:3

C sharp

C

chromatic scale, main row

Violoncello

Violoncello

Violoncello

Violoncello

5

4

3

2

1

Figure 2.9. Score of the second version of *Sounding Stile*

According to Meyer, the importance of serial thinking in visual arts was that it introduced new aspects to the notion of composition through structuring material in the form of sequences (Meyer, 2000). Alistair Rider stated that Carl Andre's manner of arranging blocks of material in space could be related to sonic outcomes:

The result is...yet rhythmic – you might say almost sonorant. In fact when Andre made a similar sculpture in 1966...he himself analogized the effect to that of music. He named it 6-Metal Fugue. (Rider, 2011, p. 96)

For Edward Strickland, “musical repetition deals with time as serial structures in the plastic arts deal with space, by progressing from one unit to the next but without variation, thus providing a more elusive form of stasis” (Strickland, 2000, p.144). Artist and critic Marjorie Welsh discussed Arnold Schoenberg’s twelve-tone method as “a conceptual framework that led to a theoretical overhauling of music and revolutionary shift in our understanding of what is possible” (Welsh, 1994, p. 359). She related this to LeWitt’s work and supported that the aim was “redefining our experience of sculpture by giving us structures developed from non-visual form” (ibid.).

Serial structure acted in this version of *Sounding Stile* as the link between sculpture and sound. Working with this method allowed me to generate a pattern of sounds, echoing the way Andre’s sculpture was placed in space. The outcome of the serial method seemed to be closer to Andre’s work due to the more successively sounding tones. The first version of the dotted halves corresponded visually, to the graphic notation of the chosen viewpoints. The sonic outcome on the other hand, did not give the impression of visual symmetry as the quarter version did. In the quarter version, the repetition of same elements created a type of sonic symmetry, which could relate to *Stile*’s visual and spatial structure.

The proportional and serial thinking inherent to Andre’s sculpture *Stile* as approached from this specific co-compositional perspective, touched upon the notion of calculation, which as discussed by Marc Botha exists in minimalist works²¹ (2017). Delving into the notion, Botha compared the thinking behind

²¹ Using philosopher Alain Badiou’s approach to a quantitative ontology (Badiou, 2005), Botha distinguished two sides of calculation in minimalist aesthetics, explicit and implicit, which he termed as follows: “explicit calculation is revealed in terms of the incorporation of numerical and alphabetical sequences, phonemic utterances, lists and series of various kinds. Implicit calculation is woven into the formal construction of minimalism through modular variation and incremental repetition, expanding or contracting sequences, and progressive displacements” (Botha, 2017, p. 122).

numeric and geometric structures in sculptural works through an analogy between LeWitt's *Maquette for One, Two, Three* and Glass's modular technique:

...a single, open cube constitutes a central axis, and is joined to a larger cube, made of eight of the original cubic unit (2x2x2), which, in its turn, is joined to a larger cube made of twenty-seven of the original cubic multiple (3x3x3). (ibid., p.130)

Sounding Stile's outcomes, questions of symmetry and structure merged minimalist aesthetic qualities of both visual and sound practices. This has been a consequence of the methods employed and the geometry of the shape of the sculptural object explored. *Sounding Stile* introduced questions of quantification and systematic organization by employing a calculative approach of the elements of co-composition and the qualities of the materials involved.

Exploring further the methods used in *Sounding Stile* for developing my own three-dimensional objects (Appendix 1, pp. 1-2; Appendix 2, Folder '2.1.1 Sounding Stile' file 05), a question of balance-dominance occurred between the modalities. This *paradox* was introduced when I attempted to apply the serial method of *Sounding Stile* as a compositional tool for sound; the graphic notation formed could not be used as the graphic representation of a three-dimensional object, as it did for *Stile*. The quantified relationships had then control over the sonic and the visual/three-dimensional outcomes, which brought artistic intentions in both modalities in a field of tension with each other. In search for a less calculative-driven way of working and thinking across the two modalities, I explore further the question by setting sculpture making as starting point.

2.1.2 Sides

Sides (2015) distanced from proportionality, seriality and calculative thinking and focused on the making of three-dimensional objects by considering the shape of their sides as an initiation for working with sound. Sculpture making was informed by the idea of objects, drawing from minimalist approaches of the 1960s and of current practices that are concerned with ideas of minimalism. I regard objects in concert with Botha's observation that they "participate in

producing the world in which they exist”²² (Botha, 2017, p. 58). The *world* here is considered the co-compositional inquiry. Experimenting with the complexity of “irregular” polyhedrons²³ as opposed to the visual simplicity and symmetry of *Stile*, I explore the relationships formed among the different shapes of the sides of the objects in relation to sound, as they were being cut.

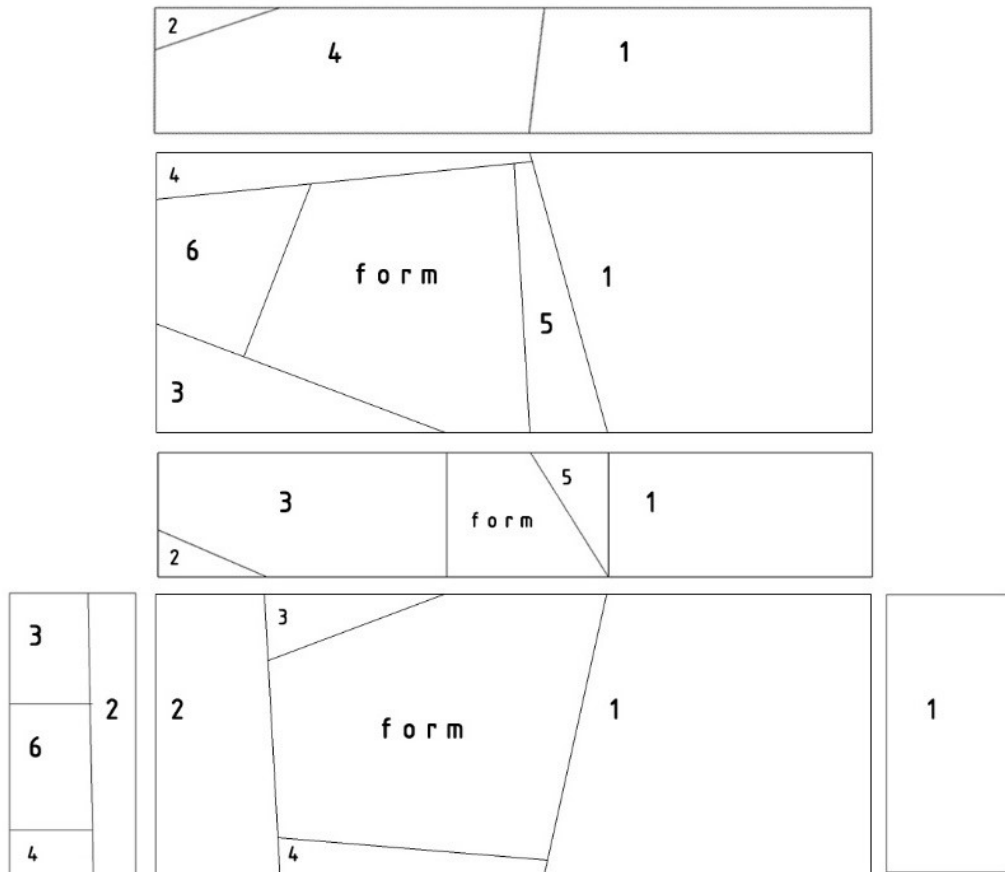
In this work, I looked at relationships between the sides of the three-dimensional objects and sounds through methods of graphic notation. The first stage involved the drawing of the object's plan, an approach that was informed by three-dimensional models for sculpture making developed by Sol LeWitt (LeWitt et al., 1993) and Richard Serra's drawing as notation (Serra, 2000). This contributed to focusing on the stages of the making process of the three-dimensional object. Therefore, the graphic representation of the object's sides acted as a form of notation providing me with instructions for its making. In this work, sculptural objects were made by the subtractive method of cutting. The starting points were cubic blocks of timber, which in successive cuts, obtained multiple sides that fulfilled ideas of irregularity as discussed by Morris (Figures 2.12-2.14). The aesthetic decisions behind the objects were in concert with LeWitt's definition of the cube:

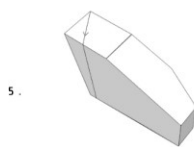
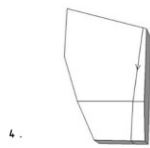
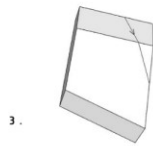
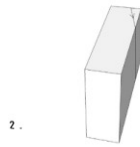
The most interesting characteristic of the cube is that it is relatively uninteresting. Compared to any other three-dimensional form, the cube lacks any aggressive force, implies no motion, and is least emotive. ... The use of the cube obviates the necessity of inventing another form and reserves its use for invention. (LeWitt, 1994, p. 72)

²² Botha referring to Bruno Latour's *Reassembling the Social: An Introduction to Actor-Network Theory* (Latour, 2005).

²³ According to Robert Morris, “...experience of solids establishes the fact that, as in flat forms, some configurations are dominated by wholeness, others tend to separate into parts. This becomes clearer if the other types of polyhedrons are considered. In the complex regular type there is a weakening of visualization as the number of sides increases. A sixty-four-sided figure is difficult to visualize, yet because of its regularity one senses the whole, even if seen from a single viewpoint...Complex irregular polyhedrons (for example crystal formations), if they are complex and irregular enough, can frustrate visualization almost completely, in which case it is difficult to maintain that one is experiencing a gestalt. Complex irregular polyhedrons allow for divisibility of parts insofar as they create weak gestalts. They would seem to return one to the condition of works that, in Mondrian's terms, transmit relations easily in that their parts separate. Complex regular polyhedrons are more ambiguous in this respect. The simpler regular and irregular ones maintain the maximum resistance to being confronted as objects with separate parts” (Morris, 1993, p. 7).

My intention is to “invent” forms by distancing from the symmetrical state of the initial cubic block by executing successive cuts (Figures 2.10 and 2.11), and considering each cut that generates a side as a common aesthetic decision between sculpture and sound (ibid.).





Figures 2.10 & 2.11. Cutting 'script' – a wooden object made in six cuts

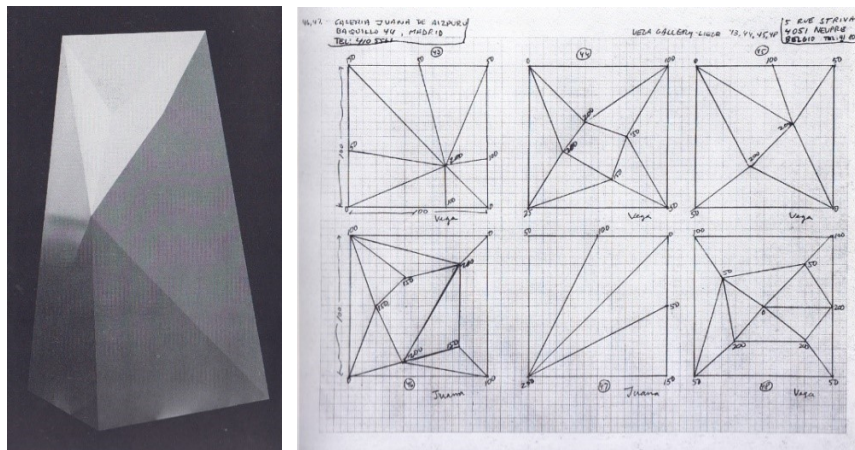


Figures 2.12 - 2.14. Three objects from the work *Sides*, timber, general dimensions 12x4x3cm

Drawing was used as means for deciding how to cut the starting block. This was informed by LeWitt's geometric variation in his *Complex Forms* (Figures 2.15 and 2.16) (LeWitt et al., 1993). LeWitt's sculptures were generated with a method of graphic representation, in which according to Meyer, the starting point of the sculpture was a two-dimensional drawing projected as a three-dimensional shape in space:

LeWitt first draws a polygon and then places a dot somewhere inside the figure; lines running from the vertexes of the polygon to the dot become the volume's multiple edges...The number of possible shapes is endless: the wildly varied forms in the series include ziggurats, irregular pyramids and polygonal solids. (Meyer, 2000, p. 179)

I consider LeWitt's method as a type of notation for sculpture regarding both the making process and the outcome. I question how graphic representations of sculptural objects could be used as starting points for the generation of sonic material. The making process is happening here in repetition and in layers; the more I continue the more the object loses its "simple" geometric quality (Morris, 1993). In that sense, the difference to LeWitt's approach is that drawing is used here at a later stage, during and after the making of the object. It is worth noting that *Complex forms* were made from wood, which was painted after the making eliminating in this way any material qualities, but also traces of the process.



Figures 2.15 & 2.16. Sol LeWitt's *Complex form 47*, sculpture, general dimensions 100 x 100 x 200cm, 1989 (left). Sol LeWitt's *Complex forms nn. 43-48*, drawing, 1989 (right) (LeWitt, 1992, pp. 54-55)

Focusing on material properties as part of a subtractive process of material manipulation, Iran do Espirito Santo's series *Corrections* involved three-

dimensional objects of similar geometry to LeWitt's (Figure 2.17) (The New School, 2013). Iran do Espírito Santo worked with solid granite blocks of a natural form transforming them through cutting that depended on the stones' veins, into polyhedrons (Juncosa, Colombo and Tone, 2006). His work has been characterized as "a subtle subversion of Minimalism" (Irish Museum of Modern Art, 2006). Curator Lilian Tone stated that do Espírito Santo's choice of an industrial-like and machine-based process of making had as aim the objectification of his works (Tone, 2006). His sculptures are exemplary for this research as they bridged minimalist ideas of reduction and geometric variation of the 60s with a current practice that brought material qualities and properties into the aesthetic concerns. Material exploration became a central aspect of my practice in *Sides* and was gradually involved in the co-compositional process.



Figure 2.17. Iran do Espírito Santo, *Corrections A*, Granite, 2001 (Inhotim, n.d.)

In the previously discussed work *Early Forms*, Szlavnic used drawing in order to "graphically represent...sounds" forming in this way, analogies between graphic representation, frequency and duration (Sauer, 2009, pp. 244-245). For Szlavnic drawing "provides an abstract, yet fertile starting point, which can be transformed into sound through an arduous but exciting composition process" (Szlavnic, 2006, p. 1). Her drawings acted as a tool, which allowed the shaping and control of sonic material. Oscar Wiggl's practice brought both drawing and

physical material properties together for creating transitions between sculptural and sonic. Sculpture in Oscar Wiggli's *Partition forgée* was regarded as the starting point for the generation of sound (Keller et al., 2010). His working method in visual and sculptural forms was common to his method of organising sounds (Flechtner, 1994). Wiggli invented techniques that brought together visual, sculptural and sonic in a multi-layered manner: material, shape, volume, making processes and material qualities were at the core of his work. A similar path of working to this of Szlavnic's can be observed in his series of *Sound-Lavis*, which concerned the visual representation of "sonic colours" in the form of ink drawing (Keller et al., 2010, p. 38, own translation) (Wiggli, 2007) (Figure 2.18). *Sound-Reliefs* transferred *Sound-Lavis* into three-dimensional space creating in this way a link between three- and two-dimensional works and sound. For Wiggli, the ephemeral aspect of this form of working depended on what was happening before and sought to influence what would follow (ibid.).

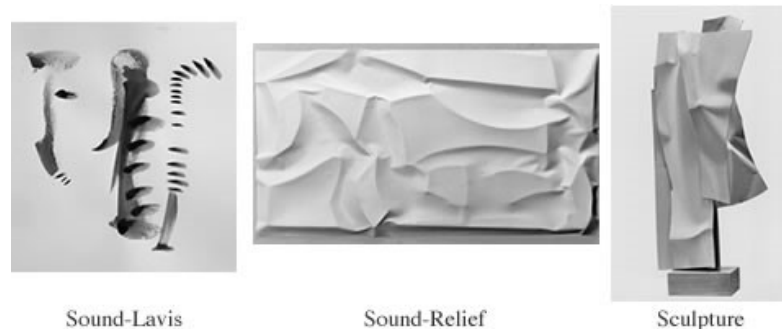


Figure 2.18. Oscar Wiggli, *Sound-Lavis*, *Sound-Relief*, *Sculpture* (Editions Iroise, n.d.)

Wiggli's drawings provided him with the means to develop "sonic ideas", which as he mentioned, he wouldn't be able to explore otherwise (Keller et al., 2010, p. 40, own translation):

I wanted to invent a graphic language that expresses if possible more things about the life of a sound – and that requires equally, more details with the verbal description than the "geometric" graphs of the scores. Journal 9.11.2004 (ibid., p. 33)

Even though drawing was not the primary practice in *Sides* but a mediation, both Szlavnic's mode of working with "*Transformation Through Translation: Art (visual) ⇒ Representation ⇒ Art (aural)*" and Wiggli's above-discussed methods

informed *Sides* in creating transitions across sculptural-visual and sonic (Szlavnic, 2006).

By adopting a less calculative strand of thinking, I sought a more flexible method in the second version of *Sides*: I considered the outline of the shape of each side as the starting point for working with sound. In this way I aimed at an interpretation of the objects through fragments of their graphic representation. Instead of forming specific mappings between the sculptural object and sound, I set flexible rules for the development of sonic material, informed by graphic notation works that I had the chance to research in Paul Sacher Foundation in Basel, Switzerland. Jon Sigurpalsson's work *Quadrant* and Peter Zegveld's *Intro-coda* (Figure 2.19) constitute important examples for thinking about the relationship between shapes and the sonic outcomes they represent through a partly improvised approach regarding structure and dynamics.

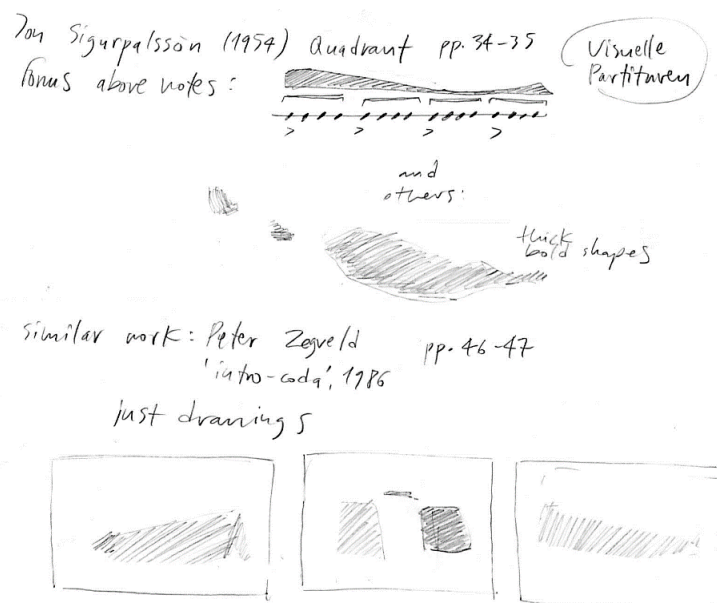


Figure 2.19. Sketch and notes from archival visit in Paul Sacher Foundation (top) Jon Sigurpalsson's *Quadrant* and Peter Zegveld's *intro-coda* (bottom) (Klein Essink, 1986)

Here, shapes are initiated from sculpture making as in Wiggli's practice and are then used to inform sound. The rules set in this version of *Sides* are: a) the starting note of each piece to be the note C and b) the angle of the outline to define pitch. I started notating by approaching the angle of the shape's outline as ascending,

stable or descending in terms of pitch (Figure 2.20). This version reflected my understanding of the object's geometry through observation. Referring back to Szlavnic's methods of drawing in relation to frequency and duration, she mentioned that they influenced her way of approaching "vertical and horizontal space" (Szlavnic, 2006, p. 2). I thought of the angles and the outlines of each side of the object as a direction for working with pitch and duration. I responded then to this visual material through notating in a semi-improvised manner within the rules that I had set. A first piece was realized, and it was further considered as the theme for improvised variations (Appendix 1, pp. 5-7). *Sides* was informed by LeWitt's idea of variations (visual) in a sonic way, but moved beyond a numeric approach of "modular logic" by involving improvised elements (Botha, 2017, p. 130, Rorimer, 2000).

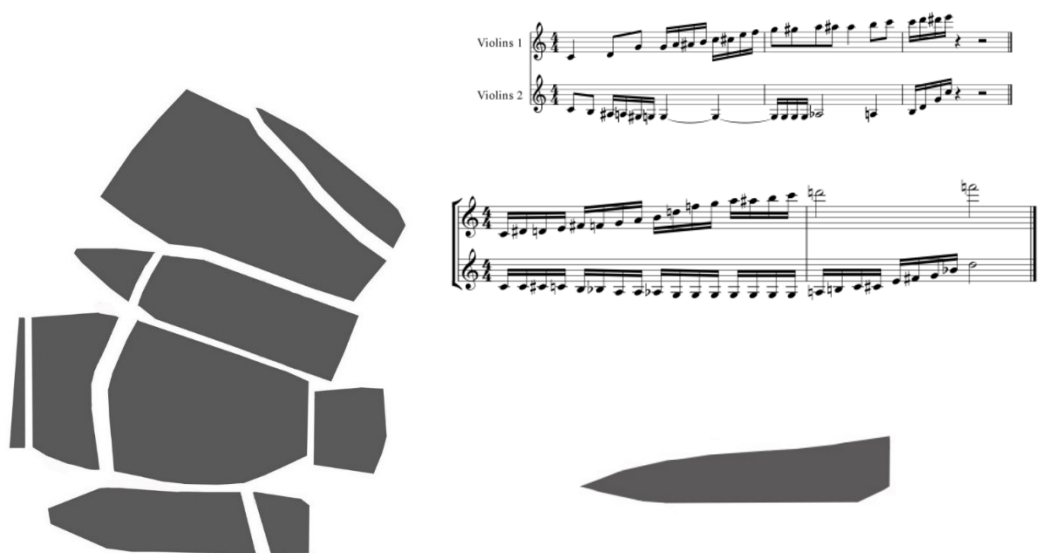


Figure 2.20. *Sides*, graphic notation

Following the above exploration, graphic representation was key to sculpture-to-sound and sound-to-sculpture mappings. It allowed for a graphic analysis of the three-dimensional objects designed for this research, as well as their interpretation into score. The transition from sculpture-to-sound and sound-to-sculpture through two-dimensional representations of sculptural objects or sonic material seemed closely related to graphic notation. So far, two types of notation

have been explored in reference to other works and concepts, and were further developed for this research: a) notation for capturing sonic ideas and b) notation for the two-dimensional analysis of three-dimensional objects. The purpose of this type of notation was essentially, for using it as a compositional tool and not for communicating the work to a performer. The main challenge of the works and methods discussed is that graphic representation simplified the three-dimensional objects and their material qualities by focusing on visual form. It extracted fragments of the objects and acted as a mediator between the object and the sound, introducing an additional process to this of sculpture- and sound-making. How is this method related to the actions of the making and the three-dimensionality of the original objects?

Sides were meant to be exhibited as sculptural objects in gallery space accompanied by graphic notation scores and a sound recording of the composed pieces. The sculptural objects of *Sides* were exhibited without their sound or notation in August 2015 as part of the 'Research-in-progress' group exhibition by PhD students during Edinburgh International Festival that took place in the Sculpture Court at Edinburgh College of Art. The idea behind this showcase was to exhibit an object together with a phrase, which represented a current issue or focus of the research. These phrases and objects were exhibited on a paper surface so that members of the audience could respond and interact with them by writing, drawing or adding to the piece. The question posed for my audience was: 'What would they sound like?'. Presented below, is a selection of anonymized comments:

"An ensemble of similar long notes elongated even more in the process."

"That they were tree before."

"Chanting as they are carved. Bold singing because they are being created."

"A harmony...I like how smooth and tactile they appear, multi-faceted."

The showcase and the interaction with the audience's comments led toward a reconsideration of the relationship sculpture-sound. Common threads that

existed behind the responses focused mainly on the process of making and the state of the object and the actions – “*as they are carved, being created, in the process*”. It was very interesting to me the way some of the members of the audience made connections between sound and process, considering the sculptural pieces in a temporal manner; an aspect that I had not thought about before realizing this exhibition.

2.2 From Representation to Action

Following the showcase of the work-in-progress, my aim was to look beyond the mediation of graphic representation by shifting my focus on the process of making. Being interested in exploring the time of co-composition, I question the formation of analogies between the modalities. I approach this shift through a notation method that aims to reflect my actions of sculpting and the state of the three-dimensional object during the making. In reviewing and bringing together aspects of works of action painting, minimalist practices, process art and instruction art, I started working inside the space of the workshop. I observe actions and their outputs, while seeking a direct relationship to material manipulation across sculpture and sound through actions.

Painter and sculptor Lucio Fontana worked with the traces of his actions on material surfaces (Schimmel, 1998). His work *Concetto spaziale* [spatial concept] 50B9 (1950) (Figure 2.21) involved the visual impressions left from the artist’s physical actions on a metal sheet. In observing this work, one can see the direct response of the material to the force of the actions of the artist that altered not only of the material’s surface but also its volume. This includes a manner of thinking about material, which is closely related to time and the way material is manipulated in successive actions.



Figure 2.21. Lucio Fontana, *Concetto spaziale (C. 50 B 9)*
1950, White iron 74.5 x 64cm (Lussac, 2009)

Carl Andre articulated his action-oriented approach to sculpture verbally. According to Alistair Rider, Andre's use of the term *cutting* instead of for instance, *carving*, detached his approach from any sculpting technique: "a cut was always a generative act, regardless of its nature" (Rider, 2011, p. 71). Rider drew attention to Carl Andre's statement: "up to a certain time I was cutting into things...Then I realized that the thing I was cutting was the cut. Rather than cut into the material, I now use the material as a cut in space" (ibid., p. 53). From this position, Andre expanded actions from techniques to notions, a way of thinking about sculpture. Such an abstract approach found in this research a dual functionality: it indicated the general nature of the action allowing space for its interpretation physically in space and in relation to sonic material. Words could then enable connections between sonic and sculptural material through indications and descriptions of actions.

Further to Andre's work, Richard Serra explored "the nature of process" through his work *Verb List Compilation: Actions to Relate to Oneself* (1967-68) (Serra, 2000). Serra's words acted as stimuli for actions rather than for communicating information about the way actions were executed for achieving a specific outcome. In discussing the *List* Serra pointed that

...dealing with the nature of process...I had written a verb list...I really just worked out pieces in relation to the verb list, physically in the space [...] it gives you a way of proceeding with material in relation to body movement in relation to making that divorces you from any notion of metaphor, any notion of easy imagery. (Serra, 2000)

The pieces reflected his actions through material properties: to splash, to spread lead, to cut, to roll lead sheets. An example is the work *To Lift* (1967), which as Serra stated, did not involve a process of thinking about composition or the result, rather it was about making sculpture by enacting “those verbs in relation to a material” (Figure 2.22) (MoMA, n.d.). *Verb List* was in that sense a creative tool that enabled the development of relationships between material and actions of making. Richard Serra discussed his work *To Lift* in relation to his *Verb List*, which as he stated, was “revealing exactly what it did” (ibid.). His approach is important for this research as it reinforces a self-referential position of process by associating actions to words and sculpture making, not only from a conceptual perspective but also “in relation to materials physically in space” (ibid.).



Figure 2.22. Richard Serra, *To Lift* 1967.
Vulcanized rubber, 91.4 x 200 x 152.4cm (MoMA, n.d.)

Philosopher John Rajchman considered Serra’s *List* as a type of thinking, which

...has a logic that makes it more than a list, and a central aspect of this logic is that it gives its verbs as infinitives. In language, infinitives are indeterminate virtualities. They become determinate only through the addition of persons, objects, and situations, given through tenses and pronouns, which tie them to the here and now of sensations and actions. In their infinitive form, verbs suggest processes without fixing them in time and space. [...] the “activities for un-specified materials” thus become a matter of attaining this infinitive potential spatially, prior to subjects or objects, and the question arises of the larger philosophical nature of this space. (Rajchman, 2007, p. 66)

How could such an “infinite” repository of ideas concern the qualities of both sculptural and sonic material? Serra’s consideration of the process itself as a model for thinking about sculpture was very influential for this research, as it enabled me to look for links between the *made/sculpted* and the *heard* towards an action-driven understanding of co-composition.

Artist Barry Le Va’s early works involved performing and exhibiting the remaining of the process such as in his work *Switch* (1967) (Figure 2.23). According to artist and curator Saul Ostrow, Le Va’s focus was on material and forms that were both produced in a process-led manner yet “logically structured” (Ostrow and Le Va, 1997). This came as a contrast to Andre’s minimality and detachment from sculpting techniques, and Serra’s actions that did not necessarily describe sculptural activity; the outcome was not predefined but was dependent on real-time decisions.



Figure 2.23. Barry Le Va, *Switch* 1967, gray felt, aluminum and steel ball bearings, 358,1 x 609,6cm (David Nolan New York, n.d.)

Compositions such as John Cage’s *Water Music* (1952) looked at a hybrid function of actions that were communicated as instructions to a performer. These included non-musical activities such as pouring water, as well as using objects on and inside musical instruments to transform sound. Such activities aimed not only at generating unique sonic outputs but also to “engage the eye” (Schimmel, 1998, p. 22). Performance instructions were notated on a score using verbs, time

indications and musical staves. Similarly, James Saunders mentioned that composer Antoine Beuger's colour series "formative principles do not determine the structure of each piece, but simply suggested a situation (a title, an instrumentation). His work *cadmiumgelb* (2000) for double bass presented a set of instructions for making a sound..." (Saunders, 2011, p. 504). In looking beyond the conceptual nature of these works and focusing on the relationships between instructions, actions and sounds, I suggest that actions could be used as intersecting points between the modalities; that the creative thinking behind those works can be revisited from a co-compositional perspective, through a process of sculpture and sound making within a solo work rather than through another person such as a performer.

Artist Steve Roden explored in his work *Contrariwise (for Philip Johnson)* the translation of a making process into sound (Susanne Vielmetter Berlin Projects, 2007). Using text as starting point, Roden looked at scoring methods based on couplings between numbers, letters and notes. Recordings from the environment of the space during the making process were also included in the score: "like the act of architectural fabrication, I wanted to create a score that would set a process in motion" (Roden, 2010). Roden's scoring method initiated and directed the making. He approached sonic material through a method of instructions. Analogies between the three-dimensional structure and sound were presented along with material that is derived from the space of the making process. Sound was then directly related to the actions executed.

Closest to the context of this research are Oscar Wiggli's scoring processes, which brought together sculpture and sound verbally. His *partitions graphiques* and *partitions verbales* integrated aspects from the making process and the environment of the workshop (Hesse, 2007). Wiggli worked with samples recorded in the sculpture workshop, and sound synthesis. His verbal score for the work *RESEMBLANCES ET MIROITEMENTS* (1994) (Figure 2.24) created links between the two modalities by using verbs such as *sparkling*, *pearling* and *rubbed*,

which were directly derived from sculptural processes, material qualities and their manipulation.

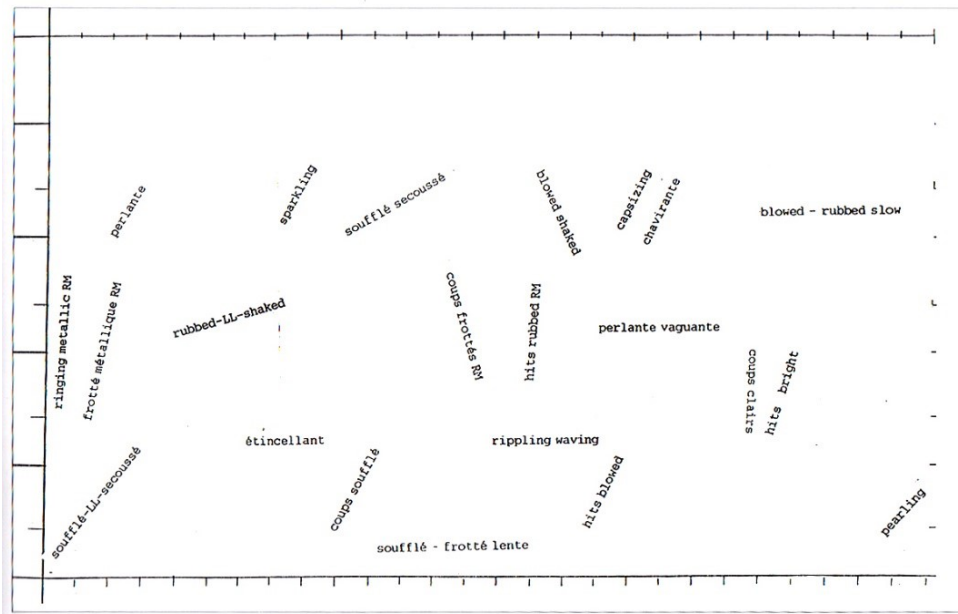


Figure 2.24. Oscar Wiggli, *RESEMBLANCES ET MIROITEMENTS*, 1994 (Baumgartner et al., 2007, p. 251)

2.2.1 Actions in sound

Actions in sound (2015) shifts from creating analogies between visual and sonic to notating sounds at each stage of the sculpture making process. By distancing myself from graphic notation, I question how the actions of my making could be regarded as a commonplace between sound and the sculptural object. The creative process of this work took place inside the sculpture workshop and was observed *in action* (Gray and Malins, 2004; Candy and Edmonds, 2018). I worked using motifs and rhythmic patterns drawing from the movement and sound of the actions realized in the workshop: a real-time, immediate reflection on material manipulation and the sculpting process through sound. *Actions in sound* involved then an understanding of each action of making through notation and revisited *Sides* from an action-oriented perspective. The work sought to create a situation of co-composition that would happen in a simultaneous manner and in the same space, and not as a mediation between the two processes as in the previous pieces. In that sense, *Actions in sound* was informed by Roden's

previously discussed approach in combining scoring and making processes, yet operating as a solo process and not a collaboration.

Wiggli's scoring methods complemented the background for this exploration. Actions and stages of the working were considered in his work as points of departure for the generation of sonic material and were captured as words. I started thinking through actions and material properties by notating words to indicate a situation within a synchronous process across the sculptural and sonic. This aimed at a reflection on the direct relationship between action and material. Thinking about solid material through sound and actions enabled me to reconsider my practice from a temporal, process-driven perspective. Wiggli created through his scoring method a hybrid palette of ideas, which were simultaneously elaborated and presented in both modalities. Similarly, what was happening between doing and listening in *Actions in sound* was elaborated through verbal indications on the score. Both Serra's and Wiggli's approaches look inward, towards the initiation of the creative process and not outward by serving as notation for communicating compositional ideas to other performers. I take a similar approach.

The three-dimensional objects in *Actions in sound* were made through an additive process of welding steel. The process started with the first action of working applied on physical material, which was followed by notating sound patterns on staves. Writing down sounds in the form of notes was influenced by the state of the object at each stage and the transition between stages within the making (Figure 2.25; Appendix 1, pp. 8-10). This process reflected the way I was thinking and acting while working with steel physically, in space. I question how such an activity could be considered as sketching with sound for making sculpture, as operating through another modality. Thinking about the stages of the process through multiple spatial viewpoints enables me to view the sculptural object as a temporal sequence.

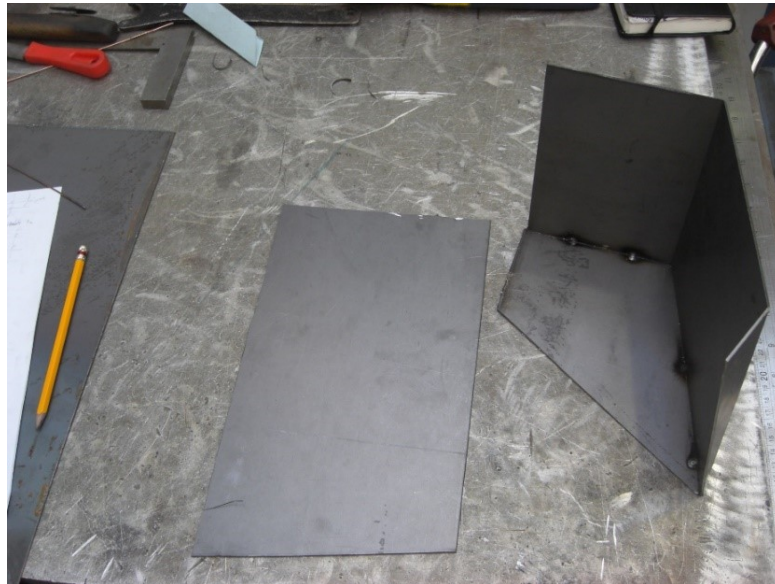


Figure 2.25. Notating while making, *Actions in Sound*

The scoring process was improvised and sought to grasp the way actions were happening using rhythmic patterns and harmonic relationships that reflected aspects of the material, the tools used and the object's state. Notation was realized on musical stave using words to describe the actions and processes of sculpture making at each moment (Figure 2.26; Appendix 1, p. 11; Appendix 2, Folder '2.2.1 Actions in sound' file 06). Using text in notation, my aim was to work with sound through what Chion called "written visual representations" (Chion, 2016, p. 219). In that sense, the words were used as means for generating metaphors of images and sounds of the making process. Capturing actions was a key part of this work as is it contributed to tracing the changing shape of the object during each stage of its development in space through sound.

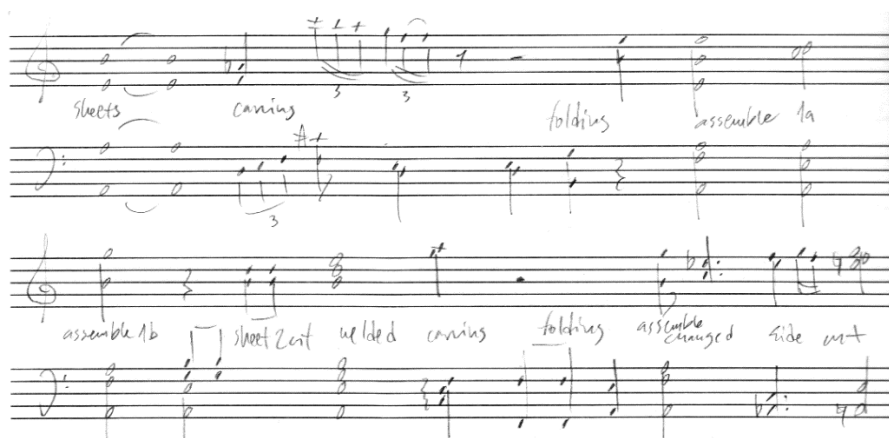


Figure 2.26. Excerpt from score for *Actions in Sound*

As in *Sides*, *Actions in sound* were meant to be experienced through a visual-verbal connection of sculpture and sound exhibited as sculptural objects with sound and notation. Verbs indicating actions provide a temporal element and a relationship between making and listening. Time is involved in a different manner than in notation: it reflects my response to what has already happened during the compositional process. Sound could be distinguished in two kinds: the sounds produced by actions and tools, and the sounds I was thinking and notating in relation to my actions while making. The combination of Serra's approach in *Verb List* and Wiggli's scoring process, formed the ground of exploration for *Actions in sound*. The link between the three-dimensional object and the sonic material exists now in levels of actions, which are realized physically in space, and are expressed verbally, and, as sounds on the score. Such an approach brought together the use of language in sculpture and in music notation introducing the concept of instruction and a temporal turn toward co-composition.

2.3 Morphologies

In this first stage of the research, I explored the combination of sculptural and sound practice across material through analogies across the sculptural objects' shape and the process of making. Following a proportional and a serial approach toward co-composition that was informed by Carl Andre's work, to a sculptural practice in *Sides* that focused on the shape of the objects drawing from Morris's polyhedrons, I adopted an action-driven approach that brought co-composition beyond the consideration of sculptural objects as a single form. The methods of notation that were developed during the first stage of the research enabled transitions, interpretations and responses of sculpture-to-sound, sound-to-sculpture and sculpture-to-action-to-sound.

This initial approach to the research question through the works *Sounding Stile*, *Sides* and *Actions in sound* introduced questions about form, the use of notation and graphic representation, as well as the object-focused perspective. Forming analogies between the two modalities in *Sounding Stile* and *Sides* brought to the

practice a meta-process, which was happening outside the making, as opposed to the synchronous process in *Actions in sound*. In *Sounding Stile* and in *Sides*, graphic representation functioned in two ways: as an analytical tool and as a method for creating analogies between modalities. Considering graphic representation as a mediation for transferring three-dimensional objects in two dimensions resulted in focusing on aspects of the sculpture's shape and specific viewpoints, excluding its material properties and scale. Organizing material and methods of mapping in a systematic way based on notions of seriality and proportionality allowed the exploration of common properties between the two modalities. However, it narrowed the potential of the making process and the sculptural-sonic outcome²⁴.

Notation allowed the visualization of analogies between sculpture and sound. It contributed to realizing mappings across the three-dimensional objects, their graphic representation, and the making processes to sound. In the works discussed so far, notation in the context of sound focused on the Western music system and syntax. This created limitations in experimentation, as well as in the sonic outcome of the works such as the texture of sound and its arrangement. In the work *Sides* for example, I considered the sonic outcome as a theme, which I then developed further through a series of variations. This method was problematic as the form and the tonal sounds used, restricted the exploration. In the words of Chion, "...what notation transcribes are not the sounds themselves but specific values selected as "musical" ones, which is not the same thing" (Chion, 2016, p. 219). Reflecting on this, the next stage involved expanding my practice towards sound based on spectral texture, working with recordings of sculpture making.

The further exploration of *Sounding Stile's* methods in a reversed process, this of developing three-dimensional objects based on sonic material, introduced in this

²⁴ Whitehead mentioned in his work *Modes of Thought* that "analogies survive amid diversity. The procedure of rationalism is the discussion of analogy. The limitation of rationalism is the inescapable diversity" (Whitehead, 1958, p. 134).

research a *paradox*: hierarchical relationships were formed between the two modalities. For when achieving satisfying results in the one modality, the functionality and the outcome of the other was affected. The realization of this series of practical work through the development of relationships between sculpture and sound using analogies, led to a situation in which the separate modalities of sculpture and sound entered a state of interdependence; a state between vision and sound that has been described by Richard Coyne as an “agony of the senses” (Coyne 2010, p. 9). Here, it reflects the merging and the resulting conflict between the two modalities within a field of tensions.

Introducing this debate of analogies based on ideas of seriality and proportionality, highlighted the complexity of the material involved in co-composition and directed my focus toward material itself rather than the interpretation of the one through the other. The work *Actions in sound* introduced a process-oriented, temporal approach to co-composition through the consideration of actions for making sculpture as starting points for generating sonic material. As this activity was happening in a synchronous manner and not as a mediation between the two processes, it contributed to moving from analogies to an action-driven practice. Besides the above-mentioned problems of notation, *Actions in sound* drew a new direction for approaching co-composition by developing an understanding of sculpture as a temporal situation.

In this section, I identified a constellation of minimalist notions, which augmented and challenged the ideas behind the theoretical exploration and the aesthetic aim of the co-compositional practice. *Sounding Stile* touched upon the notions of calculation and seriality concerning both modalities, while the object-centred exploration of co-composition in *Sides* evolved into a process-oriented mediation of verbal notation between the sculptural and sonic material in *Actions in sound*. I viewed this shift toward a temporal and action-driven approach to co-composition as a state of interdependence between materials and not as mappings *from* the one *to* the other. This observation led to a direction that

approached the *reality* of the materials of the co-compositional process by eliminating notation and looking directly at their qualities.

Chapter 3

Intrinsic Sound

3. Intrinsic Sound

Selection of materials and tools is crucial in my creative process. The exploration of material qualities through making and listening is my way into the concept of co-composition that emerges from my intention to map the gap between sculptural and sonic. The way we handle materials reveals their potential. Physically acting on material enables a temporal dimension in which forms begin to occupy time through their handling. Sound provides me with perspectives that I cannot have when looking at or handling sculptural objects. Handling them offers a visual and tactile response to sound.

I am interested in the negotiations that happen in the space between listening and making by exploring time's divergent qualities across ephemeral and continuing material states. The works of this chapter exist in an intermediary state; they look at the notion of time in terms of sound-source relationships, enabling us to think about objects through their traces. In engaging with the concept of repetition, I seek to intensify perception by focusing on the temporal levels and energetic characteristics behind such traces.

So far, this research has led to an approach of the one modality informing the development of the other. My aim at this stage is to consider sculpture in a temporal manner and look beyond the object itself by exploring the processes and materials of my practice. In this chapter, I examine the possibility of working with sounds produced by actions, tools and materials during sculpture making, which are intrinsic aspects of the creative process. Sound is regarded at this stage based on its spectral texture rather than following a music syntax. Focusing on the process itself, I investigate sounds of the making in relation to co-composition. The practical explorations presented in this chapter, expand on the work *Actions in sound* in terms of both the making process and the sonic outputs.

The background of this exploration draws from the work *Box With the Sound of Its Own Making* by Robert Morris, its reconsideration by Mike Blow, and Oscar Wiggli's practice. Wiggli combined sculpture making and sound using notation

directly referent to his working and recordings from the workshop. The practical explorations realized at this stage of the research question aspects of materiality, beyond form, based on actions of physical material manipulation and the sounds produced. I review works that involve sound produced by making processes and theories that engage with physical material manipulation for sound generation (Kelly, 2018). Michel Chion's notion of "ergo-audition" and ideas of causality are viewed in relation to sculptural actions and physical material manipulation. Sounds of sculpture making are examined through Denis Smalley's notions of spectromorphology, with an aim to develop an alternative understanding of material transformation through the way "energetic characteristics" reflect actions and the structure of the making process (Croft, 2007, p. 60).

3.1 Listening

The work *Actions in sound* directed this research towards the making process itself and its intrinsic material: physical material used for sculpture and the sounds produced from their manipulation²⁵. During the scoring process of *Actions in sound*, I was not only reflecting on my actions and the sculptural object's transformation visually, but also on the sounds produced during the making. In this chapter, I employ aspects of "causal listening" for reaching an alternative understanding of such physical material manipulation. According to Caramiaux et al., Chion's mode of causal listening (1983), which was later defined as "denotative" by Huron (2002) and "denotative (causal)" by Tuuri and Eerola (2012), was considered from the latter as the association "of a sound to the action that created the sound"²⁶ (Caramiaux et al., 2014, p. 37).

²⁵ Caleb Kelly argued that "we have a much more real relationship with sound than we do with the vision. This is currently manifesting in art in a number of experimental practices, as well as a rather reactionary return to 'realism' in field recording practices. Taking this literally field recordists draw on the language of ecology, realism and purity of the medium onto which they capture these sounds" (Kelly, 2014).

²⁶ Michel Chion distinguished three "modes of listening": a) causal, which in the words of Chion "consists of listening to a sound in order to gather information about its cause (or source)"; b)

I am interested in exploring listening through the activity of the maker who is at the same time producing sound and responding to it; what Michel Chion called “ergo-audition” (Chion, 2016, p. 91). The conditions for this mode of listening have been discussed by Chion through examples of instrument playing and machine operation. In both the examples, the listener receives audible feedback on their actions with regard to the process that they are in:

There is ergo-audition when an auditor is at the same time, completely or partially, answerable for, consciously or not, a sound that is heard: playing an instrument, operating a machine or vehicle, making noises—footsteps, the sound of clothing, and so forth—on account of movements or actions, and, also, by speaking. In such a situation, a particular feedback is produced that, except in cases of learned deconditioning, can influence the emitter with regard to the nature of the sound emitted or controlled. (Chion, 2016, pp. 91-92)

So, how could sculpting be discussed through sound produced by actions?

Considering Chion’s “ergo-audition” from an action-feedback perspective, I question the way sounds are caused and how could sounds influence the way I understand the process. Artist Vicky Browne mentioned in an interview with Caleb Kelly that:

...everything/object/material has a known sound. The way we know a material is not only through sight or touch, part of knowing the material is sensing the sound it makes. For instance, if we take a piece of wood we sense the sound of what it would make if we drummed our fingers onto it; hence it is part of the way we know the material. (Interview with author, 2014 in Kelly, 2018)

My interest here is in the response of the emitter to the sounds produced and how this could contribute to the next stages and the continuation of the making. It is through this mode of thinking and listening that I attempt to reach an understanding of these responses in a co-compositional context.

semantic, “which refers to a code or a language to interpret a message: spoken language” and c) reduced, Pierre Schaeffer’s term that centers on the sound itself, unattached to its source or semantic content (Chion, 2012). It is not my errand here to go further into a study of reduced listening, rather to form an understanding of sound produced by sculpture making based on action-sound relationships.

Mike Blow's "multisensory continuum" highlighted a range of relationships between objects-materials and sound in terms of "coherence", "co-creation" and interpretation (2014, p. 81). Relevant to this inquiry is Blow's *Category 1: Direct Physical Relationship* in which object and sound linked to materiality, as an interdependent state of causality such that "change in one element causes change in the other" (ibid.). *Category 4: Process Relationship* is also closely connected to material transformation and the changes this introduces in the relationship between sculptural object and sound:

.... the gap between the elements does depend somewhat on the processes involved, there is a high likelihood it will be large as transformative processes may include accretion or removal, re-ordering, inversion or randomisation controlled by some unrelated command, and the end result will depend a great deal on the ontologies of the materials involved. It is possible that the final components of the work share a common ancestry but the semantic gap is widened past the point at which the viewer can reconcile them. (Blow, 2014, p. 91)

Chion made a distinction between figurative and real cause: *figurative* listening differs from causal listening. In the first the focus is placed on "what does that sound represent?" (Chion, 2016, p. 115), whereas in the second on the real emitter of the sound. The latter could be viewed in relation to the non-representational status of works that employ a minimalist aesthetic. Bringing these aspects together, my focus is not solely on the listening experience, but on developing a co-compositional understanding of the relationships formed. How could sound produced by sculpture making influence my understanding and my response to the process?

And yet "making noise," as we say, is often not the purpose of the action. With regard to labor, noise functions to regulate the efficacy of a hammer's blow, the proper forward thrust of a saw blade, the manipulation of a tool, or one's own steps. (Chion, 2016, p. 92)

Informed by Chion's notion of efficacy within a situation of "ergo-audition", I proceed to a sound-driven understanding of physical material manipulation. The sculptural actions realized in the work *Actions in sound* such as carving, folding, welding involve the use of tools, which also affect the type of sound produced.

Therefore, understanding the efficacy of the actions through listening is also about the state of the materials after each action and the possible continuation.

Caleb Kelly discussed sound practices that focus on physical material aspects and properties, a “material-based practice” as he named it, “in which the materials stand for themselves” (Kelly, 2018). By asking “what is a materials-based sound practice, and what can we learn about materials by listening to them” he spoke of “the underbelly of matter and the flows of energy that are ever present”:

...physical relationship to sound... Sound is understood as always being produced by an event, and that event must always involve materials. As acknowledged by any critique of materials, the materials themselves always carry with them a multitude of histories, stories...By examining the materials that produce sound within contemporary art, we can approach sounding works not only from the perspective of “sound as sound” or “sound in itself” but rather as “sound as more than sound.” (Kelly, 2018)

Musicologist Sonya Hofer, characterized sound in sound art and electronica works as something “tactile”, which could be worked as a physical material “like cloth, film frame, paint or sand” (Hofer, 2014). This characterization is close to the approach of Oscar Wiggli who referred to sound in a sculptural manner and in relation to physical material; as if he was working with it inside his workshop using sculptural tools (Dhomont, 1994). In Hofer’s view, this manner of working brought “different associations and practices for creators and listeners” (Hofer, 2014, p. 298). It promotes then a visual yet embodied way of thinking about sound related to actions and fabrication processes.

In undertaking this physical-driven approach to sound and listening, I focus on the co-compositional process by thinking about the role of the artist’s actions. Art historian Benjamin Buchloh supported that in Serra’s films *Hand Catching Lead* and *Hands Scraping* both produced in 1968, “the hand of the artist so noticeably absent from Minimalist work is reintroduced” (Buchloh, 2007, p. 56). Here, it is

considered in relation to the efficacy of the actions²⁷ realized as a result of co-composition and not merely in favour of the sonic outputs. Chion stressed that,

... peeling a fruit or a vegetable produces distinctive variations in harmonic timbre, with which the peeler is familiar and by which there is auditory verification of the current stage of the operation, albeit it also seems to provide a distinctive oral satisfaction. (Chion, 2016, p. 93)

Considering the relationship material-action-sound in a co-compositional manner, I explore how “auditory verification” at each stage of sculpture making could relate to the visual outcome (ibid.). I then question the role of sound as a trace of the object through the actions of its making.

3.2 Making and Sound

Robert Morris suggested that the activity of making could generate creative outcomes in the same way as a finalized output. In his view, “these [processes] are forms of behaviour aimed at testing the limits and possibilities involved in that particular interaction between one’s actions and the materials of the environment” (Morris, 1993, p. 77). Morris’s work *Box With the Sound of Its Own Making* embraced this idea and enabled a temporal approach to sculpture that combined actions and sound (Figure 3.1) (Krauss, 1995). As the artist described, “images, the past tense of reality, begin to give way to duration, the present tense of immediate spatial experience. Time is in this newer work in a way it never was in past sculpture” (Morris, 1993, p. 176). For Susan Holtham, the role of sound in Morris’s *Box* is that it “acoustically re-enacts” the making process of the object (Holtham, 2013). Although *Box* has a strong conceptual background, which Morris characterized as a “death of process...and a kind of duration of idea *only*”,

²⁷ Ingold (2013, p. 113) referring to a debate between Heidegger and Bell on hand as mere instrument, mentioned that “the rhythmic repetitions of gesture entailed in handling tools and materials are not, however, of a mechanical kind, like the oscillations of the pendulum or metronome. For they are set up through the continual sensory attunement of the practitioner’s movements to the inherent rhythmicity of those components of the environment with which he or she is engaged” (ibid., p. 115).

it introduced a mode of thinking about sculpture through another medium: sound (Morris, 1997, p. 71).

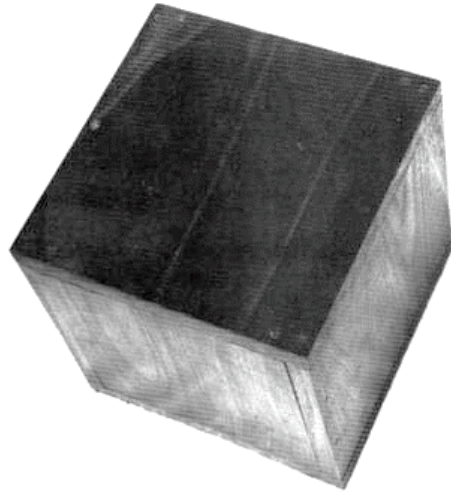


Figure 3.1. Robert Morris, *Box with the Sound of its Own Making*, 1961, Wood, speaker and cassette, 23 x 23 x 23cm (Medien Kunst Netz, n.d.)

The *Box* was not only about the combination of the visual/sculptural and the sonic, but also a reminiscent of the artist's working. As sound artist Rune Søchting discussed,

Through this design an experiential tension is established between the visually present box and the audible activities related to the box. This tension can be conceptualised as a kind of de-synchronisation of the sensorial, perceived elements related to the box in a similar fashion as Chion depicts in relation to the audio-visual aspects of the film or as Brandon LaBelle describes it, a doubling of the presence. In this regard, Morris's *Box* ... is really two boxes: the one presented in front of me as a finished and stable material fabrication, and the other as the continual replaying of its building, as recording buried inside the other. Therefore, perception oscillates between the two, left to wander through the divide created by presence and its reproducibility, between the "bodily real" and "reproduction authenticated by the object. (LaBelle, 2006, p. 83 as quoted in Søchting, 2017; Søchting, 2017)

Søchting described Morris's *Box* as two boxes; a three-dimensional object produced through a fabrication process that has already been completed, and another that was an enlivening of this process through a looped sound recording. Creating an interweaving experience between what is present – the wooden box, and the reminiscent of it, the sound while it was being made, offers an ephemeral dimension of what is lost and invisible in the object itself. The role of sound in

Morris's *Box* provides the audience with a double perspective between what is seen and what is heard, creating in this way "an experienced tension in the suspension of the object", as Söchting mentioned (Söchting, 2017).

Morris's fusion of sculpture and sound enhanced the experiential process of the 'object'. With the term object I refer here to a group of *things*: Morris's act of making the box, the sounds produced and the finalised box. According to Söchting's words, the tensions that were created in this work between process-sound-representation were what defined the object itself (ibid.). Drawing from this, I question the relationships formed between the box and the sound: what would be our understanding of the process if the box was absent from our vision? The different levels of time that exist within the relationship sound-making process are well-described by Michel Chion's example of the sound of a circular saw in operation:

The sound of a circular saw cutting a plank: the cutting of the latter advances linearly until the moment of rupture, whereas the sound draws for the ear a sort of circular surface, so to speak, prior to the characteristic sound that precedes the breaking of the plank. (Chion, 2016, p. 111)

From this perspective, sounds of the making do not entirely represent a cut, but contribute to activating a 'memory' of it. According to historians Michael Hobart and Zachary Schiffman, "...'memory' evokes the image of a thing, a container for information, or the content of that container" (Hobart and Schiffman, 1998, p. 15). Composer Katharine Norman discussed memory in relation to sound as inherent with regard to "comprehension, and in the images and metaphors we pull from memory in trying to make sense of our present perceptions" (Norman, 2016, p. 183). In reference to composer Wim Mertens's quote that repetition "appears as a reference to what has gone before, so that one has to remember what was forgotten" (Mertens, 1983, p. 17), Marc Botha claimed that "repetition and process are fundamental mnemonic tools involved in providing cohesion at the level both of content and of structure" (Botha, 2017, p.123).

In that sense, the experience of Morris's *Box* is attached to its past states through sound. *Box*'s sound ended when the box was completed: the sound being the consequence of the box. However, the sound existed as a tape recording inside the three-dimensional object – the *Box*, and did not affect or alter the physical material in real-time, as the viewer was experiencing it. It was then a remnant of Morris *performing* the cutting and assembling of the box's material: "the noises of carpentry produced during its lengthy construction with a hammer and saw were recorded and a small loudspeaker inside the box plays back these sounds, acoustically re-enacting the making of the object" (Holtham, 2013). Sound could be thought of as the remnant of the object, during its fabrication and as an alternative identity of the object, beyond what we see. The box as an object was existing in this way in-between its past condition over the making process through the sound playback and the present through the visual, employing in this way Krauss's question of "what does it take to be a box?" (Krauss, 1995, p. 50).

In response to Robert Morris's *Box* and Richard Serra's *Verb List*, Michael Blow worked with sounds that were derived from physical material manipulation. In his work *Bleigiessen*, he reworked Serra's *Verb List* "for a sound context, replacing the actions relating to physical material with corresponding actions relating to sonic material" (Blow, 2014, p. 26). Blow recorded sounds from casting metal in a melting stage, which was then thrown in water. The sound of the act of throwing the melting metal into a bucket of water was recorded with hydrophones, capturing the "explosive" moment, as he described it, that was caused by the different temperature and the properties of the materials. The resulting sound was according to Blow, "a mixture of a falling pitch, white noise and final clunk of the solid metal hitting the bottom of the bucket, all of which lasted about a second" (ibid.). Revisiting Morris's *Box*, Blow manipulated the recording of his process of throwing by stretching it in time, which in his words resulted in "giving a slow-motion impression of what is in reality an almost instantaneous event" (ibid., p. 27). For Blow, the actions, which contributed to the formation of the physical material, bore with them "a sense of frozen violence" produced by time and movement. These actions were related to both human activity and

environmental influences. The object carried with it marks from the process that although they might have been disappeared in its final form, were audible in the recording.

My hope was that the extended sound would slow the imaginary creation of the object; that the visitor would be inspired to see the metal flowing in slow motion from molten drop into the tendriled shape before them on the plinth, evoking a deeper sense of time and process into their visual appreciation of the object. (ibid., pp. 27-28)

Blow's work was presented in a similar way to Morris's *Box*. *Bleigiessen's* solid object was placed on a plinth in gallery space, while sound was played through headphones, instead of inside the object as it was happening in *Box*. Mike Blow's method of material manipulation through this specific casting process resulted to an undefined shape, whereas my aim was to look at the relationship between actions and outcome with regard to the shape of the object. His action of "throwing" had inherent the decision of having limited control over the finished product, as in Serra's works that were derived from his *Verb List*. I argue that actions can be used for the simultaneous manipulation of physical and sonic material. I take an analytical approach for associating actions to sounds and to sculptural outcomes for reaching an understanding of their potential interdependent articulation within co-composition. Blow's time-stretching method introduced a notion of expansion of the making process over time. Composer Trevor Wishart stressed that time-stretching of sound can "reveal continuation properties intrinsic to the sound" and "...expand the indivisible qualitative properties of a grain into a perceptibly time-varying structure a continuation" (Wishart, 1994, p. 51). Being interested in revealing these aspects of the sounds recorded, I investigated sound morphologies and structure through notions of spectromorphology, which is discussed later in section 3.3.

Wiggli spoke of material analogies for describing sound, which were related by composer Francis Dhomont to Pierre Schaefer's notions of texture, mass, grain and density²⁸. Wiggli considered such vocabulary to be common in the way we

²⁸ Lasse Thoresen in revisiting of Schaeffer's typomorphology of sound, mentioned that "spectral

see and listen to things. The “concrete” element in Wiggli’s work has been constantly sought according to Dhomont through “vision, hands and hearing” (Dhomont, 1994, p. 180). He further argued that Wiggli considered the textural quality as a way to achieve a level of abstraction that exists in the visual arts (ibid.). Working with sounds based on spectral texture and aspects of physical material manipulation, generates questions on how the combination of the two modalities could happen beyond existing forms.

In exploring “the potential of sound as integral to the composition (as opposed to serving simply as accompaniment), Lye [artist Len Lye] proposed taping the sounds of his sculptures and playing them back with the “tangible action” (Lye, 1960, p. 5)” (Wall, 2018). The sounds of Lye’s were produced by the movement of his kinetic sculptures²⁹ and were percussive. Although this research is not concerned with the mechanical movement of kinetic sculpture, Lye’s practice is an example that stands close to Wiggli’s work, for integrating sound into the way sculptural work was structured in space and thus thinking through both modalities (ibid.). As opposed to Wiggli’s solo practice, Lye collaborated with composer Ann McMillan, who as Sarah Wall mentioned, “manipulated and organized the source material to produce a hauntingly strange composition” (ibid.).

Makers Marks project by Lisa Naas et al. is another collaborative approach that combined making and sounds from the working; a process that brought together field recording, glass making and sound composition. The audio team “isolated the making sounds from the studio environment in the field recordings, and then developed and transformed these source sounds into virtual instruments that can

width (*classes de texture de masse*) (Chion 1983: 146) is defined in relationship to the extremities of sinusoidal sounds and white noise” (Thoresen and Hedman, 2007, p. 136). Concerning grain he distinguished three categories: a) “the sound spectrum of the grain (to the extent it differs from the sound spectrum of the ‘carrier’ sound)”; b) “the weight of the grain (how prominent the grain is in relation to the ‘carrier’ sound)”, and c) “the placement of the grain (i.e. in which register the grain can be found)” (ibid., p. 140).

²⁹ Kinetic sculptures that produce sounds through mechanical movement as in Zimoun’s and Jean Tinguely’s works *Meta-Harmonies* or as he called them “soundmix machines” do not involve an active response to making (personal notes from archival visit in Tinguely Museum).

be used to create musical compositions, soundscapes, and sound effects for visual media (film, performance, contemporary art work)” (Naas, 2015). Glass objects were presented with their sounds emitted via headphones in a similar setup to this of Mike Blow in *Bleigiessen*, or as music instruments that encouraged audience interaction. Naas discussed that “intersections” and “shared interest” among collaborators involved breaking down of the process, tools and sounds in the recordings (sIREN University of Edinburgh, 2017b). Following this, individual notions of composition for each member of the team were employed, while the process did not emerge from a single compositional idea, rather as a consequence of bringing different aspects of the collaboration together. This comparative discourse underlined the specific thinking behind co-composition as a solo creative process and as a process of composing. How were then the actions of the process related to the output?

Recordings of making processes and physical material manipulation can also be found in a field-recording and sound design context, such as in Tim Prebble’s and Chris Watson’s work. Sound installation *Inside the circle of fire: A Sheffield Sound Map* (2013) by Watson involved sound recordings from a metal workshop (sounds of machinery operating and of welding in particular) that aimed to “place people in those environments” (Figures 3.2 and 3.3) (Watson in Museums Sheffield, 2013). The connections between workshop environment, actions and operations are perceived through sound in Watson’s work. Tim Prebble’s *Metal Cabinet* recordings functioned in a different manner; they constituted an exploration into the sound qualities themselves and material manipulation is viewed in relation to that (Prebble, 2018). Prebble’s actions on the metal served mainly for exciting the material and were mostly percussive. In what way is such physical material manipulation related to the sounds produced?



Figures 3.2 & 3.3. Still from the documentary *Chris Watson, Inside the Circle of Fire - A Sheffield Sound Map 3'25"* (Museums Sheffield, 2013) (left), *City Sounds | Chris Watson* talk at Reid Concert Hall Edinburgh April 2018 (right). Photographed by the author

3.2.1 Of Blocks

For reaching a better understanding of these relationships between material-action-sound-process, I filmed my making process and realized audio recordings in the space of the workshop during a process of cutting blocks of timber in a band saw. I created a series of wooden cubes using a subtractive method of making similar to *Sides*. My aim in *Of blocks* (2016) was to relate each cut, each material subtraction to the sound produced by the operating band saw and my action of pushing the blocks of timber towards the blade. Having filmed this process, I observed each operation and I re-created the cubes digitally, in the form of animated three-dimensional models³⁰, which were mapped to the sound produced from each cut (Figure 3.4). The timber blocks and their cuts animated in the 3D models, represent the act of splitting wood; an action that although repetitive, was never exactly the same. Each cut varied in length, effort and duration, which also depended to the type of timber used. I worked with three types of timber: pine, oak and beech.

³⁰ The 3D models were generated with SketchUp software (@Last Software, 2015).

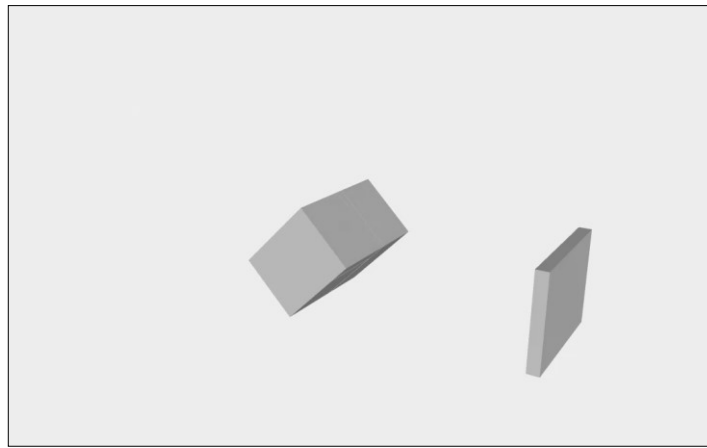


Figure 3.4. Still from *Of Blocks* animation

In *Of blocks*, I pursued an understanding of physical material manipulation through sound, which was not obvious in *Box*, *Bleigiessen* or in Oscar Wiggli's work. In this piece, my aim besides acquiring an understanding of my actions through sound, was to look at the qualities of the sounds in relation to material properties. The role of animation was not to produce a realistic model of the blocks or the process, but to highlight these relationships (Appendix 2, Folder '3.2.1 Of Blocks' files 07, 08, 09). Having a defined shape, such as in Morris's *Box* allowed me to develop sculptural-sonic relationships during the process of cutting. Through *Of blocks*, I direct my focus on material properties of the different types of timber and seek an understanding of the parameters of the cutting process through sound. I further question the use of such parameters as tools for co-composing. What is the role of sound in the sculptural outcome? Does it only play that role during the making process?

Following the animated models, I revisited the cutting script that was developed in *Sides*, by using cuts as instructions for manipulating and sequencing frequencies. Each cut starts at A4/440Hz and its duration, depending on the type of timber and the angle of the cut, defines the amount of change in sound frequency (Figure 3.5; Appendix 1, pp. 12-14).

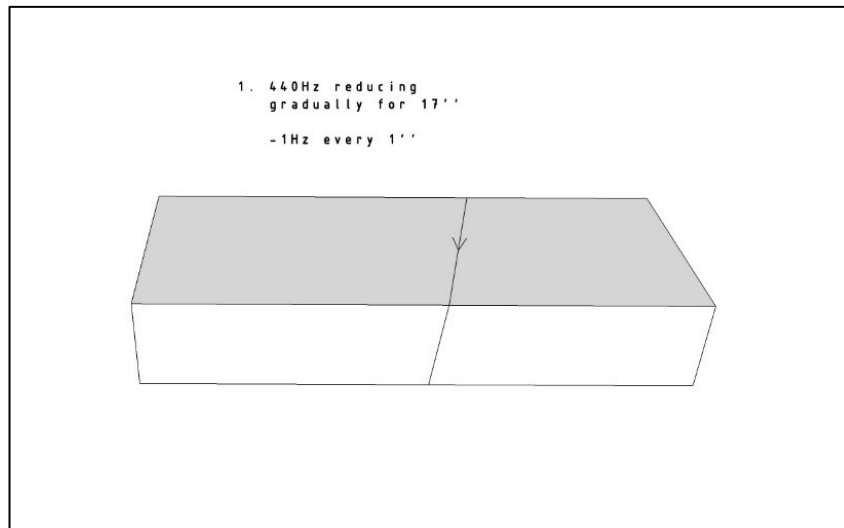


Figure 3.5. First stage of the *Of Blocks* frequency script

Of Blocks showcased the difference between the state of physical material output and the sound produced; sound's temporal dimension contradicts according to Blow, "the solid, static quality of the sculpture" (ibid.). The connection between these two qualities was realized through the traces of the making process, which are evident on the solid material and show that this static form once existed in time. In *Of Blocks* one is able to trace back the cutting process and develop an understanding of the relationship between actions and sound through the digital model. Something that was a hidden element in Morris' *Box*, Blow's *Bleigiessen*, Wiggli's and Naas et. al's work. In that way, *Of Blocks* promoted a reality of the process through sound, whereas the visual representation constituted an abstraction of the physical material manipulation placing the focus on how sound determined the process and the object as an output of that process. The visual became a trace of the sound produced during the making, which opened up a new area of exploration for this inquiry. However, the models' emphasis on action-sound relationships was based on each cut ignoring the sound events in-between cuts. The sound frequency cutting script formed a proposition of how an action of making – a cut, could manipulate sound. Even though this practical exploration might seem to have operated as another form of representation or an interpretation of specific aspects of the creative process towards co-composition, it generated an understanding of how actions and physical material manipulation of cutting *sound like*.

3.3 Anatomies

In looking at actions through the sounds produced – looking *inside the Box*, I proceed to an exploration of the spectral content of the sounds. I argue that the modalities of sound and sculpture can be brought together by relating the sounds of making to material transformation and actions. In this exploration, the materials used for sculpture making are in the form of blocks and sheets and I experiment with a range of making processes: welding steel, cutting marble and casting/cutting glass. In this part, I look at ways for using observations from sound patterns visualized on spectrograms as instructions for making; how could sequences of sounds be related to a sculptural object by providing information about its making process? The structure and morphology of the sounds of the working, are discussed based on Denis Smalley’s ideas of *spectromorphology*. Employing this framework, my intention is to acquire an understanding of actions through the way sounds are evolving over time in relation to the making process.

Smalley defined spectromorphology as “...an approach to sound materials and musical structures which concentrates on the spectrum of available pitches and their shaping in time”³¹ (Smalley, 1986). Considering this together with Michel Chion’s previously discussed causal mode of listening, my aim is to ‘dissect’ the stages of physical material manipulation and gain insight of the process through sound.

One of Denis Smalley’s “fundamental strategies [of] ...multi-level focus and the experience of the temporal unfolding of structure, is *gesture*”:

Gesture is concerned with action directed away from a previous goal or towards a new goal; it is concerned with the application of energy and its consequences; it is synonymous with intervention, growth and progress, and can rise from its energetic profile that could have been caused, and its spectro-morphology will provide evidence of the nature of such a cause. (ibid., p. 82)

³¹ According to Denis Smalley, functions of spectromorphology “can be applied at both higher and lower levels of musical structure, referring, for example, to a note, an object, a gesture, a texture, or a type of motion or growth process, depending on our focus of attention” (Smalley, 1997, p. 115).

How is gesture – or in the context of sculpture, action – applied in a co-compositional manner? I discuss the idea of creating connections between the actions of the making process of a sculptural object and its sounds. Smalley spoke of “three linked temporal phases of morphological design – onset, continuant, and termination – as models of structural function” (Smalley, 1986, p. 84). I direct my focus on the three temporal phases in relation to the actions executed while working with sculpture with an aim to relate the structure of my making process to this of the sounds produced. Smalley’s “ideas of onset (how something starts)”, “continuant (how it continues)” and “termination (how it ends)” are then reconsidered from a sculptural perspective (ibid.). I investigate how actions of making sculpture could be reflected through sound; the variations of spectra that could inform different actions; how different materials could affect sound outcomes and in what ways the actions of making sculpture could be predefined as sequences through sound material in a generative way.

“Models for structural functions” allow according to Smalley, to insert morphological ideas within a structure (Figure 3.6) (ibid.). Smalley stressed that the onset group concerned the initiation of sound material and could vary from the downbeat, to “anacrusis” and to “the less specific emergence”. The continuant group had for Smalley, a wider range of possibilities such as the “maintenance”, “prolongation”, “statement” and “transition”. These terms show the constant change that is happening in the continuant function. As for the termination group, it included concepts such as this of “plane” as “arrival”, “a goal of what has come before” (ibid.). Smalley categorized in this manner, potential situations for producing sounds during each of the three structural functions. Using this terminology, Smalley explained that his ideas of structural functions “can be expanded into a list of terms, some of them technical, some more metaphorical, which can be used to interpret the function-significance of an event or context” (Smalley, 1997, p. 115). In reference to Smalley’s concepts and analysis of sound structures, I examine how a sound emerges in both ends of co-composition: sculpted as shaped, in terms of spectromorphology, and sculpted, as being influential to sculpture making in terms of Chion’s concept of “efficacy” and “ergo-

audition”. I consider then my actions of making to have a starting point, a continuant and a termination; to exist in a temporal manner, in relation to the sounds they produce within the sculptural process.

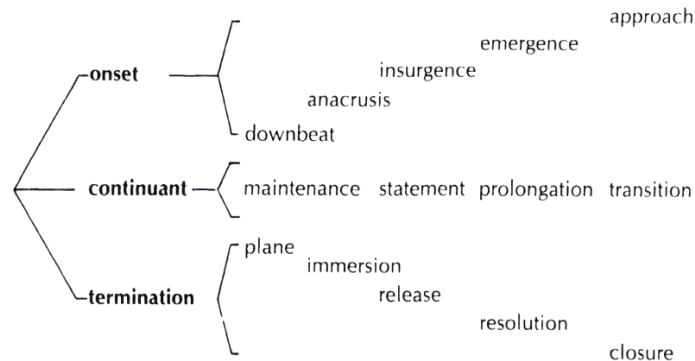


Figure 3.6. Smalley’s structural functions (Smalley, 1986, p. 85)

Smalley discussed the connection of spectromorphology to spatial dimensions through the notions of motion and growth, which as he stated “are not exclusively or even primarily sonic phenomena: sonic motion can suggest real or imagined motions of shapes in free space” (Smalley, 1997, p. 110). Spectromorphology is then used in this research as a framework for tracing the energy of actions through sound, contributing to an understanding of the relationships between the actions that generate shapes in three-dimensional space and also produce sound. What has been described by Denis Smalley as “energy-motion trajectory...when we hear spectromorphologies we detect the humanity behind them by deducing gestural activity...” (ibid., p. 111). Composer David Hirst argued that Smalley’s notions were approached from a traditional Western music perspective and in response to this, he spoke of “gestures” that are produced in an industrialized “modern everyday world” (Hirst, 2011, p. 44). He stated that part of these gestures is directly related to human activity, whereas other gestures are operating in accordance to machinery and human-made surroundings: “the gesture process cause-source-spectromorphology can also operate in the reverse direction of spectromorphology-source-cause” (ibid., p. 43).

3.3.1 *Sculptural spectrograms*

Sculptural spectrograms (2016) investigated a method for making sculpture based on recordings of sounds that were produced by the actions of making sculpture. I argue that the energy of the sculptor's actions, whether these are manually executed or with the use of machines, could be traced through the spectromorphologies of the sounds of the making. Exploring this could provide us with information and an understanding of the process of making itself that we could not otherwise have. Sculptor Tony Cragg stated that "to see beyond that surface [of the material]" is to understand energy, to see beyond representation – to show the energy behind the process (Cragg, n.d.). Spectrograms are considered here as a visualization of that energy, which is at the same time shaping sculptural and sonic material.

Oscar Wiggli used sound recordings from his making as material for his compositions. Using video stills Wiggli captured visual qualities of his sculptures similar to those of spectrograms for visualising sound qualities. Oscar Wiggli structured the morphology of his sounds as a collage of visual material that was derived from his sculptures and their making (Wiggli, 2010). Figure 3.7 shows Wiggli's graphic-verbal score for *AVELEK* (1994) that consists of a video-print-collage representing sonic material as a sequence (Hesse, 2007), in which every sound corresponded to a technique from the making process of his sculptures (Dhomont, 1994). Informed by Wiggli's notation, my aim is to explore methods that would elaborate making sculpture based on sequences of sounds. The starting point for the sculptures developed during this practical exploration followed the same aesthetic as in *Sides*: clarity in geometry for tracing the actions of the making process that could be used *in reverse*. In referring to Robert Morris's *Untitled (Standing Box)* together with his quote "the notion that work is an irreversible process ending in a static icon-object no longer has much relevance", Jens Hoffmann and Joan Jonas discussed the fluidity within the action of the artist performing his sculpture (Hoffmann and Jonas, 2012, p. 63).

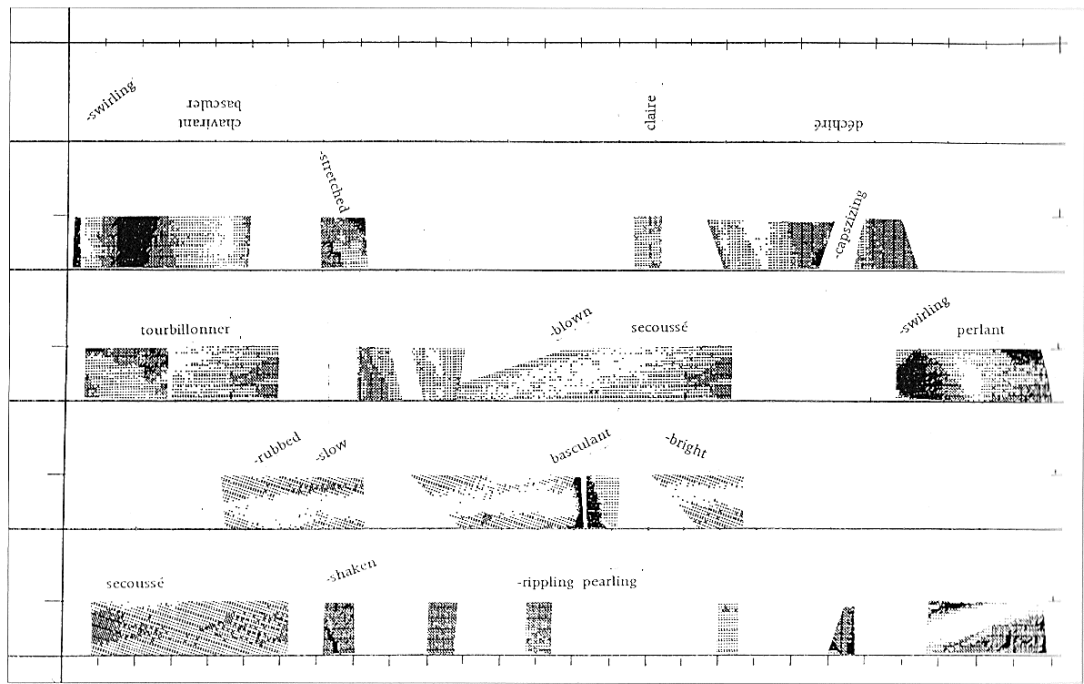


Figure 3.7. Oscar Wigli, Partition graphique-verbale pour la composition AVELEK, 1994
(Baumgartner et al., 2007, p. 250)

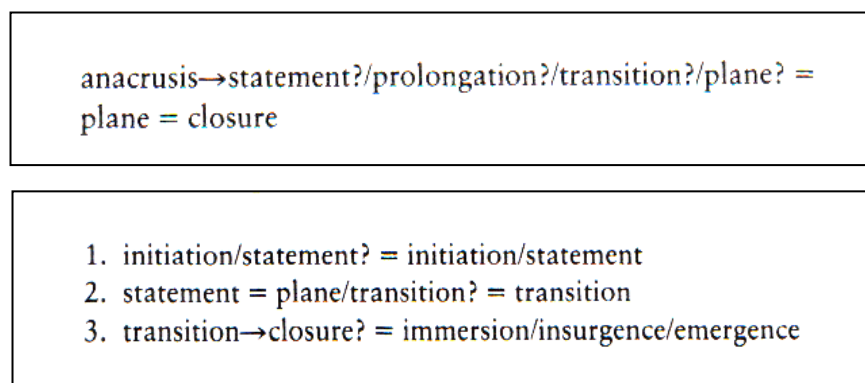
Sol LeWitt suggested that the process of making of a work of art is realized either based on decisions made at each stage or through a system that would control these decisions (Welsh, 1994). Thinking about co-composition in a reversible manner turned my thinking about action toward a temporal approach. My intention in *Sculptural spectrograms* is placing the process itself at the core of the co-compositional thinking. I work both in an additive and subtractive manner: this of cutting marble and of welding steel. Each object is considered as a reflection to a series of decisions expressed through working actions (Figures 3.8-3.13; Appendix 1, pp. 15-18). I look at ways for developing a method for articulating concepts of co-composition based on functions that were both analytical and generative. A position in-between LeWitt's statement, a combination of decisions made at each stage and a more systematic approach that used a set of rules (Galanter, 2003). How could the first contribute to the latter in the context of co-composition?



Figures 3.8 - 3.13. Object in marble, general dimensions 10 x 8 x 11cm (left)
Object in steel, general dimensions 25 x 15 x 15cm (right)

Samples are derived from two making processes each using different material: marble and steel. The points of reference of this exploration are the processes of cutting marble and welding steel. Working with different materials and techniques contributes to showing how material properties could affect the sounds produced, the making process and finally, the outcome of this exploration. Recording sound and filming the processes allowed for the realization of a spectrogram analysis of the sound recordings based on concepts of spectromorphology, while having videos as visual references for the sculptural actions. Sound samples from each action of making are used to identify the three temporal phases: onset, continuant and termination. This analysis explores how actions “...were happening and highlighted that actions of making sculpture can be reflected through sound” and how structures of spectra could inform different actions (Panourgia, 2016, p. 183).

Actions are viewed as a temporal form through a series of spectrogram analyses and with regards to material transformation. I explore the possibility of ordering actions and sounds into sequences. Based on Smalley’s idea of “hypothetical *function chains*” I investigate the development of potential sequences of sounds for describing actions of making sculpture (Smalley, 1986) (Figure 3.14). Smalley’s function chains can happen in multiple stages (Figure 3.15).



Figures 3.14 & 3.15. Denis Smalley’s *hypothetical function chains* (Smalley, 1986, pp. 86-87)

Informed by Wiggl’s graphic scores and Smalley’s chains, I look at how sound sequences could inform from new actions that would generate sculptural objects. Both objects have a similar shape (Figures 3.8 - 3.13), however, they differ from

each other in terms of material: the marble object is solid, whereas the metallic hollow. Something that does not only depend on material properties, but also on the making process:

Cutting a block of marble involved three types of actions: placing the marble on the cutter, adjusting the marble in relation to the blade and finally, cutting. Placing the marble included lifting, landing and pushing the marble on the track slider of the machine. Adjusting concerned moving and pushing the marble until it was on the right position for cutting in relation to the blade. Cutting happened by pushing the block of marble towards the blade. This sequence of actions was realized for each cut. The marble object was then formed by a sequence of cuts. (Panourgia, 2016, p. 184) (Appendix 2, Folder '3.3.1 Sculptural spectrograms' file 14)



Figure 3.16. Marble object and operating cutting machine. Still from video

To make the object from steel, sheets were cut in the guillotine, welded together and then grinded at their edges:

Cutting the sheets in the guillotine required the rotation and adjustment of the sheets to the machine before each cut. Welding included holding the pieces together and rotating the object as it was being built. The action of welding was happening in a repetitive manner across the edges of the object. Grinding was executed with an angle-grinder being moved back and forth for removing extra material from welding, while rotating the object for completing this process in all its edges. (ibid.)

In this process, actions were happening in a single sequence: cutting all sides, welding all sides, grinding all sides, as opposed to the marble sequence of actions, which happened multiple times (Appendix 2, Folder '3.3.1 Sculptural spectrograms' file 21).



Figure 3.17. Grinding steel. Still from video

A comparison between the spectrogram analyses³² of the sounds of the two material processes is used to explain the material properties of the objects (Appendix 1, pp. 21-25; Appendix 2, Folder '3.3.1 Sculptural spectrograms' files 10-13 and 15-20). In marble, the first two actions were not as intense, and their sound spectra were not continuous. The action of cutting produced on the other hand, continuous sound. Regarding steel, the first two actions were not continuous either but more intense than the first ones in marble. Grinding steel had a similar spectrogram to cutting marble, but the first was more intense. It also involved repetitive parts due to the back and forth movement of the grinder. Smalley noted that

...continuous motion is sustained while discontinuous motion may be more or less fragmented. The continuity-discontinuity continuum runs from sustained motion at one extreme to iterative motion at the other. If iterative repetitions become too widely spaced then separate objects will be heard. (Smalley, 1997, p. 117)

Spectrograms allowed the observation of continuity and discontinuity in the sound samples with precision and enabled me to question what such continuity

³² Spectrograms were generated in IRCAM Audiosculpt (Picasso et al., 1995-2013). Appendix 1 (pp. 21-26) includes detailed description based on the numerical values of the spectrogram analyses using Sonic Visualiser (Centre for Digital Music, 2015); the spectrograms presented in the main text focus on the sound patterns identified visually, in each action.

or discontinuity signified for the process of making. Following this, “selecting a material is also selecting sound spectra” (Panourgia, 2016, p. 188).

Analyzing the spectrograms in greater depth, my aim was to identify and interpret the type of structures, the way they could function within sequences and influence the sculptural outcome. Figure 3.18 relates the action of placing marble to Smalley’s spectromorphological “onset (how it starts)” and indicates its structure (Smalley, 1997). The two main sound events within the action of placing, are enclosed in rectangles. The start of the sequence placing-adjusting-cutting is considered here as an onset. Placing is happening in three stages: lifting, placing, moving, which is repeated until the marble block is adjusted.

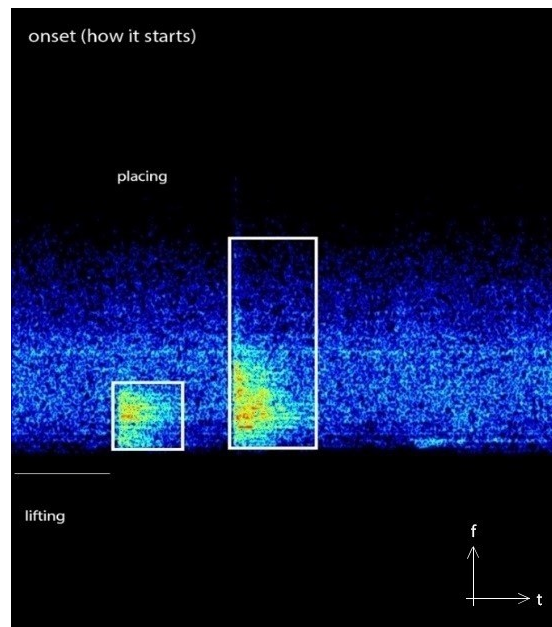


Figure 3.18. Spectrogram of placing marble: action-sound structure. X axis represents time, Y axis frequency and colour range intensity.

The actions of adjusting and cutting marble involved

...‘moving, placing and testing’ until the object is adjusted, which was related to the continuant phase [Figure 3.19]...between the above-mentioned stages there is always the action of moving. The spectrogram of cutting marble in the machine does not include any remarkable patterns as it continues in the same way it started [Figure 3.20]. What is obvious on its spectrogram analysis is the gradual termination as the blade crosses the material, cutting off the piece. If we consider all three actions together...placing marble could be the onset as ‘downbeat’, adjusting could be a continuant such as ‘transition’ along with part of cutting as ‘prolongation’, followed by a gradual termination, a ‘closure’. (Panourgia, 2016, p. 190)

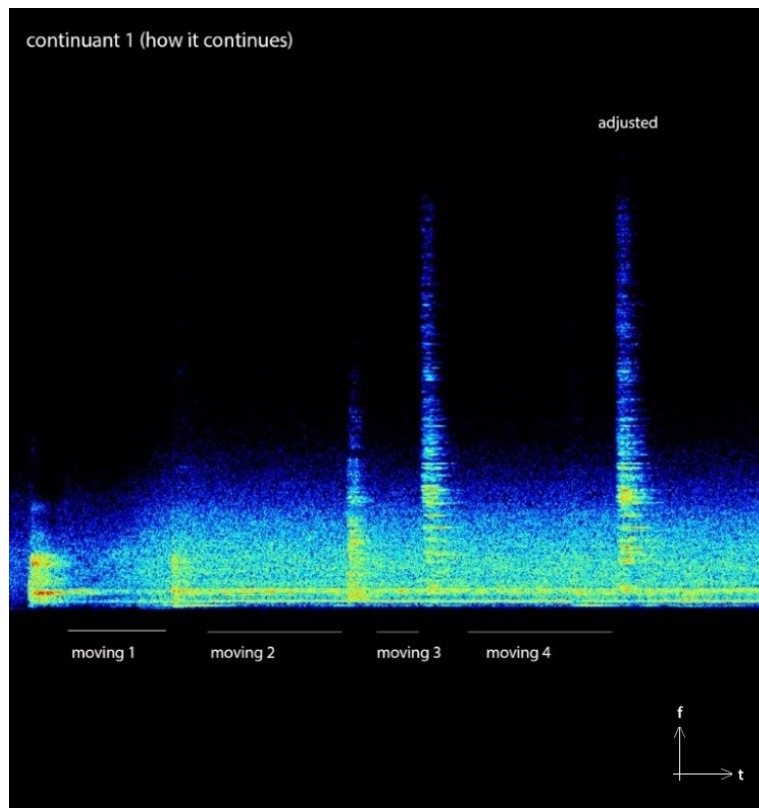


Figure 3.19. Spectrogram of adjusting marble: action-sound structure. X axis represents time, Y axis frequency and colour range intensity.

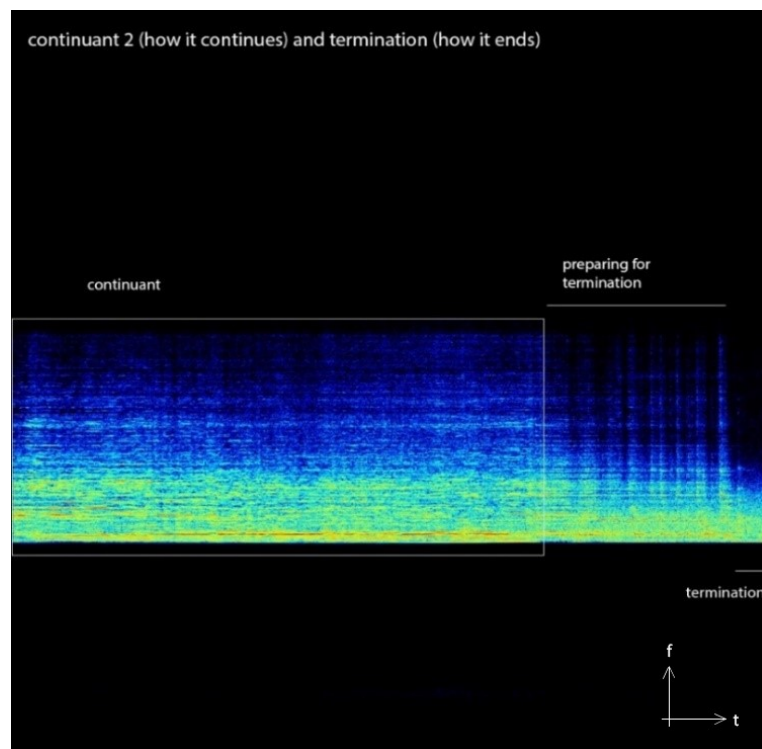


Figure 3.20. Spectrogram of cutting marble: action-sound structure. X axis represents time, Y axis frequency and colour range intensity.

Figure 3.21 illustrates a cut of steel sheets in the guillotine:

The three rectangles show three different parts, actions within the action of cutting: adjusting, pressing the pedal and cutting/pieces falling. This could act both as an 'initiation' onset with the action of adjusting the sheets and as a 'transition' continuant with the actions of pressing the pedal and cutting/pieces falling. (ibid., p. 192)

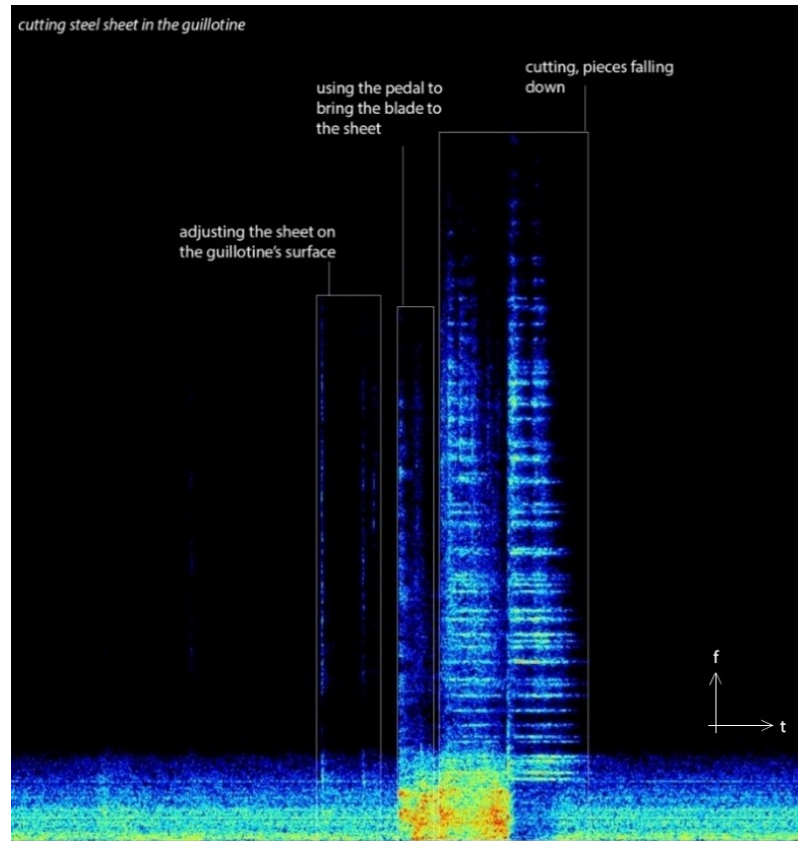


Figure 3.21. Spectrogram of cutting steel sheets in the guillotine: action-sound structure. X axis represents time, Y axis frequency and colour range intensity.

Figure 3.22 relates the action of welding, which based on Smalley's terms, could be characterised as a "prolongation" (Smalley, 1997). As in the previously discussed action of adjusting marble, "between each sound of welding there is a pause while rotating, which creates a type of rhythmic pattern" (Panourgia, 2016, p. 192). Figure 3.23 shows the action of grinding that is happening with a back and forth movement with pauses in between. The pauses of the main action concern pauses in sound, but not in the actions themselves, as I was observing the process for adjusting the grinder appropriately. Distancing the grinder from the object had as consequence the loss of contact with the material and the change of its sound (rectangles on spectrogram of Figure 3.23). It could be

characterised as another “prolongation”. Figure 3.24 shows a further continuant: grinding and rotating the object. The difference to the previous sound sample is the action of rotating that creates another type of sound in the recording. Although its structure is very similar to this of grinding, the in-between action of rotating/moving produces additional sound (rectangles on spectrogram).

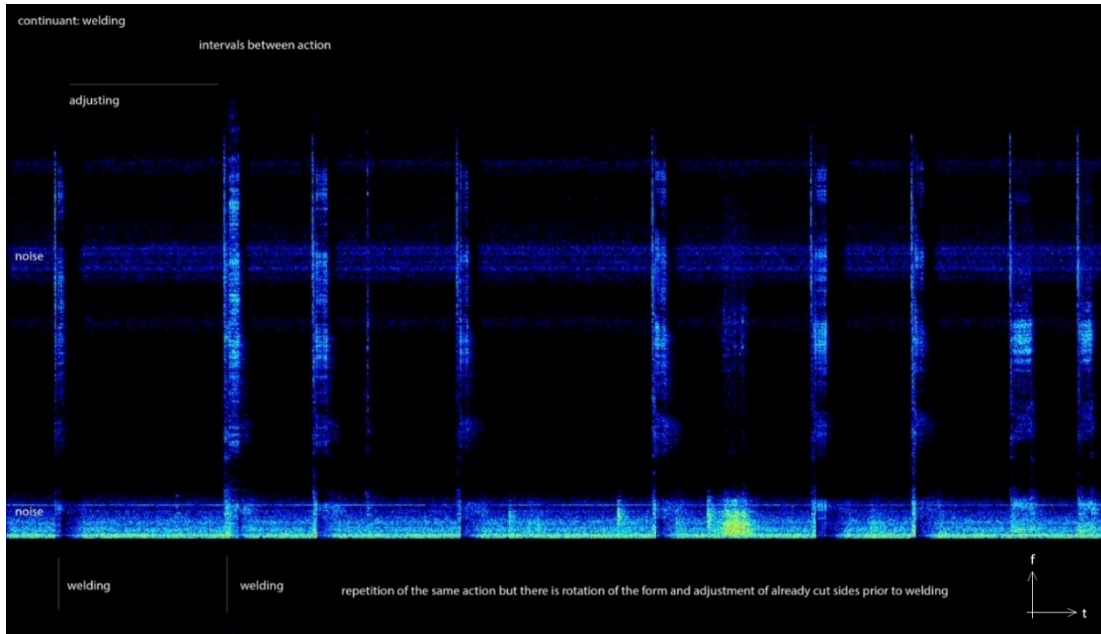


Figure 3.22. Spectrogram of welding: action-sound structure. X axis represents time, Y axis frequency and colour range intensity.

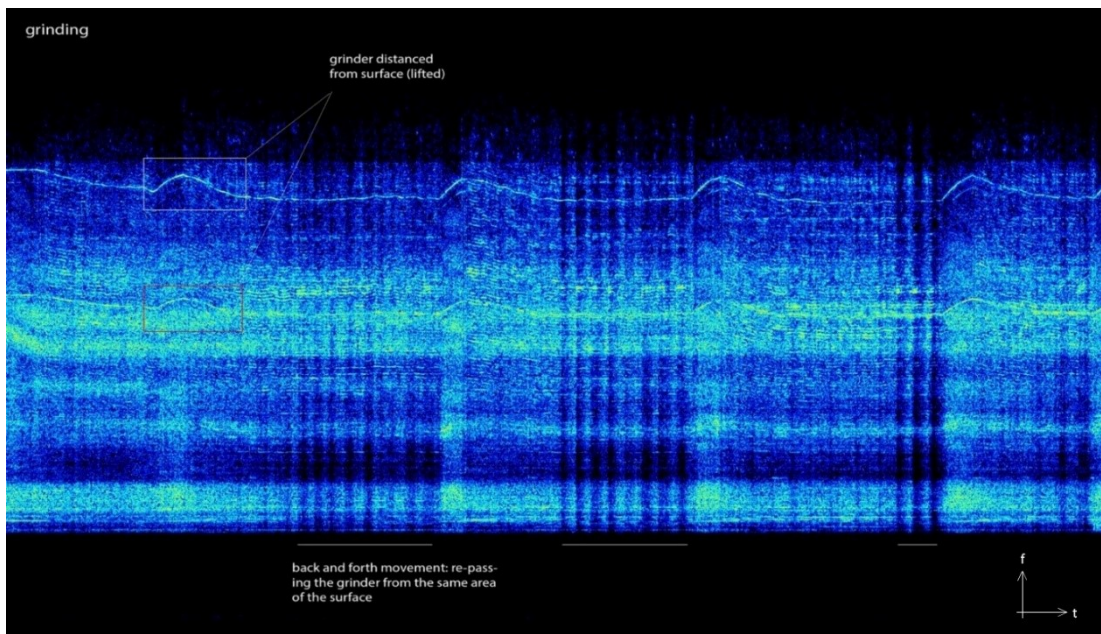


Figure 3.23. Spectrogram of grinding steel: action-sound structure. X axis represents time, Y axis frequency and colour range intensity.

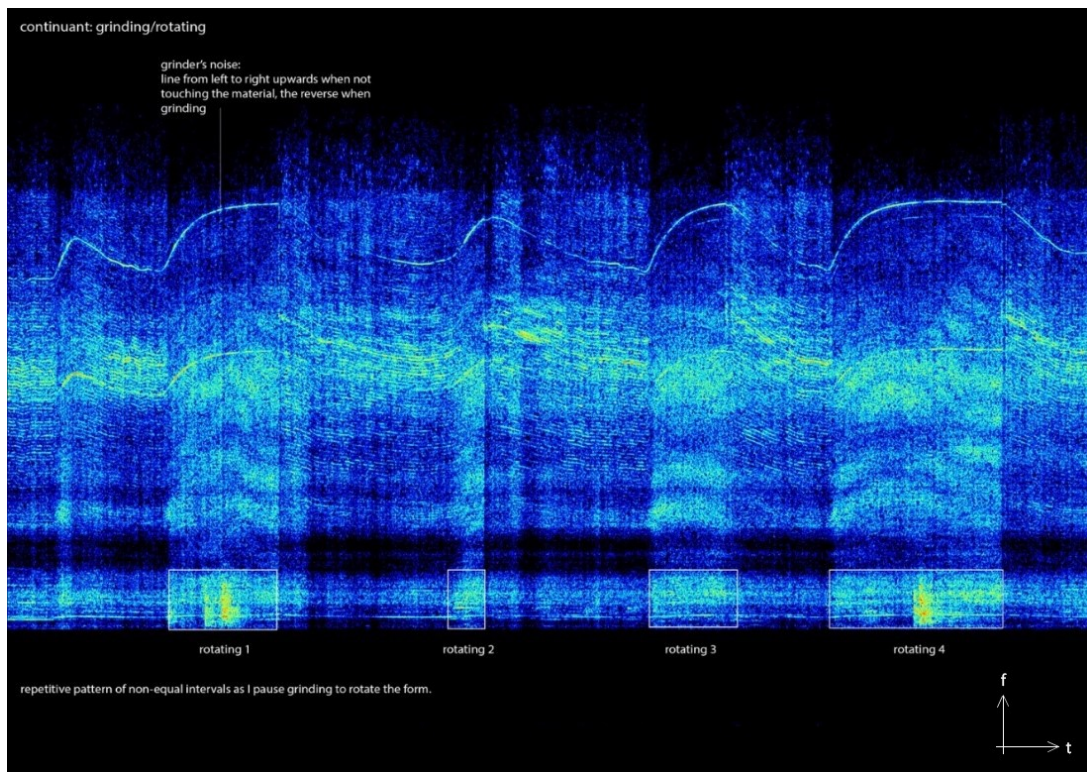


Figure 3.24. Spectrogram of grinding steel and rotating the object: action-sound structure. X axis represents time, Y axis frequency and colour range intensity.

Categorizing the sound samples according to their structural function provided with an understanding of the connection between sculptural actions and the sounds produced (Figures 3.25 and 3.26). So far, three types of sounds were encountered, which occurred from: a) repetitive actions somehow regular such as welding, b) continuous such as cutting, and c) fragmented such as adjusting (ibid.). Actions such as lifting the object could be characterized as silent.

placing (onset) < lifting, placing, moving adjusting (continuant) < moving, placing, pushing/testing cutting (continuant/termination) < pushing/cutting
cutting < adjusting/moving (onset) pedal/cutting (continuant) welding (continuant) < adjusting/moving, welding grinding (continuant) < moving/rotating, grinding

Figures 3.25 & 3.26. Smalley's *structural functions* revisited for the marble making process (top) Smalley's *structural functions* revisited for the steel making process (bottom)

In pursuing a connection between words and the creative process, I question the role of verbal descriptions within the above spectromorphological analyses. As Oscar Wiggli, composer Manuella Blackburn considered words as source for developing sounds. Blackburn stated that the terms used to describe spectromorphologies concerned words “not exclusive to musical description, but common and applicable to much wider functions, often suggestive of non-sounding situations, phenomena and other cultural experience” (Blackburn, 2011, p. 5). So, what do these word-sets have to say about actions for physical material manipulation? Referring to Andre’s verbs, Wiggli’s partitions and Serra’s *Verb List*, I am reconsidering the verbal expression of actions and processes through terms that were derived from Smalley’s structural functions. Wiggli’s verbal articulation of actions along with ‘snap-shots’ of his sculptures structured in sequences for the formation of a score in which the horizontal axis represented time, whereas the vertical was arranged in four voices (Wiggli, 2010).

My aim is to look at relationships between the two types of duration; this of the action and this of the sound. Introducing these notions to a sculptural context could contribute to reach a co-compositional understanding of each action in terms of duration and outcome. In this way, I began thinking about co-composition through time and energy. The common ground created between the two modalities in this exploration was action. Spectrogram analyses of sounds of the working, was another form of visual representation of sound material, which allowed me to relate the making process with the sounds produced. How could sound structures take the form of sequences that could inform in their turn the making process of a sculptural object? In what ways could sounds of the working be used for different materials and making processes?

Wiggli’s sequences of images from his sculptures and verbs that represented actions were used for the generation of sound material (Figure 3.7), as he wrote in his journal (August 2006):

In 1984/1985, I started developing graphs with the idea of the visualization of musical timbres. These graphs were based on words, which I used for the description of the

timbres. The graphs were realized with the aid of Video-Prints, which I cut and pasted like a compositional project – for four lines – always quadriphonic. (Keller et al., 2010, p. 27, own translation)

Drawing from Wiggl’s scoring method, a collage of spectra aimed to structure sculpture making in a temporal form through sound. The potential sound sequences explore relationships among actions. Spectrograms and their analysis revealed the existing structures of sonic material during the making of this specific kind of sculpture in marble and steel. The aim of the potential sequences is the ability to generate a sculptural outcome. For achieving this, the order of each action within the sequence was taken into consideration. A potential sequence could be: lifting/placing, welding, adjusting and grinding. Due to the action of welding, this process will have to concern metal. The spectrogram of this potential sequence is presented in Figure 3.27 with material from the initial processes (Appendix 1, p. 27). Onsets, continuants and terminations could determine the progress of each sequence. In the above-mentioned example, placing was considered as an onset, welding as a “prolongation” continuant, adjusting as a “transition” continuant and grinding as another “prolongation”.

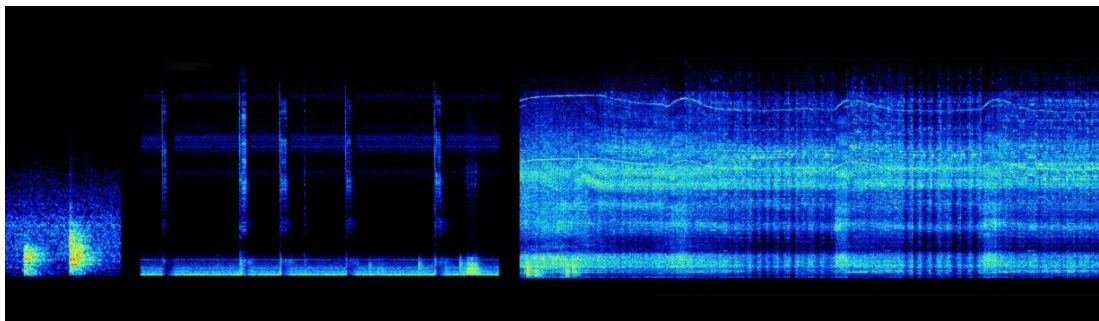


Figure 3.27. Collage of spectrograms. Potential sequence: placing, welding, adjusting, grinding

The observation of the spectrograms of the recordings, contributed to identifying how a sound of the making started, continued and ended. Concerning different actions, these three phases were visualized in a different manner, creating different visual patterns. They were either repeated as they initially appeared, changing during repetition or happened only once during the action. This analysis offered a more profound understanding of making processes concerning intensity of actions, their duration and material transformation over time, and

provided with an alternative method for combining sculpture making and sonic material through sequences. Sound was considered as a trace of the process that might not always be evident on the object itself. Grinding for example, eliminated the evidence of welding, which in itself added to the final expression of the object. The object then could represent a sequence of sound spectra. A first question regarding the potential sequence is in terms of duration and material specificity. I have used the duration of the spectrograms from the initial processes. Different duration of actions could lead to different sculptural outcomes: there are actions that could last longer depending for example, on the size of the object. Therefore, the temporal nature of sound is affected differently by scale than the form of the object. Using Smalley's concepts, I was able to classify the various actions through sound. Furthermore, my decision of using two types of material influenced the degree of the generative aspect of this exploration as for example, welding is a process that was not possible to realize when working with marble. Each material has its own sound sequence depending on actions and their intensity, as well as the tools used. In this research the consequence of material choice in sculpture is reflected through sound.

Following this exploration, I worked with a block of cast glass in order to compare materials and processes (Figures 3.28-3.30; Appendix 1, pp. 19-21; Appendix 2, Folder '3.3.1 Sculptural spectrograms' files 22-26). Cutting and grinding glass involved the combination of actions of the working of marble and steel. As in marble, cutting glass was realized using a diamond saw, whereas grinding was happening in different manner than steel. I was moving the block on the rotating disc for polishing the surface of the glass. Observing the spectrogram of cutting glass (Figure 3.31), there was more energy released during this action than when I was cutting marble. Material hardness influenced then not only the duration of the action and thus the duration of the sound produced, but also the frequency range of the action (Appendix 1, p. 26).



Figures 3.28 - 3.30. Object from glass, general dimensions 9 x 9 x7.5cm

In the spectrogram of grinding glass, we can observe the noise of the operating machine and its rotating a disc (Figure 3.32). Silicon carbide grit and water were applied on the rotating disc for polishing the glass. Lifting the block of glass from the grinder's surface was the only interruption of the continuity of the grinding sound. Moving the block in a back and forth manner was the main action that produced sound and caused the grinding. It created a similar repeated visual pattern on the spectrogram as in grinding steel, yet in a less regular manner.

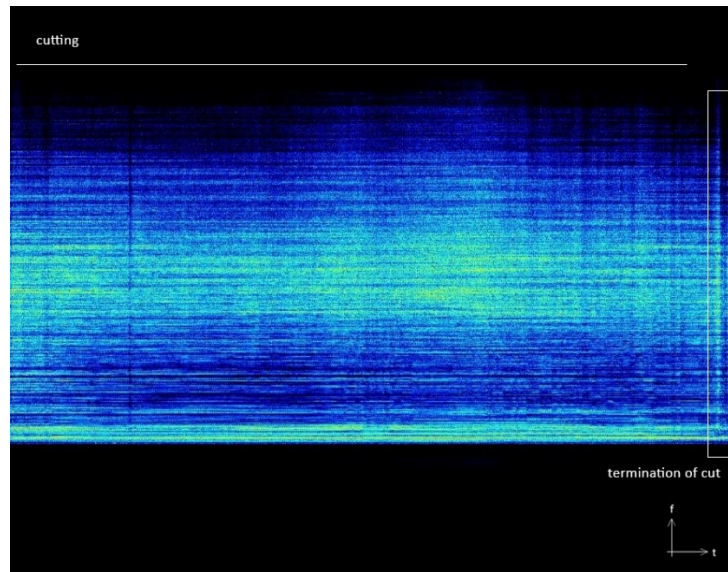


Figure 3.31. Spectrogram of cutting glass: action-sound structure. X axis represents time, Y axis frequency and colour range intensity.

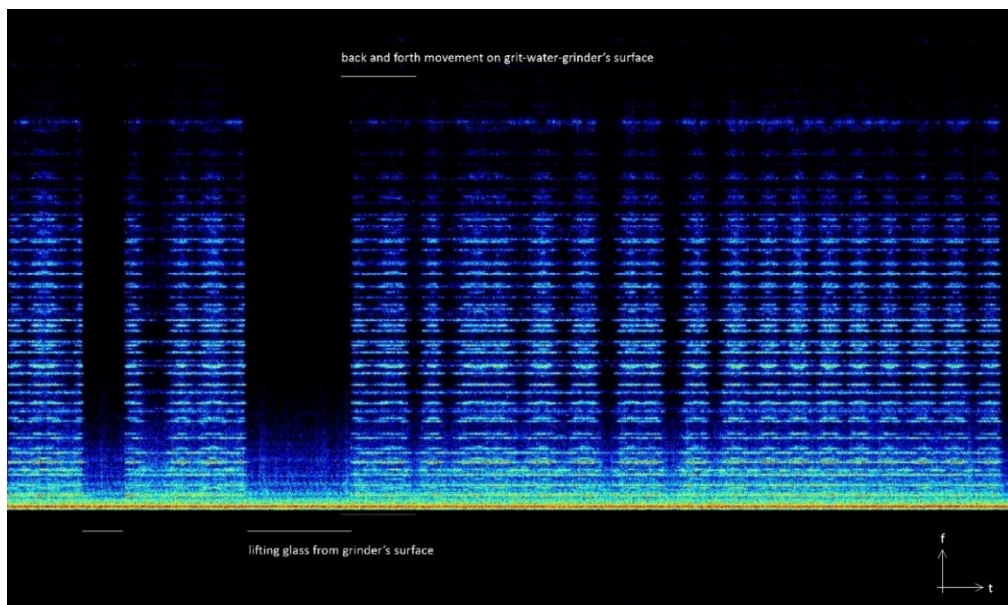


Figure 3.32. Spectrogram of grinding glass: action-sound structure. X axis represents time, Y axis frequency and colour range intensity.

Having worked with marble, wood and glass, I observed that each cutting process involved additional actions of shorter duration such as moving, rotating, placing, and cutting. Spectromorphology contributed to a deeper understanding of the relationship between actions in sculpture making and sounds. Following the above exploration, I argue that in sculpture, the sequence of actions can determine the final outcome.

Blackburn used the flexibility of the non-sound specific vocabulary of spectromorphology and the visual representation of sound in the spectrograms, as a basis for developing compositional ideas.

Using the word *emergence*, sounds were chosen on the basis of becoming more apparent over time, while when using disappearance, sounds that fulfilled this criteria were those that faded out over time. This process informed the selection of sounds to be recorded and those chosen from within a given sound library. (Blackburn, 2011)

In choosing to work with spectromorphological analyses and notions, my aim was to investigate the “energy articulation” of sculptural actions through sound (Thoresen and Hedman, 2007). How could I relate patterns of actions with patterns of sounds? Looking at analytical methods of spectromorphology was more about the categorization of energy characteristics of the working sounds rather than visual representation through a scoring process.

Making potential sequences with the samples of actions from the analysis above could be considered as a first approach to co-composition based on a generative process. Spectromorphological instructions brought with them aspects of *systematic organisation*, which touched upon the previously discussed notions of calculation and repetition: “Elaborating minimalist materialism in terms of process, the logic of calculation seeks to intensify perception by clarifying the structure and structuration of the work” (Botha, 2017, p. 131). Regarding instruction, Hoffman referred to the instruction scripts of the Theatre of Mistakes, which she characterized as

...highly rigorous, complicated organizational formats, often necessitating schematic diagrams mapping the action for the audience...like performance machines constructed

out of temporal and gestural component parts. The group was 'creating instruction recipes' that Nick Kaye compares to Fluxus scores (1996, pp. 130-131); he describes *Going* as 'a system generating a performance (141)' (Hoffman, 2012, p.55).

The written analysis of the creative process in the form of tables is considered as a method for understanding the changes that are happening concurrently: in the sculptural/physical material, in sound and regarding my actions. It is about the *de-composition* of these three elements of the work; a logic of moving backwards through the stages of the creative process. Composer Richard Dudas noted that sounds can be categorized in two "opposing" strands: "transient sounds whose perceptual characteristics evolve quickly in time, and stationary sounds whose perceptual characteristics evolve slowly in time" (Dudas, 2013). Further to these two categories, I consider continuity and fragmentation in sound as a result of each action on the material.

Reflecting on the documented processes, I realized a categorization of sounds in the form of a table according to movement, actions, duration and the way they evolve over time (Appendix 1, p. 28). What about actions that are involved in the process but cannot be 'heard'? Observing the video documentation of cutting marble (Appendix 2, Folder '3.3.1 Sculptural spectrograms' file 14), I wrote a script of the process in textual form (Figure 3.33). The actions described on the script were repeated for each cut, until the end of the process. Repetition of sounds in co-composition is then related to the actions executed and the materials chosen. What defined the final shape of the form was the actions 1 and 2, as well as the manner of placing the block in relation to the blade. Examining the pattern of the process, without thinking about the final outcome, I question: what makes each action what it is? How is each pattern defined by duration?

Measuring and drawing the cut on the surface of the piece as a line with a starting and ending point. Placing, lifting/pushing marble concerned a physical manipulation of material, guided by the drawn line. Pushing toward the machine was about a physical action forwards. Switching on the blade and the water involved enabling power, which is a differs from the previous actions in terms of intensity (interaction with the power of the machine). Adjusting included small

changes in the position of the marble. Holding the marble referred to an act of resistance against the force of the machine for achieving the desired cut and reducing material. Pulling back the tray enabled returning to a previous state followed by the repetition of this series of actions for each cut and the switching off of the machine, as the termination of the process. Analytical methods for the categorization of actions according to their result and bodily effort were informed by Rudolf Laban's principles of movement (Laban, 1975). They had as aim not the generation of notation but to provide an understanding of the actions as movement in relation to this co-compositional proposition (Appendix 1, p. 28).

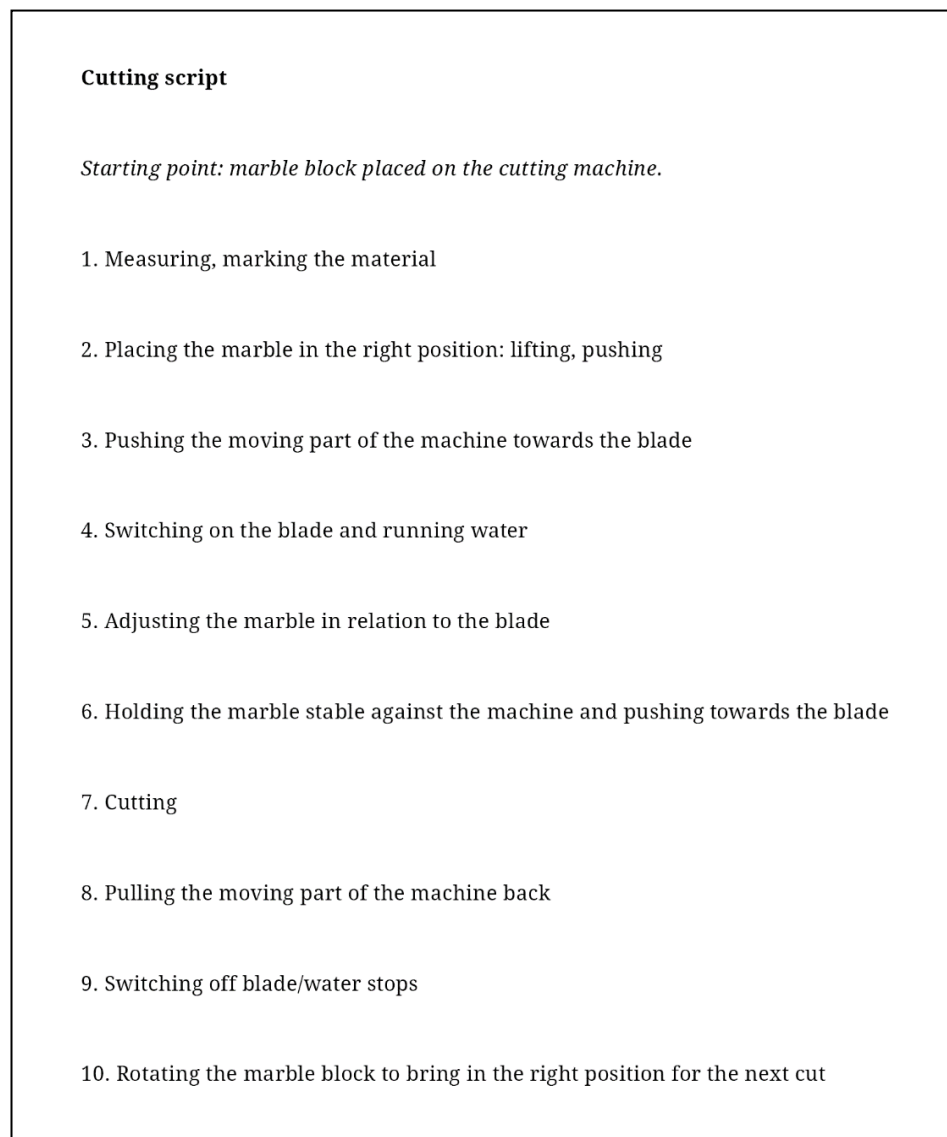


Figure 3.33. Cutting script, verbal instructions

This meta-analysis of sculpture making could be used as pre-compositional point and initiation for creating sound patterns by considering ways in which the sound could reflect the action. Addressing what Chion stated: “The sounds are part of the traces of the event but the particularity of sound is that it leaves no visible traces” (Chion in Velasco-Puffleau, 2017, p. 169). Spectrograms of the actions did not show the entire process but fragments of it in order to analyse and compare actions and materials. In discussing Hans Jonas’ insight on the relationship seeing-hearing, Ingold suggested that to “arrest the flow [of sounds]...is not a coherent snapshot, but a collection of atomic fragments” (Ingold, 2000, p. 258). The aim of this exploration was not to turn the process into “mechanical”³³, but to dissect it in smaller parts for the formation of a co-compositional description of each action. My intention for the continuation of this research is to restructure these aspects of the process in a co-compositional manner, through ideas of instruction. What this spectromorphological study did bring was a perspective of co-composition that provided an understanding of energy articulation in sculpture through the sounds of the working. Focusing on energy and material qualities rather than the shape, on relationships of dynamics in the process rather than the figure of the object, led this research toward an action-driven mode of co-composition.

³³ Ingold argued that “skilled practice cannot be understood as the mechanical execution of prefigured design; it is now clear that the same applies to the design process itself” (Ingold, 2000, p. 418).

Chapter 4

Actions - Materials - Processes

4. Actions - Materials - Processes

Change never goes without acting. Actions define the shaping of our environment and allow us to challenge its known state. How do we communicate, perceive and respond to changes happening simultaneously? Are there common values between actions on the spatial-visual and actions on the sonic? The projects in this chapter investigate these questions in physical and digital spaces by deconstructing and reforming temporal relationships that are interlocking or inherent to materials. My aim is to produce new responses and meanings through actions that operate as gestures of expansion seeking to invest in a range of angles to understand the object as a combination of realities. I explore a process-driven way of thinking through physical encounters with materials, forces and conditions. This redefines the notion of nowness as a permeating state across the spatial, visual and sonic.

The exploration of sounds produced by sculpture making led to questions about source and generated an understanding of actions for sculpting and material properties in relation to sound. It brought together the discussion of listening to the process and the understanding that is produced by physical material transformation. In this chapter, I argue that actions could act as the link between modalities and re-introduce a process-oriented and temporal approach to co-composition. I aim to merge the action-oriented thinking that existed in Serra's work with Morris's, Wiggli's and Blow's way of using sound produced by physical material manipulation. Also, I aim to explore my response to the sounds. I started thinking about co-composition through action-feedback relationships and responsiveness in a performative manner based on the transformation of sounds. I then pursue then an understanding of sculpture making actions through listening and explore how this process of reflection-in-action influences the decisions that follow.

Material transformation is viewed in relation to actions from a process art and performative perspective, and is articulated based on an *aesthetic of effort*, which

describes the multi-tasking nature of co-composition and the conditions of the practice, the skill it takes to make and perform the work in relation to bodily effort. I take a different approach to what Krauss described as “a process-conditioned exchange of the goal, or object, of the action for the logic of the action itself” (Krauss, 1986, p. 18), as action is viewed here in-between modalities, and its outcome is considered an initiation of what would follow and not an end product. Drawing from Blow’s method of sound-stretching in his work *Bleigiessen* and Justin Boyd’s methods of filtering based on relationships of object-material-place, my aim is to transform sounds produced during making in a degree that they no longer refer to the actions that generated them (Walley Films, 2014). My interest in manipulating these sounds is in the way it could affect our experience not only of the process and three-dimensional object itself, but also of the timing of its transformation.

This chapter elaborates ideas of minimalism concerning materials and actions, process and processual art leading to a performative approach to co-composition. I discuss the way I work with sculptural material based on the work of artists such as Richard Serra, Oscar Wiggli and Barry Le Va, the New York-based B-Team and Greg Pope. Actions that involve machinery and others realized solely by body movement are viewed in relation to sound in both sculptural and sound contexts. This is followed by a discussion on sound making through actions of manipulating material, through operating machinery, through percussive-instrument playing with ‘non-musical’ objects, raising questions of an interface for co-composition. A comparison between physical and digital material manipulation in the framework of co-composition is explored through prototypes in *Digital interactions*. In this experimentation, actions of sculpture making are considered as the point of departure for manipulating synthesized sound. The prototypes constitute an attempt to build a digital interface for bringing together three-dimensional forms and sound.

4.1 Actions

Throughout this research, minimalist ideas have been approached from a range of perspectives. Here, I continue this discussion from an action- and process-driven approach. Music theorist Timothy A. Johnson pursued a definition of minimalism as “the conception of the non-narrative work-in-progress” by referring to Elaine Broad (Johnson, 1994, p. 744). Johnson stated that minimalism concerned more the process itself rather than an outcome, articulated through a continuous form. Temporality was considered by Johnson as inherent to the notion of process and the state of a work-in-progress. In a sculptural context, Robert Morris discussed “forms of behaviour” that existed within the “activity of making as much as within the end products” (Morris, 1993, p. 73). In his chapter *Anti-Form*, he stated that Pollock’s painting method through actions was about working with the “nature of material”, considering in other words, material properties as an interdependent aspect of the making process (ibid., pp. 44-45). Morris opposed to an “idealized” view of form and its meaning in Cubist terms, as an end product. Instead, he spoke of “forms of behaviour aimed at testing the limits and possibilities involved in that particular interaction between one’s actions and the materials of the environment” (ibid., p. 73).

Morris’s ideas of process were closely related to Paul Klee’s view that the making of the artwork was more important than the outcome itself (Klee, 1973). For Klee, it was about being in motion, the act of bringing something to its existence; focusing then on the energy of the creative process through the actions and thoughts of the artist that generate the work. Informed by Klee’s view, Tim Ingold stressed that an artwork is “...not an object but a thing and as Klee argued, the role of the artist is not to reproduce a preconceived idea, novel or not, but to join with and follow the forces and flows of material that bring the form of the work into being” (Ingold, 2010, p. 10) .

Using the terms “forces” and “flows” Ingold referred to an articulation of energy in the creative process³⁴:

...in life as in music or painting, the movement of becoming – the growth of the plant from its seed, the issuing of the melody from the meeting of violin and bow, the motion of the brush and its trace – points are not joined so much as swept aside and rendered indiscernible by the current as it sweeps through. Life is open-ended: its impulse is not to reach a terminus but to keep on going. (ibid.)

The work would become apparent through its making and the real-time decisions of the artist; an approach to sculpting with no prearranged limit or end but of manipulating material over time. As Klee believed, “form must on no account ever be considered as something to be got over with, as a result, as an end, but rather as genesis, growth, essence. [...] form as movement, as action, as active form” (Klee, 1973, p. 269). The temporality of this sentence not only shows the transformation of physical material through sound but bringing both modalities in a temporal dimension. I explore this aspect through a performative shift of my work by considering co-composition not as a result, but an *active* process during which constant change and variation of one's actions and decisions seek to explore complex morphologies that combine spatial and sonic material and dimensions.

Ian Chilvers and John Graves-Smith stated that process art diverted its focus on “the formal aspects of a work” but at its heart were the processes of working in a temporal, changing situation (Chilvers and Graves-Smith, 2009). Thinking through the process in this research did not concern just an action, but it involved a real-time reflection on both material types that aimed to bring together the aspects of co-composition. The process of co-composition is then viewed as an activity, which is happening over time and focuses on the way both types of

³⁴ Ingold mentioned that “philosophers Gilles Deleuze and Félix Guattari argue that the essential relation, in a world of life, is not between *matter* and *form* but between *materials* and *forces* (Deleuze and Guattari, 2004, p. 377)” (Ingold, 2009, p. 92). Klee’s views were included in Deleuze’s discussion about art through his approach of capturing forces instead of inventing forms: “in art, and in painting as in music, it is not a matter of reproducing or inventing forms, but of capturing forces. For this reason no art is figurative. Paul Klee's famous formula - "Not to render the visible, but to render visible" - means nothing else” (Deleuze, 2004, p. 56). It is not my aim here to expand on this philosophical argument rather to investigate this idea through my practice.

material are transformed. This directed me to rethink about the nature of process in relation to co-composition, which had a tight relationship with specific objects informed by Serra's work. However, Serra's approach was mainly about the actions themselves. For instance, actions structured within a process: what is the purpose of the processes? Here, originally, they are not solely for making sound but for making sculpture, actions should serve in a two-way manner. During the performance of *Tightrope Dance* by Hans-Joachim Hespos an action of welding was used by the performer to free himself from a space in which he was enclosed (Steiert, 1994). This operated as a visual, theatrical element, but also contributed to the sound environment of the composition. Hespos used then a making process of metalwork (welding) in the context of music performance and composition. The performer's act of welding aimed to intervene in the performance's stage design/visual and sonic outcome. Cage's instruction of pouring water in *Water Music* was an action that could relate to other activities such as planting, cleaning or drinking. In what ways could such actions influence sound outcomes in the composition and what was their role of theatrical and the visual aspects for audience experience?

Referring to Morris's works *Box With the Sound of Its Own Making* and *Performance Box*, Edward Strickland argued that they were closer to Fluxus ideas³⁵ rather than to minimalist principles. *Performance Box* (1960) "an oak box which opened to reveal a switch and instructions on the lid advising, "TO BEGIN TURN ON – CONTINUE DOING WHAT YOU ARE DOING – OR DON'T – DO SOMETHING ELSE. LATER SWITCH MAY BE TURNED OFF – AFTER A SECOND, HOUR, DAY, YEAR, POST-HUMOUSLY"" (ibid.). Instructions included short sentences that were structured in a higher level of precision than in Serra's list with regard to the actions they suggested; they referred directly to the action that needed to be executed but did not give information about the *how* of the activity. One could start with switching on the light and then do something that Morris

³⁵ Fluxus network of artists founded in 1960 by George Maciunas. Fluxus manifesto was to "promote a revolutionary flood and tide in art, promote living art, anti-art, promote non art reality to be grasped by all peoples, not only critics, dilettantes and professionals." (Phillpot, 1988, p. 12; Graves-Smith and Chilvers, 2015).

might have not thought of while writing these instructions. In this way, he made time unlimited and the process unpredictable although the starting and ending action was known and defined.

For Blackburn, verbal terms could also be used for “shaping and manipulating” sound: how a sound is initiated, its duration and termination (Blackburn, 2011, p. 6). In zooming out from a single sound, Blackburn discussed the potential of structuring groups of sounds using words. I am interested in looking at the diversity and intensity, the potential of these actions and the variation of the sounds produced concerning: manipulation, performativity and interaction. Eva Reiter developed a “pre-compositional process” in which she would analyze sounds produced by a range of machines and then use underlying structures as a starting point for her compositions. She worked towards a transformation of sonic phenomena into “a clearly defined sonic frame given by the instrumentation of a certain piece” (Reiter, Rutz and Nierhaus, 2015, p. 69).

Oscar Wiggli’s *Sound-Lavis* was a visual method of describing sonic ideas that existed in the ‘now’ and concerned the texture of sound depending on its previous state by contributing to what will proceed (Claude Stadelmann and Signe Productions, 2013). In that sense it did not involve a fixed idea of a sound but acted as a medium for exploring sound composition and creating new material (Keller et al., 2010, p. 38). Reconsidering *Sound-Lavis* from a process perspective, Wiggli’s temporal aspect of the situation “before” and “after” a sound’s existence and its “evolution”³⁶, could be related to an action of sculpture making.

I will now review this process based on structures existing in recorded material in terms of co-composition: how could it bring together the actions, physical material and sounds? Blackburn developed a compositional method based on a visual interpretation of Smalley’s structural functions, which have been previously discussed in *Anatomies* section (3.3). Blackburn’s method involved

³⁶ Personal notes from archival research at Paul Sacher Foundation in Basel, Switzerland in February 2016.

“the shaping and manipulation of individual sounds” through actions that were derived from a list of words.

Choosing one word from each column can dictate the sculpting of a single sound by accentuation of its inherent features. This allows a sound to be composed into a desired shape. Applying an increasing volume envelope to a sustained sound, for example, will create an emergence. A possible continuant for this sound might be a prolongation by looping or sustaining its original duration and a gradual fade will terminate the sound as a disappearance. (Blackburn, 2011, p. 6)

Blackburn’s thinking of an interdependent visual and spectromorphological transformation of sound led to an “assemblage” of sounds through the visual merging of graphic representations of sound shapes. Expanding on the spectral collage that was realized in the previous Chapter (Figure 3.27), I worked at this stage with sound itself. How could the actions of my creative process discussed in Chapter 3 operate in terms of sound manipulation?

Sound artist and sculptor Justin Boyd worked with field recordings and found objects. His aim was to transform the sounds “to a specific set of frequencies and [look at] how those frequencies vibrate and resonate another material” (Walley Films, 2014). In this way, he persuaded the development of a material-place-sound dialogue, enacted by the sonic element of his work. Placing the processed sounds into objects foreign to the sounds’ sources, he created “...a conversation between materials and place and sound...the sound will be ...the activating element in all of those things”, as he mentioned (ibid.). Sound in his work was detached to its direct, initial source. Boyd stressed that “these barrels have their own sound and that sound has been brought together and combined with the sound of the brass bell and then those two things make their own sound together” (ibid.).

Boyd’s work generated questions about the presentation of the new processed sound material in relation to objects, space and physical material. His ideas of transforming sound recordings through filtering for making them distant from their original source, were viewed here in relation to actions and the continuation of the process of co-composing. Sound artist Marek Gabrysch’s soundpanting

works used sound processing as means for generating visual works through their spectrogram analysis (Figure 4.1). Seeking to create architectural drawings, Gabrysch constantly processed sound recordings until their spectrograms would take the desired visual form³⁷. Sounds were exhibited together with their spectrograms and a cursor was used in the playback software to indicate the relationship between the sonic and the visual.

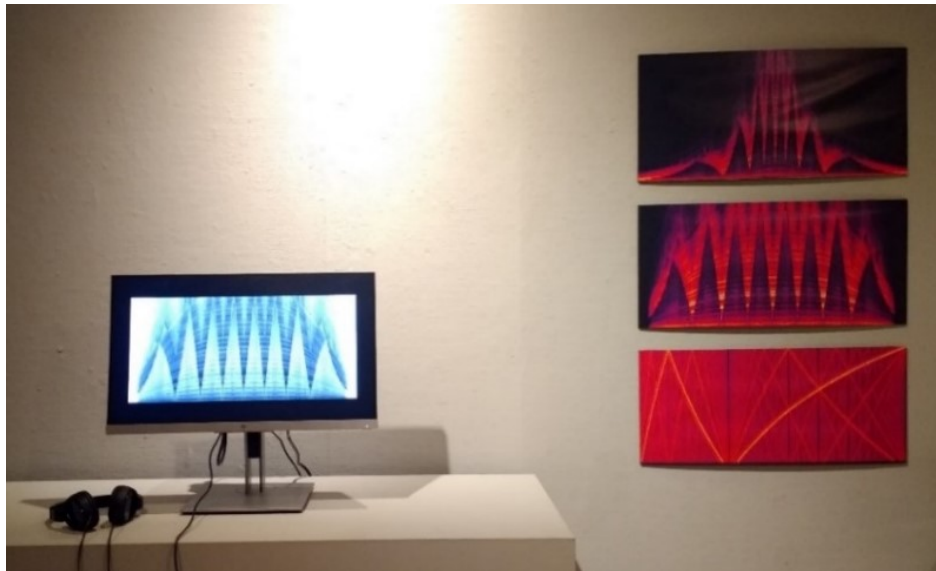


Figure 4.1. Marek Gabrysch's soundpaintings *Ketter Tower*, *Colosseum* and *Spectral Halls*, 2018 part of the exhibition 'Looking for the Absolute' curated by Cath Keay in July 2018 Mathew Gallery, Minto House, ESALA. Photo by the author

Bringing together the previously discussed approach to process with Mike Blow's method of sound stretching in *Bleigiessen*, Gabrysch's and Boyd's work, I look at ways for transforming the sounds recorded in the workshop. My intention is to develop new imageries of actions and explore how these could instantiate new responses in relation to the co-compositional process; to think therefore, about how changes in sound could allow a reconsideration of sculptural actions. Following the spectromorphological analyses and the understanding of my actions through sound, I worked visually on the spectrograms with the aim to diverge from their original source by employing techniques of sound processing such as time-stretching, filtering, frequency shifting and cross-synthesis. A way of working that was similar to this of Mike Blow and Oscar Wiggli, as I moved

³⁷ Personal communication with the curator of the exhibition Cath Keay (July, 2018).

between the workshop space and the music studio. This stage was critical for the continuation of the research as it introduced digital processes towards co-composition through this parallel activity of working in the workshop space with physical material and in the music studio.

Ircam AudioSculpt software was used for the visual manipulation of sounds based on their spectral analysis. Using filters visually on the spectrogram in relation to the shape of the sculptural objects was the first approach to manipulating the sounds of the making (Figure 4.2). This formed a reconsideration of the notation method developed in *Sides* (Figure 2.20) and a continuation of the spectral collage developed in *Sculptural spectrograms* (Figure 3.27). Responding to filtering in a visual manner based on my sculptural objects aimed at introducing aspects from the one modality to the other: sound manipulation based on my sculptural objects brought the process of the one to define the outcome of the process of the other. Filtering sought to distance the sound from its original source by eliminating a range of frequencies and introduced an aesthetic of reduction in terms of sound manipulation (Appendix 2, Folder '4.1 Actions (Processed sound samples)' Subfolder 'Multiple material_with Ircam AudioSculpt', files 30 and 31).

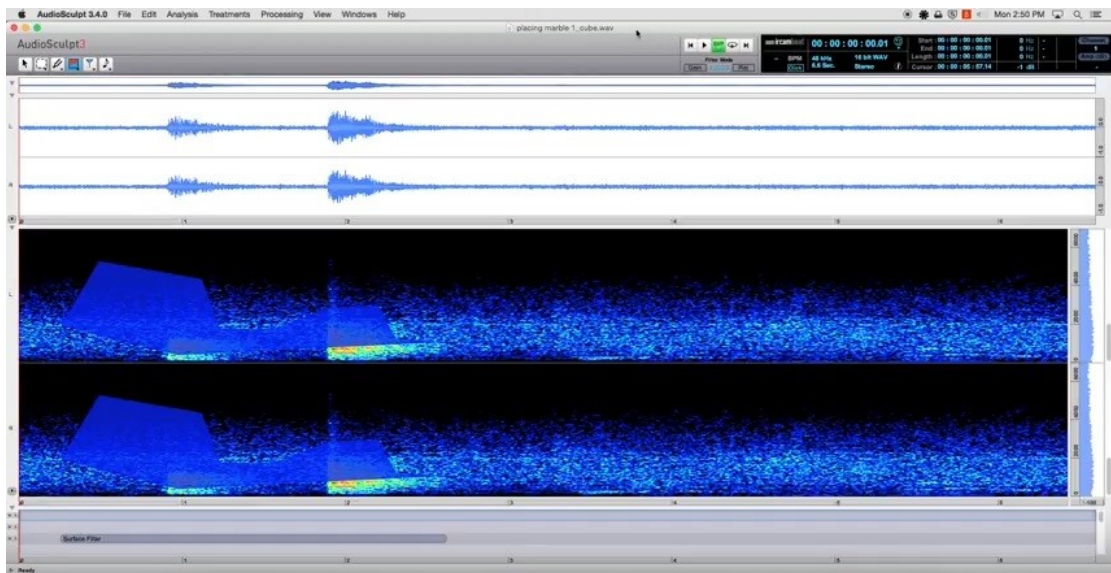


Figure 4.2. Surface filtering on the *sound of placing marble* in Ircam AudioSculpt

Stretching was about deforming the time of the making, which was attached to the notion of continuity (Appendix 2, Folder '4.1 Actions (Processed sound samples)' Subfolder 'Multiple material_with Ircam AudioSculpt' files 28, 32-38). As in Blow's *Bleigiessen*, time-stretching aimed at giving a slower impression of each action creating a contrast of duration, but also a better insight on the way the action was executed. Cross-synthesis involved merging two actions (Appendix 2, Folder '4.1 Actions (Processed sound samples)' Subfolder 'Multiple material_with Ircam AudioSculpt' files 39 and 40). This technique acted as an additive method, which generated outcomes that did not distance from the original source of the sound, rather created a fusion of two actions. Frequency shift made sound samples different than the original recordings by transforming harmonic relationships within the signal (Appendix 2, Folder '4.1 Actions (Processed sound samples)' Subfolder 'Multiple material_with Ircam AudioSculpt' files 27 and 29).

I further applied effects, filters and resynthesized the samples in the environment of Ableton Live using Live devices (Appendix 2, Folder '4.1 Actions (Processed sound samples)' Subfolder 'Steel_with Ableton Live devices' files 41-51) (Ableton AG, 2016) and Max MSP using *grainstretch~* by Timo Rozendal (Appendix 2, Folder '4.1 Actions (Processed sound samples)' file 52) (Cycling'74, 2016; Rozendal, 2012), which led to outcomes that distanced sounds from actions and provided with additional relationships of actions-sounds-tools-materials (Appendix 2, Folder '4.1 Actions (Processed sound samples)' files 53-57).

In thinking about how to structure and further employ sound processing in my creative process, I looked at ways for arranging samples in sequences and as a mix, in response to one another. Manipulating the duration and the sequence of the sculptural process had as outcome a sequence of actions that could not have been achieved inside the workshop, which led to a process beyond its sculptural reality. Reflecting on the spectral collage of 3.3.1, the sound sequences did not communicate a real-workshop situation of the actions, but fragments of the process. Working in this way, I combined traces of the process through excerpts

of sounds of the working from different moments of a single material process (Appendix 2, Folder '4.1 Actions (Processed sound samples)' files 56 and 57), multiple actions (Appendix 2, Folder '4.1 Actions (Processed sound samples)' file 55) and multiple materials and actions together (Appendix 2, Folder '4.1 Actions (Processed sound samples)' files 53 and 54). The outcomes were still referring to the use of machinery, yet became more distant from the actual process. I question how this non-real-time and post-making sound manipulation could be brought together with sculpture making through actions.

In revisiting Serra's *Verb List*, I started thinking about series of actions in a sound context: how could a sound be pushed, rotated, placed or welded? I explored the co-compositional aspect of the simultaneous manipulation of physical material and sound through the same type of actions. Thinking about the actions of my creative process and the way they could be traced through sound, 'to lift' did not produce sound but 'to place', which is the result of the former did. There are actions such as 'to place', 'to rotate', 'to push' that could be more independent to their relationship with materials. They are mostly dependent on the weight of the objects. Other categories of actions such as 'to adjust', 'to cut' and 'to grind' were directly related to the materials used. 'To adjust' signified the initiation of another action prior to the final realization for controlling its accuracy. A first consideration of analogies between actions of sculpture making and sound processing could be based on the outcome of each process in relation to physical material. For instance, 'to push' could relate to the action of time stretching; 'to rotate' could be about applying a "zigzagging (reversal points)" process (Wishart, 1994); 'to place' as a low pass filter; 'to cut' as gain reduction; 'to grind' as granulation and 'to weld' as a distortion. In what ways could such analogies serve within this co-compositional enquiry? Thinking in this manner, my aim was not to translate the one into the other but to create interactions that could receive, process and generate new material. I started looking at developing a co-compositional 'instrument' that would allow the incorporation of the above-discussed ideas of synchronous material manipulation as instructions.

4.1.1 Digital interactions

Digital interactions (2017-18) is a first attempt to build an interactive environment for co-composition. The development of a prototype, explored how processes of transforming physical material could be used as starting points for sound synthesis. The aim of this experimentation is to approach such digital mappings in an action-driven manner and to create ways for the simultaneous manipulation of digital three-dimensional objects and sound. *Digital interactions* brought together the digital 3D model in *Of blocks* and sound synthesis using animation as a way to generate spatial data for co-composing 3D digital forms and sound.

Reviewing the analogies through parameter coupling based on actions and processes of material transformation by revisiting *Of blocks*, *Digital interactions* sought to bring together actions of sculpture making and sound. It examined parameter couplings between digital three-dimensional objects and sound objects based on ideas of process and interaction³⁸. The prototypes used 3D animation, sound synthesis, digital signal processing and programming. In developing a three-dimensional digital object whose form changes over time according to specific actions, “sonic parameters such as amplitude, spectral density/width and timbre were controlled by select spatial parameters from the three-dimensional object” (Panourgia, Wheelaghan and Yang, 2018, p. 3). Sound processing was realized based on the changes applied to the three-dimensional object in time, which was designed based on physical actions such as splitting, distorting, cutting, shattering and rotating. The aim of this practical experimentation was to look beyond basic synchronisation of sound and vision to relationships based on changes to sonic and visual parameters experienced

³⁸ From an acoustics perspective according to composer Richard Dudas, “...the object source of energy is referred to as the “exciter” and the vibrating object is called the “resonator.” The type of coupling between the two objects is known as an “interaction”” (Dudas, 2013).

concurrently, rather to explore ways for the simultaneous manipulation of three-dimensional digital objects and sound.

Physical material manipulation was viewed from a digital yet action-based approach that strongly existed in the work of the sculptors Oscar Wiggli and Richard Serra. My interest in this work was in the actions themselves and the way they informed processes of making as they brought changes to the three-dimensional objects, which in their turn introduced a temporal characteristic to these objects. The combination of three-dimensional objects and sound is approached in my work from a process and action-based perspective. This entails not only the mapping of parameters of the one modality to the other, but also the use of similar methods for working with both together. Mike Blow's work *Bleigiessen* focused on the actions applied to a solid material and the sounds produced during the making. Serra's *Splashing* and *Verb List* informed Blow's "tracing" of the changes applied to the solid material over time through sound (Blow, 2014).

Working across visual, spatial and sonic, Oscar Wiggli stated that "...both three-dimensional sculpture and music exist in space – sculpture in real space, music as an acoustic phenomenon in ephemeral space" (Hesse, 2007, p. 80, own translation). Digital works such as Davide Quayola's and Candas Sisman's, which involve the combination of 3D animation and sound, bring both modalities in "ephemeral space". Sisman brought together sound, visuals and space in *NOISEFLOOR (Data Sculpture)*, a work that involved a three-dimensional digital form that was developed based on the sound's frequency and duration (Sisman, 2014). Quayola's time-based sculptures were in a dialogue with sound, which was mainly generated by their unfolding in virtual space, which he characterized as "...a synthesiser that I calibrate in order to achieve what I consider to be the 'richest 'image'" (Quayola, 2016). Such digital actions across visuals and sound, are reconsidered here from a process point of view.

Movement in the three-dimensional objects is happening in *Digital interactions* as a result of specific actions, which create simultaneous changes to the form of the shape and sound. I am interested in the changes that occur as a result of actions applied to the objects. Serra's actions and processes influenced the manipulation of the material and the concept behind the prototypes. Using verbs that indicate how material is being worked, the aim is to apply them in both visual/spatial and sonic modalities. The difference here is that the actions are realized through digital means and not with physical manipulation, which rather focuses on the way sound manipulation could be informed by sculptural actions.

Media artist Ursula Damm stressed that the main aspects of both process and processual art are "the action, the activity and the performance", but processual art differed in the introduction of such actions in systems whose operation can happen in various levels of autonomy (Damm, 2018), such as "art that performs itself in a continuous flux" (transmediale, 2010). In *Digital interactions* actions were being processed in a system programmed by the artist, yet required user interaction for the activation of the work's process; "rather than representing processes with sounds which are pre-rendered as audio recordings and simply triggered to coincide with an action, sonic material parameters were coupled with spatial and modified in real-time through digital signal processes" (Panourgia, Wheelaghan and Yang, 2018, p. 6). Verbs used to describe each process "tend to pertain inherently to visual space rather than sound" (ibid.). An example of this would be rotating a visual object and a sound. For the first, there is little or no need for interpretation of the instruction whereas, applying it to sound consists a process that is of more need for interpretation: *how do we rotate a sound?*

Spatial parameters of a digital three-dimensional object were mapped to sonic parameters of a synthesized sound, "so that as these processes were applied to the visual object in real time, a relative action was applied to the sound" (ibid.). Three versions of *Digital interactions* explored granular and subtractive

synthesis, manipulated together with a three-dimensional model through processes of reshaping, rotating, splitting and distorting.

Prototype 1 [Appendix 2, Folder '4.1.1 Digital interactions' file 58] explored mappings of a three-dimensional cube with sonic parameters of a sustained tone generated via two pulse-wave oscillators. The cube is rotated upon horizontal movement of a mouse...the oscillators are detuned, creating a shift in phase and a rotation in the sound...it generates complex, minute sonic movements, which amount more to a shifting in texture than a complete change in form. As the rotation of the object stops, the oscillators revert to their original frequencies, into a *freezing* state of both visual and sonic...Acceleration is considered so that the faster the rotation, the more severe the detuning of the oscillators, creating a tight connection between interaction...of three-dimensional rotation and sonic movement.

Spatial width or narrowness of the cube...coupled with spectral width of the tone; as the shape becomes thinner a high pass filter was applied to sound...The words *thinness* and *width* are often applied to describe both audio spectra and physical three-dimensional objects. The phase to rotation pairing in this prototype illustrated movement in sound at a textural level. (Panourgia, Wheelaghan and Yang, 2018, pp. 6-7)

Prototype 2 (Appendix 2, Folder '4.1.1 Digital interactions' file 59) explored the same relationships between three-dimensional shape and the actions applied as prototype 1, using instead a granular synthesizer applied to a vocal recording. An "oblique" mapping between grain length and object length explored "the forging of a temporal to spatial relationship":

...as we listen to the grain or audio loop becoming smaller in time we see the three-dimensional object narrowing. We track the sound's repetition simultaneously connect this with the form we observe as the three-dimensional shape narrows in space. Prototype 2 also exhibited a further example of a coupling informed by real-world acoustic behaviour, where a low pass filter was applied to the audio signal in parallel with rotation, to create an occlusion effect. Every half rotation of the shape resulted in a top-down linear diminution in spectral range, a phenomenon we might expect to experience if the sound was emitting from two opposing faces of the cuboid object. (ibid., p. 7)

The action of splitting was in both prototypes applied through ideas of polyphony. The action of distorting was explored through a third prototype (Appendix 2, Folder '4.1.1 Digital interactions' file 60) in which a three-dimensional object was transforming from a shape into another (a sphere into a cube): "the cube eventually separated into a series of component planes, at which point we observed a complete opening of a low-pass filter...gave the impression that the sound originated from inside the cube" (ibid., p. 8) (Figure 4.3).

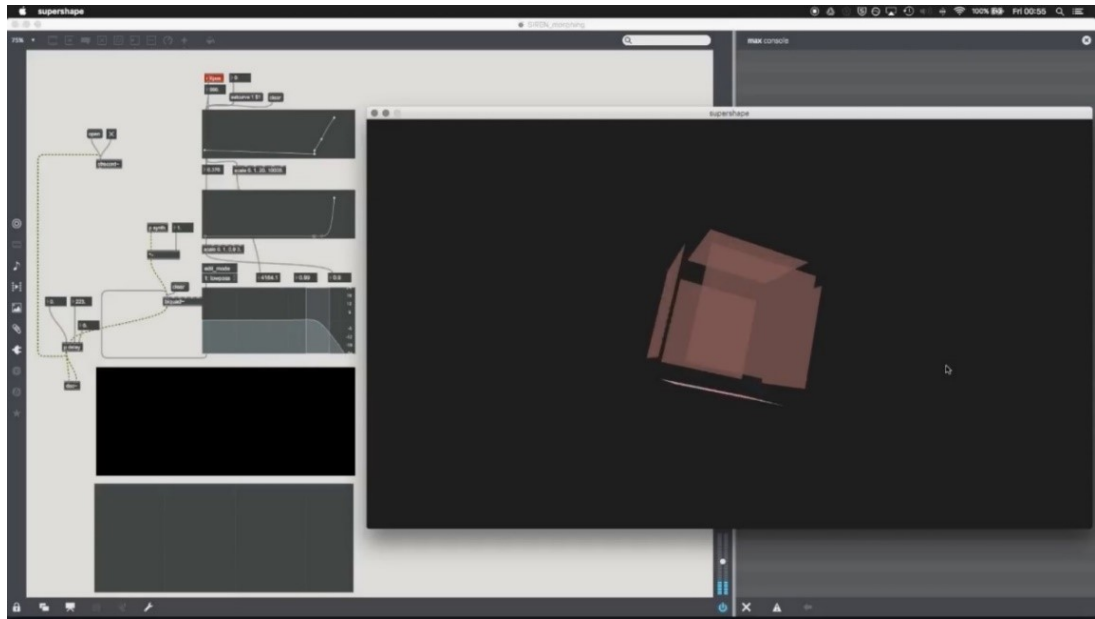


Figure 4.3. *Digital interactions - Distortion / Reshaping.* Screenshot (Panourgia, Wheelaghan and Yang, 2018)

This exploration achieved an action-based digital approach that allowed precise and direct mapping of parameters of the transformation of both modalities. It introduced a different type of interaction with material than in the physical approach, not as immediate as decisions were programmed in advance. Although *Digital interactions* ignored physical material properties as Quayola's and Sisman's work, it contributed to the introduction of an action-based digital manipulation of the sonic material within an interactive environment. It involved a succession of actions that formed processes allowing the control of spatial/three-dimensional and sonic materials over time, to shape and create contrasts, expand their possibilities both visually-spatially and sonically.

4.2 An Aesthetic of Effort

Returning to Richard Serra's process-oriented approach in relation to physical material manipulation, this time I question how materials could reflect actions and function within a process of co-composition. As discussed in 2.2, Serra used in *Verb List* words as a starting point for making pieces by focusing on the material manipulation itself (MoMA, n.d.). The outcome of the actions that were

executed based on this list was presented as objects and installations, but also as films of the processes. Serra's *Gutter Corner Splash: Night Shift* (1969/1995) in the San Francisco Museum of Modern Art, during which, Serra threw over fifteen thousand pounds of molten lead into the gallery (San Francisco Museum of Modern Art, n.d.). The audience was not present during this act due to the high levels of toxicity; the gallery was open to the audience some hours after throwing the lead. In that sense, the audience experience of the work was not live, but they were encountering the traces of Serra's activity in the space of the exhibition, including traces of material manipulation and of time. Serra's act of throwing lead (Figure 4.4) was described by Benjamin Heinz-Dieter Buchloh as "action sculpture" and as a first-time published "litany of performative sculptural operations" (Buchloh, 2007, p. 52).



Figure 4.4. Richard Serra, *Throwing Lead* at Leo Castelli's Warehouse, 1968 (Krauss, 1986, p. 14)

Rosalind Krauss considered Serra's decision to film his processes "as a way of manifesting a pure operation on a physical material" (Krauss, 1986, p. 18). She further stated that this approach aimed to oppose to the strict geometric aesthetic of Minimalism sculpture and the object-centred experience of the viewer. Serra's process-driven work eliminated the "closed system" that would cover any intrinsic view of the pieces themselves and their making, as according to Krauss "'to catch" was a process conceived within the strategic terms of this critique, but "to catch lead" represented a decision that what is at stake in this critique is the status of sculpture" (Krauss, 1986, p. 18). Marc Botha discussed by referring to Strickland that "the action of the artist unquestionably requires a

particular degree of strength and physical force...and critics have recognized in Serra's work something 'inherently more kinetic and menacing' than earlier minimalism (Strickland, 1993, p. 290)" (Botha, 2015, p. 172). This process did not intend to have a specific sculptural object as an outcome, but to expose activities of making; to display process by bringing back the "image"³⁹, as Krauss discussed on process outputs showcased in the space where they were produced. Curator Maria Tucker discussed the temporal element in the sculptural process of Richard Serra as a result of his focus on actions:

Serra's mode of sculpture is *active*, that is, he is involved with the physical properties of things, and the traces that result from a manipulation of the materials. Serra is concerned with various activities and processes – propping, bending, leaning, rolling, sawing, splattering. He avoids illusion, representation and especially construction in order to concentrate on *what is being done*. Since the emphasis is on the activity, the piece must be analysed in terms of the kind of work that has gone into its making...His concern with what he calls "arrested moments", that is fixing a piece at its point of maximum potential change, incorporates an element of actual time into a sculptural mode. (Tucker and Monte, 1969, pp. 34-35)

Fellow curator in *Anti-Illusion: Procedures/Materials* exhibition James Monte mentioned that "the radical nature of many works in this exhibition depends...on the fact that the acts of conceiving and placing the pieces take precedence over the object quality of the works" (Tucker and Monte, 1969, p. 4). Stressing the performative aspects of actions, Monte mentioned that "the artist must rely on his act, outside his studio...within a short period of time, to carry the weight of his aesthetic position" (ibid., p. 5). He highlighted the concern of the participating artists, which was the "responses to materials, time and creative acts" (ibid., p. 13); "...to express a new content that is totally integrated with material", as Marcia Tucker observed (ibid., p. 30). Following this, to perform a sculptural activity in public differs from realizing the same process in one's workshops space in private.

Barry Le Va's work *Shatterscatter* (Within the Series of Layered/Pattern Acts) (1968-1971) (Figure 4.5), involved the shattering of six sheets of glass placed on

³⁹ "...the logic of the process had gone full circle: although a material operation was used to break the grip of the "image," the image had come back to lay hold of the operation and to convert it into the terms of painting, to threaten it with a space that was virtual rather than actual" (Krauss, 1986, p. 20).

the ground the one on top of the other. Le Va used a sledgehammer and struck at the center of each sheet of glass causing it to break and form cracks throughout its surface. Following this raw action of high intensity, Le Va would place an intact sheet over the worked stack of glasses, as sealing his actions in space and in time, what Le Va called an “isolated contained act” (The Museum of Contemporary Art Los Angeles, 2014). In both Serra’s pieces based on the *Verb List* and Le Va’s *Shatterscatter*, the creative process was physical, as it involved effort controlled by the artist in a bodily manner and responded to the actions in a similar way. Objects that represented traces of working generated relationships between material-action-tools such as in Ulrich Rückriem’s work *The Last Fifty Years* that was discussed earlier in 1.3.2 (Churner, 2015). In relation to Serra’s action of throwing lead and Rückriem’s work, Le Va’s *Shatterscatter* was a live act, during which the audience experienced the physicality and intensity of the artist’s work providing with a different type of immersion in relation to Serra’s *Gutter Corner Splash: Night Shift*.



Figure 4.5. Barry Le Va *Shatterscatter*, 1968-71, Performance
(The Museum of Contemporary Art Los Angeles, 2014)

How could then a live co-compositional process be presented in front of an audience? Artists working with live and temporal processes depending on the focus of their practice, such as in actions, materials or a combination of both, used a range of types of presentation: outputs of process as objects; materials showing traces of the actions and processes; notation for subsequent processes such as list of actions; performances that presented the process. How could such

decisions of showing the work influence and potentially change the creative process? Has the process finished once exhibited? The decision of the type of presentation was related then to the level of time the artist wished to make apparent to the audience. Such an ephemeral approach with regard to material manipulation comes to contrast with a constant present tense that is core to minimalist works, concerning both sculpture and music. According to Tucker and Monte:

For Philip Glass and Steve Reich, actual time is a crucial factor in their music; it offers no illusion of temporality other than that which exists in the performance of their pieces. They have no beginning, middle or end – only the sense of an isolated present. This constant present exists because of a deliberate and unrelenting use of repetition which destroys the illusion of musical time and focuses attention instead on the material of the sounds and on their performance ... Carle Andre, in a recent symposium (March, 1969), discussed the question of time in his sculpture...*The work must be experienced in terms of its material presence. The tense of memory is the present...* (Tucker and Monte, 1969, pp. 35-36)

Traces of material manipulation bring with them the different temporal levels that exist in co-composition. In that sense, co-composition distances itself from an “isolated present” and draws attention to the potential of material and its different states during the various stages of a process (Fried, 1998; Greenberg, 1993).

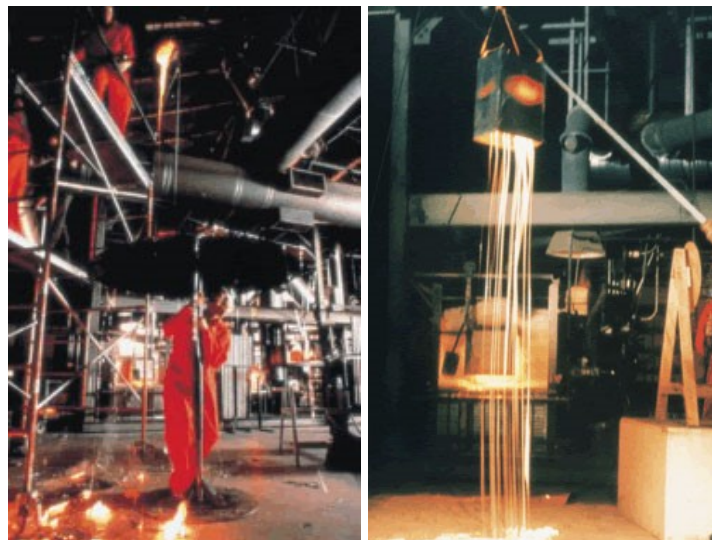
Take a stone: you can saw it, grind it, drill into it, or polish it – it will be a different thing each time. Then take tiny amounts of the same stone, or huge amounts, and it will turn into something else again. Then hold it up to the light – different again. There are a thousand different possibilities in one material alone. (Zumthor, 2006, p. 25 as quoted in Ingold, 2013, p. 30)

So, what is happening to material after each action that is applied to it? How does each material transformation contribute to the continuation of the process? Thinking in this manner about co-composition, I proceed by looking at works that involve the performance of such actions in both sculptural and sound contexts.

B-Team worked with performances of manipulating glass through glassblowing methods that took place in workshops (Figures 4.6 and 4.7). According to Stephanie Cash, editor of *BURNAWAY* and *Art in America*,

In their performances the artists' concern is not so much with creating a glass object, or even destroying one, as it is with demonstrating the various properties and capabilities of the molten medium. Rather than merely showing how objects are created, they seek to demystify the process, revealing the absolute destructive potential of the fiery liquid while making it seem enticingly touchable. (Cash, 1999)

B-Team stated that their objective was to “...explore the beauty of the raw material and we thought it was most impressive when you’re making the glass at the furnace. Once it’s done, it almost seemed dead in comparison” (Adamson, 2010, p. 24). This made me refer back to Klee’s idea of process; considering something being lifeless after it is completed (Klee, 1973). Similarly, Cash explained that for B-Team “the process itself is the art work” (Cash, 1999). The focus of B-Team was on the material properties of glass and the articulation of energy during its physical manipulation; a phenomenon that was also reflected through sound: “dropped hot glass objects into tanks of water, where they instantly cause a raging boil and then hiss and pop like firecrackers” (ibid.). How does then sound speak for the “energetic characteristics” of this process (Croft, 2007, p. 60)? How could it give another dimension to the sensory experience of live material manipulation?



Figures 4.6 & 4.7. B-Team *Spontaneous Combustion 2*, Performance, 1997 (Grand Arts, 1999)

In combining such ideas of *aesthetics of effort* across physical material manipulation and sound, Greg Pope used in his work *Cipher Screen* (2010), a reductive process of scratching leather strips for producing visuals and sound.

His creative process could be characterized as a loop in which material is manipulated through successive actions in a workshop-like installation-performance. The output involved sound, performance and projected moving images. *Cipher Screen* could be considered as a creative process that involves changes happening simultaneously across physical material and sound, although Pope design the sounds of *Cipher Screen* himself but in collaboration with sound artists. The leather strips are looped over a plate and get further scratched, coloured and layered, what screenwriter Dirk de Bruyn called “intervention process” (de Bruyn, 2013). Pope’s process was characterized by de Bruyn as similar to the “activity occurring in the computer’s covered-over circuitry” (de Bruyn, 2013). A machine-like operation fused to “an aesthetic of labor” (Buchloh, 2007, p. 56). According to de Bryun,

Pope has also built and used a machine that can inscribe such patterns onto the strip of film automatically. Such improvisation recalls Konrad Zuse’s Z1, built in 1935-8: the world’s first binary calculating machine....it read its instructions from a perforated strip of 35mm film. Pope’s scratch performances re-enact the operation of Zuse’s original computing machine, but place it in an immersive body-centred sonic environment that engage the senses in a very different way to sitting in front of a computer screen. (de Bruyn, 2013, p. 7)

Although Greg Pope’s work did not involve sculpture making, it was structured around synchronous material transformation in a performative way. The relevance of this work to co-composition lies on the way sound is produced in a live and synchronous manner with physical material manipulation, as de Bruyn described: “scratches in the soundtrack area add a further synchronous, sonic layer to the dynamic movement created” (ibid.). According to curator Dave Griffith, “the visual development is echoed in the sonic sphere; contact mics amplify the projectors internal workings and the optical cracks and bursts are manipulated into a huge unfolding live synchronized score” (Griffith, 2010). I am particularly interested in the synchronous material manipulation and the way decisions are improvised based on Pope’s response to sound and visual projection of the process.

Peter Zegveld's *Scherzo Mechanica* (2014) involved the development of a multi-layered sonic environment in a performative and at times theatrical manner (Figure 4.8). A work for two performers with sound as the main element, which was produced by machines and material manipulation (metal, elastics, glass, steam), musical instruments and human voice. The performers were operating machines for creating both sonic and visual outcomes. Sound was produced by the amplification of the machines, the voices of the performers, as well as from processes of working with material. Although these processes seemed to be part of fabricating something, they acted more in favour of producing sounds and a stage spectacle. The performers were interacting with machines like these of a blacksmith and other built machines; some were connected to a network, influencing each other's operation, while others were used mainly for producing sound. Both performers controlled sound through their actions, and via sound devices such as controllers, and mixers. Performing involved using their voices and acts such as handling a book and objects that did not refer to a fabrication process but to the theatrical element of the work.



Figure 4.8. Peter Zegveld *Scherzo Mechanica*, Performance, 2014 (Zegveld, 2014)

Hans-Joachim Hespos combined in his work *Tightrope Dance (Seiltanz)* (1994) musical and non-musical instruments such as a welder. In this work, welding, an action related to metalwork, was used by Hespos in the context of a music concert. The act of welding bears with it a material aspect, that of metal, which is

being melted in order to be fused. His sustained, persistent “shrill-whistling” sounds that were followed by the sound of the welding action formed a concert-like experience, which referred at the same time to a workshop space (Steiert, 1994, p. 15). The reference of this action creates elements of an industrial/workshop/labour environment in the performance, which are also evident from the sonic output. Steiert mentioned that “...the percussionist’s act of liberation [through welding] the visual process is consequently changed into a “musical action” (Hespos), a term specifying the resolution of borders between the fields of sensory perception...” (Steiert, 1994, p. 14).

The group Test Department (Test Dept) worked toward an aesthetic of a “dynamic physical totality” (Test Dept, 2014). Their performances involved raw materials, abandoned industrial environments and tools that were turned into “designed, sculptural instruments” (ibid.). Such equipment was used for achieving a fusion of light, sound samples, live percussive sound and electronics. Turning industrial spaces into multisensory environments through a physically demanding experience for both performers and audience, Test Dept realized “a test of physical endurance that journeyed through the sonic pain threshold and into a cathartic energy release” (Figures 4.9 and 4.10) (ibid.). The extreme conditions in their performances brought an intense, polemic mood that was reflecting on the sociopolitical situation and changes in the industrial fabrication of the time (ibid.). The site-specificity of their work such as car factories, depots, railway stations, phenomena that wouldn’t be experienced in theater space, element of danger, “electric” context (Brith Gof, 1989). Performers were part of something very large, whereas here the performance exists within a solo environment (ibid.). Test Dept used objets trouvés, industrial percussion built from ruins of the sites as instruments and included in their performances actions that were more about the theatrical aspect of the spectacle rather than producing sounds such as climbing up ropes. Here, I am using specific tools, machines, and actions intended for sculpture making. This comparison revived the *paradox* of co-composition as in using these sculpture-specific actions exclusively for making sound, would affect the state of the working and the sculptural objects.



Figures 4.9 & 4.10. Test Dept performing (Test Dept, 2014)

In their collaborative work *Soundforge* (2012), Gabriel Craig and Michael Remson considered the actions of manipulating metal in a percussive manner (Craig, 2012). In their *Soundforge Highlight Clip*, the sound of each strike of the forging process was replaced with heavily processed versions of the original recording. The scope of this work was to view the process of forging as “an act of music making” (Houston Center For Contemporary Craft, 2011); “with *Soundforge*, Craig and Remson have interpreted craft not only as finished objects—the steel structures and video—but also as the “crafting” of a musical score” (ibid.). Gabriel Craig’s collaboration with composer Michael Remson involved the musical interpretation of some actions and their repetition but not of a structured process. The work was presented as an interactive instrument-like installation with objects from steel that could be played, and acted as reminiscent of the process of forge.

Mark Applebaum’s work *Echolalia: 22 amplified and signal processed Dadaist rituals* is a performance based on shared psychosis and dissociative identity disorder, during which, a performer is undertaking a series of ritual activities using everyday objects on a table in a theatrical manner (Figure 4.11). The work is based on instructions communicated through a verbal score and graphic indications that concern the signal processing (Applebaum, 2006). The processed sounds were generated by another person, and acted as echoes of the original ones, slightly changed by reverberation and granulation using “an FFT-based

spectral shifter/bender, a filtered spectral freeze effect” (Sanchez, n.d.). Sound processing was applied by another person, as opposed to the situation of co-composition. Using a box, a reminiscent of Morris’s *Box*, one is able to see and listen to its manipulation and handling, as well as its sealing with hammered nails, yet not its fabrication process. Although *Echolalia* involved actions in relation to a sonic outcome, they operated more under an idea of a spectacle that is pre-composed, rather than based on a response to material transformation.



Figure 4.11. Mark Applebaum’s *Echolalia*, Performance (Bluedot, 2012)

Composer and sound artist Cathy van Eck discussed that in *Apple Box Double* (1965) by Pauline Oliveros, “a contact microphone is attached to an apple box and amplified through loudspeakers. The performer is playing objects attached to the box” (Van Eck, 2017, p. 110). Performed in 2004 by Oliveros and Seth Cluett,

...they attached pieces of wood and metal to their apple boxes and use glasses, cups, bows, metal chains and several other objects to play them... The apple box together with its contact microphones as a kind of filter, amplifier and reverb, giving the different types of material a similar sound colour, resembling in effect... (ibid., p.111)

The performance of sound artists Akio Suzuki and Aki Onda at Hara Museum in Tokyo (2014) involved the real-time manipulation of sounds produced from the one performer in acoustic amplified manner by the other performer. Sounds, from voice to scratching expanded the sonic environment and the object-action-instrument relationship (Onda, 2015). In their work *ke i te ki* they used “unconventional and self-made instruments” such as found objects made from wood, marble and glass as well as tools including hammers and buckets,

“allowing the individual architecture and acoustics of the various sites to guide the flow and development of the performances” (The Lab, 2015). Such objects were used mainly for producing sound, which was the central element of their work but also visually, in a performative and theatrical way. Here, as my aim is to make a sculptural object, there is a double response in both modalities concerning the use of the ‘instruments-tools’.

Such compositions of ‘extended’ or ‘extreme’ techniques were associated with actions beyond performing a musical instrument in a traditional sense and related to “the nature of experience in relation to materials” (Kelly, 2018). Producing sounds that depend on a range of material properties and using machinery tools as ‘non-musical instruments’ brought again at this point of the research the question of physical material and its relationship to the sound produced: how could a material-driven approach to sculpture and to sound inform each other? The group effort, the theatrical aspect of executing actions for visual purposes or actions mainly for producing sound were questioned in terms of co-composition. The role of tools in my sculptural process is associated with dynamics as they are articulated through actions and materials. For example, choosing to cut marble with the electrically operated saw, signified a fast manipulation of the material toward a specific aesthetic outcome: sharp edges and flat surfaces. If this was to be achieved by hand it would take much more time beyond a duration that would allow instant response to actions-sounds. Following this, besides the bodily effort during the sculpture making process there is also *an aesthetic of effort* with regard to the *paradox* between the modalities that has been developing and emerging in new forms throughout this research.

4.2.1 Marble Sounds

Marble sounds (2017) involved an excerpt from the video documentation of my marble cutting process and sound samples, which were recorded during the making and were further manipulated (Appendix 2, Folder ‘4.2.1 Marble sounds’)

file 61). Informed by the review of the above-discussed works in terms of actions, effort and sound, this practical experimentation questioned the role of sound manipulation in sculpture making by reversing the dynamics of the process of cutting marble through sound. Original sounds of the making were replaced with processed samples of the same sounds for looking at the making process based on ideas of sonic transformation. This brought a reversed perspective to the one employed in the animated 3D models in *Of blocks* by going beyond the reality of performing the process of cutting. What one sees in this video excerpt of the process does not meet the listening expectation in terms of texture and intensity. The approach in *Marble sounds* created a shift concerning the research question as: in *Of blocks*, the purpose was to extract an understanding of the sounds of the making through a symbolic interpretation of the state of the sculptural object, whereas in *Marble sounds*, I pursued an understanding of sound processing based on a real-life documentation of cutting marble.

A question that occurred from this process concerned the relationship of the manipulated sounds with their original source, the actions, tools and material properties. This practical experimentation contributed to taking distance from a creative process structured around an abstraction of the making through sound. *Marble sounds* expanded on Blow's work *Bleigiessen* in a process- and performative-driven way as it presented together the manipulated sounds and the conditions within which they were produced. In relation to Morris's *Box...* *Marble sounds* involved *the making* of a marble piece as a filmed act together with processed sounds of its making; *Box...* was about the becoming of the object through the sound of its fabrication, through listening to Morris performing the making. Looking at the process of cutting marble while listening to the transformed sounds enabled me to think about sculpture through sound processing. Therefore, the experimentation with video and sound acted as a maquette for thinking about a live and interactive potential of co-composition, reflecting on the above-discussed works.

Replacing the original sounds of the process as in Craig and Remson's work, involved importing time from elsewhere, which affected the relationship of sound source and time. *Marble Sounds* brought physical material manipulation to the concept of *Digital interactions*; it introduced electronically processed sounds in the workshop space and created links between their transformation and actions of the making. *Marble sounds* contributed to a key transition point of this research by turning the artist into a performer inside the sculpture workshop, bringing what has been so far, a meta-process, in a synchronous and time-based situation. How could this approach be employed in a live performance setup?

4.3 Liveness

Marble sounds and the discussion of an aesthetic of effort in 4.2, highlighted a performative way of thinking and making, which was a key shift of the research focus. The framing of co-composition as a process that is performed touches upon concepts of time and liveness, which became substantial for the relationships between the elements of my practice. Hoffman argued that "...time is engaged as an elusive yet malleable dimension of live performance whose passing can be marked, moulded, and experienced in different ways" (Hoffman, 2012, p. 38). For Hoffman, a work, which is unfolding in time makes temporal aspects appear to the audience in forms that are "visible, palpable and legible...how configurations of time become meaningful not in isolation, but in and through other material..." (ibid.). She further stated that art, which exists in a temporal way aims to work around different levels of time and explore the potential of "...different ways of thinking about the relationship between time and value" (Hoffman, 2012, p. 39). So, *how* does co-composition exist in time?

Reconsidering *Marble sounds* from this perspective, different temporal levels could be traced on the basis of sound: the sound of the making, which is immediate and clearly connected with its source, and processed sound, leading to a revisiting of the original source and influences the continuation of the process. A first approach to a live setup was informed by Applebaum's *Echolalia*

and Suzuki and Onda's *ke i te ki* during which, one person performed the actions and a second person the sound processing.

In thinking about how to present a co-compositional situation in front of an audience, a first concern was about the space: placing the audience in a gallery space and performing in the workshop space, while transmitting live video feed to screens, and live sound through speakers. Sound would be processed by another person located in the gallery space and transmitted back in the workshop space as instruction feedback (sonic and verbal-visual) (Figure 4.12). A third person would transport the sculptural objects from the workshop to the gallery space and place them on the ground to form an installation.

What about my actions in the workshop space; in what way would the feedback affect my response to the process?

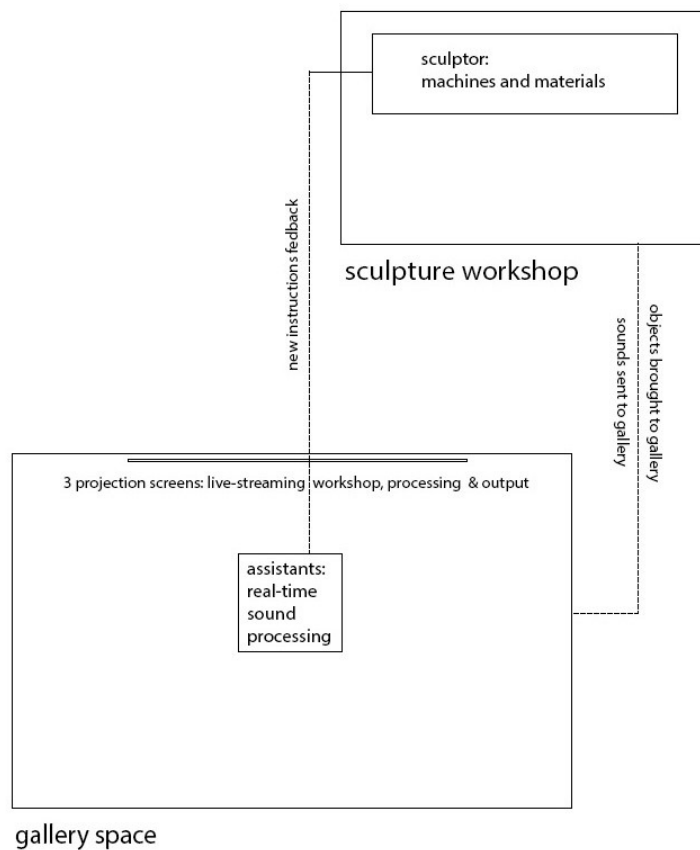


Figure 4.12. Potential setup for co-composition using two spaces and assistants

Brandon LaBelle stressed that Robert Morris was “making...objects and situations that unravel the conditions of presence. That is to say, the experiential is confounded through a discursive twist, which underscores the ‘mediation’ of perception even in its very immediacy” (LaBelle, 2006, p. 85). Composer John Croft noted that “...the onus of justification of liveness is shifted to the causal link between the performer’s action and the computer’s response” (Croft, 2007, p. 61). Expanding on Croft’s definition, Pete Furniss and Martin Parker observed that “...the *interactive* liveness [is] perceived in moments of wrestling or negotiating with the electronics” (Furniss and Parker, 2014, p. 192). The terms “wrestling” and “negotiating” described the aspect of effort with regard to time and liveness, of the interaction between performer, computer and outputs. Performing together with physical material, in reference to the previously discussed aesthetic of effort, I consider the liveness of the performance and my response to material as central parts of co-composition; a kind of liveness that is concerned with “traces of human effort”, as Furniss (2017, p. 55) mentioned in reference to Paul Sanden’s typology of liveness (2013). For this, I did not proceed with the above setup and sought to explore a mode of performance that would bring audience and co-composition in the same space.

The real-time compositional decisions aimed at expanding the control of both modalities together and the one through the other by introducing a multisensory experience of space-time. In that sense, co-composition could exist as a temporal form and one would need to be *present* in order to experience it.

As it takes place (and that takes time), it also takes on the semantic connotations of the place, as an event in and of the environment...Attending to the sound event, what takes place is a politics of presence, proximity and relationship. (Di Scipio, 2013-14, p. 12)

Di Scipio used space as an active element of his compositional process. In his work *Modes of Interference* (2005-6) the spectral content of space was reverberated through an autonomous feedback system (Di Scipio, 2014). I regard space attached to the physical experience of co-composition, as where liveness is unfolding. This includes the sound from the environment of the workshop, but focuses on the process of sculpting rather the reverberation of the space.

Richard Coyne stated that “...Martin Parker inverts the romantic metaphor of architecture as “frozen music” to inflect the dynamic of live performance: “Being neither frozen architecture nor liquid music, these live encounters are fractured and shard-like” (Coyne, 2010, p. 55). This consideration speaks to my initial exploration toward co-composition by forming analogies and an interpretative yet more static approach to a work that is of temporal form. Such ‘liquidity’ of the performance, the liveness and the real-time decision making, could create the *in-betweenness* for an interaction across the modalities. Beth Hoffman considered time as “a stretch or space of continued existence”⁴⁰ and further discussed the involvement of space in this sentence as “a spatial metaphor: the idea that time is an area or expanse, a pathway, an enabling *container* in which the live unfolds” (Hoffman, 2012, p. 38). Thinking about co-composition as a temporal situation directed sculpture away from objectification. From the works produced and the material exploration undertaken, I decided to work with steel as the direct and flexible transformation of the material would enhance the spontaneity of the co-compositional process. Working with steel in the form of sheets, my intention is to achieve constant change in the process; to be flexible and to change the procedure within a short time period.

Quoting theater researcher Josette Feral and performance theorist and theater director Richard Schechner, Hoffman mentioned:

Josette Feral (1982) asserted that not only time, but a grounding in presence is what distinguishes performance from theatre – where theatre trades in what Richard Schechner (1988) called ‘symbolic time’, time represented and imported from elsewhere and elsewhen. (Hoffman, 2012, p. 39)

Through this example, Hoffman identified the *now* of performance in comparison to the circumstances in the notion of time concerning theatre. I am interested in this liveness and *nowness* in my work, which is closely related to the real-time structuring of co-composition, to exist in the *here* and the *now*. By contrast, Test

⁴⁰ Hoffman refers to the definition of *time* of the Oxford English Dictionary: “a finite extent or stretch of continued existence, as the interval separating two successive events or actions, or the period during which an action, condition, or state continues” (Anon, 2018b; Hoffman, 2012).

Dept's performance *Gododdin* (1989) referred to specific socio-political events at that time. Hoffman highlighted that a performance can only happen in the present as according to Peggy Phelan, it "cannot be saved, recorded, documented, or otherwise participate in the circulation of representations of representations: once it does so, it becomes something other than performance [...] Performance's being [...] becomes itself through disappearance" (Phelan, 1993, p. 146; Hoffman, 2012). Hoffman continued by mentioning that "...time provides the logic through which the ever-receding 'now' of the ephemeral gesture can be figured relative to the 'afterwardness' of writing and documentation, performance's 'other'..." (Hoffman, 2012, p. 41). In live time and with time, I am interested in engaging with these different levels: how an action that has been realized (past) is related to something that is happening (now), which in turn could affect what will occur (future).

In discussing liveness in relation to sound, Croft focused on the "energetic characteristics" of the live generated sound by the actions of a performer in respect to the outcome as a manipulated sound. He was concerned with the "poetic significance of liveness" based on such relationships:

...pieces which use live processing to generate a generalised texture or environment whose relation to the energetic characteristics of the performer's sound and action is so remote that the effect is barely distinguishable from fixed tape, and could be more easily achieved thereby. I say 'so remote', but in fact (and this takes us to the heart of the problem), the relationship does not need to be very remote at all before this disjunction takes place and the poetic significance of 'liveness' is lost. In other words, the range of musical situations which actually call for live interaction on a more than pragmatic level – in which interaction is aesthetically relevant – is in fact rather narrow. (Croft, 2007, p. 60)

The "energetic characteristics" of the sound produced by sculpture making were explored in Chapter 3 and further discussed in relation to sound processing in Chapter 4, which brought questions about a sound's manipulation in relation to its source. Reflecting on *Marble Sounds* and the intermediated situation that it created between actions, the intention for sound processing in co-composition is considered attached to the notion of liveness. The combination of sounds from the working and processed sounds depends on the degree of "remoteness"

between sound and source, time and actions (ibid.). The aim for the continuation of this research is thus to structure co-composition as a live and lived experience for both the performer and the audience. For this, introducing multiple levels of time during the process becomes at this stage core to co-composition. How could a simultaneous manipulation of physical material and sound be applied in a live, performative context? Such temporal perspective of co-composition aims at bringing together all elements under one situation.

Chapter 5

Process / Procedure: Performance

5. Process/Procedure: Performance

The work of this chapter explores multisensory environments that are constantly changing and shifting the way we use our senses, the way we perceive material and immaterial aspects of our surroundings. How things co-exist, how they might be connected or be in a state of collision, defines the way we experience and interact with them. I am interested in the types of knowledge that can be generated from our attempt to cope with conflicting states of order and continuity, the static and the ephemeral, processes and procedures. Using steel and sounds of the making, multifaceted objects, interactive situations and performative events, I seek to identify art as an expanded form of generating, evolving and changing, simultaneously world-making and self-making, triggered and grasped through states of in-betweenness of relationships, actions and responses.

I consider my work as a learning process both for myself as a co-composing artist and for my audience as experiencers. In engaging with the themes of multiplicity and presentness, my creative process makes it necessary for the mind to constantly re-adjust and re-focus.

So far, this research has explored a range of methods and ways of thinking about the combination of the two modalities through a parallel investigation of theoretical concepts, the review of other works and my own practice. In Chapter 2, analogies and crossings were developed based on visual-spatial qualities of sculpture and forms of graphic and verbal notation informed by ideas of calculation and seriality. Bringing both modalities inside the space of the workshop in *Actions in sound*, introduced a synchronous activity of making and thinking about co-composition, which placed the research focus on actions. In Chapter 3, such actions were explored in relation to material qualities based on sound recordings of the making, which shaped a process-driven approach to co-composition. Analytical and theoretical explorations of listening to the sources and causes of the sounds of making, spectromorphological ideas, recording and

filming of the making promoted a temporal way of thinking about co-composition in relation to actions and processes. In Chapter 4, I explored the transformation of sounds informed by actions of making, which directed my approach toward action-feedback relationships and responsiveness. The discussion of an aesthetic of effort viewed actions in a performative manner, which was a key shift for the continuation of the research. A theoretical investigation of liveness highlighted ideas of temporality and aspects of interactivity with regard to co-composition.

Through a discussion of sculpture, sound and performativity progressing in parallel with my own work, it has become apparent that co-composition can be developed in a temporal and performative way. This chapter is about bringing the explorations of this research together into live time; revisiting then the notion of co-composition through performing. I argue that co-composition can be experienced as a multi-layered situation of actions stretching over time and I consider audience experience important in the way that co-composition is structured and performed. Drawing from the process-driven approach to the works in the *Anti-Illusion: Procedures/Materials* exhibition, curated by Marcia Tucker and James Monte in 1969 for the Whitney Museum of American Art, the title of this chapter *Process/Procedure* refers to a series of co-compositional events and situations emerging in time (Tucker and Monte, 1969). The use of these two terms together creates here a contrast between a fluid and at times improvisational development of the work (process) with a scripted structure of the spaces-in-between the different elements of the performance (procedure). It emphasizes the on-going tension between the two modalities during this research; procedure reflects minimalist ideas of calculation, whereas process gives space to an emerging approach of an active response to actions and material transformation.

In this chapter, I look at solo performance environments in which co-composition could happen and evolve in front of an audience. Drawing from the previously discussed theoretical ideas and the process-oriented, temporal thinking of sculpture and sound performance with objects, I argue that sculpting can take an

ephemeral form, and can be performed together with sound in a temporal, experiential fusion. Based on Beth Hoffman's discussion on "presentness", I question the ontological aspects of co-composition and its spatio-temporal situation: "to be live is always to be live *in time*" (Hoffman, 2012, p. 37). Performance art practices are introduced at this stage in relation to co-composition. This discussion is illustrated by a simultaneous presentation of the final work of this research, its methods, concepts and technical aspects that explored co-composition through three different structures and versions of the performance *Process/Procedure* (2017-18). This work seeks to create a co-compositional situation in which physical and sonic material are concurrently produced, rearranged and transformed. The idea of process is at the core of performance and is viewed in relation to actions of making and their reflection through a state of simultaneous material manipulation. *Process/Procedure* expresses traces of actions, relationships and events in time, which draws on Ingold's definition of material by quoting Karen Barad: "whatever the objective forms in which they are currently cast, materials are always and already on their ways to becoming something else – always, as Barad puts it, 'already an ongoing historicity' (Barad, 2003, p. 821)" (Ingold, 2013, p. 31).

Material is decided on the basis of both sculptural and sonic qualities. Physical material manipulation involves welding, grinding and cutting steel, which allows the immediate material transformation and response to the performative process of co-composition, as it can be re-worked. Following the investigation of sounds in relation to actions and processes in Chapter 3 and their transformation in Chapter 4, steel recordings offer greater variation in terms of texture and time. The scale of the sculptural objects is viewed in relation to my body for a manageable handling of material within the solo environment of co-composition.

The first version of the work (*Performing With*) focused on presenting co-composition as a semi-scripted performance of fixed duration in a responsive environment. A second version (*Performing For*) examined a durational form of performance as a process slowly evolving in time through a constant negotiation

with materials, sound processing and redefinition of actions. The third version (*Performing At*) aimed at inhabiting the space of the workshop, it expanded and revisited the durational structure of the previous version concerning time and the way of unfolding. Co-compositional performance concerns a process of emergence within a multi-tasking environment. This required performing live, while having control over the sound processing and the interactive environment in a viable and practical way inside the space of a workshop. Skills and tools were further developed and adjusted in order to achieve co-composing.

Employing a dual perspective in observing the co-compositional process, I am considering and discussing the work both from the artist's and the audience's viewpoint. This was complimented by participant observation using qualitative research methods of questionnaire-based interviews. The feedback collected allowed me to study how co-composition is experienced and how insights from the audience could be employed to further develop the live performance. To structure this section, I bring together the three features of co-composition: liveness, material, and action-interactivity. These introduce multiple layers of composition: the physical objects, the sound and a third element, this of the performance, which occurred as a consequence of this research and acts as a mediator for bringing together the modalities.

5.1 Interfaces

The implementation of the research thinking and the material processes into an interface⁴¹ sought to answer the question of how does co-composition operate in a live performance context? What kind of tools could be developed and applied in this context? In *Digital interactions* aspects of the actions were fed into a digital prototype that operated based on predefined parameter mappings. In that sense, the level of interaction with the interface and the co-compositional ideas

⁴¹ According to Oxford English Dictionary, the term interface is defined as “a means or place of interaction between two systems, organizations, etc.; a meeting-point or common ground between two parties, systems, or disciplines” (Anon, 2018a).

employed was problematic. At this stage, my aim is to bring together the actions, materials and processes explored so far in this research, for performing co-composition live inside the workshop; to achieve a real-time interaction between performer and modalities using a computer as mediator for creating an action-feedback situation⁴². Following this, I question the approach of organizing my process into sequences, which was strongly present in minimalist practices and built on the notion of seriality. I argue that co-composition is not “just one thing after another”⁴³ but a self-reflective process that is happening in a multi-layered manner. In pursuing a live mode of co-composition, I work toward setting up the process inside the space of the workshop by employing a real-time interaction with what has been so far, a meta-process.

Artist Vito Acconci referred to the potential of feedback with regard to the way it could contribute to the development of a performance.

The performance can be set up as a learning process. When the performer makes a move, the consequences of his behaviour can control his next move. The use of feedback can ...bring into unison on stage of the performance, after which can come change as new material is imported and adapted to. The performer can work as a producer; the performance pattern can be linear – a series of additions of material and energy. Or he can work as a consumer; the pattern can be radial – lines of material and energy converging on him for his use. (Acconci, 1970 as quoted in Osborne, 2002, p. 206)

Drawing from Acconci’s statement, I am reconsidering the actions in relation to the feedback received from the processed sounds of the making: in what way could the response to feedback give space for semi-scripted or improvised performance? The main concern for the development of an interactive device for co-composition was to encompass and blend tools, materials and actions. To achieve this, this device is considered specific to this process in which

⁴² In referring to the common-coding theory (Prinz, 1997), Marc Leman and Pieter-Jan Maes explained that “the planning or executing of an action and the perception of the sensory outcome of this action lead to similar activation patterns in the brain involving sensory and motor-cortical areas. Important in this theory is that the integration of motor, sensory and introspective representations lead to internal models of the relationship between the body, the mind and the external environment.” (Leman and Maes, 2014, p. 87).

⁴³ Rosalind Krauss in discussing Serra’s work *Hand Catching Lead*, refers to this quote by Donald Judd in order to describe the pulsional actions and regularity in Serra’s process (Krauss, 1986).

compositional decisions made before the performance could merge with real-time decisions and live generated input. The compositional aim for the interface was to behave as an interactive environment in a sculpture workshop setup bound to its practical particularities, while meaningfully addressing challenges of liveness, energetic characteristics of the physical material transformation and sound, and most importantly, allowing an interaction among all elements of co-composition.

According to composers Franziska Schroeder and Pedro Rebelo, the relationship between instrument and performer constitutes “a sensory space” that as Rebelo stressed is “navigated by constant reference, by constantly acting on feedback from an immediate environment” (Rebelo, 2006, p. 30; Schroeder and Rebelo, 2007, p. 88). Relating action to process, Tim Ingold argued that “...to act is to attend. The agent’s attention, in other words, is fully absorbed in the action” (Ingold, 2000, p. 414). Both views involve an action of understanding and responding to the process. How could the knowledge produced by simultaneous material manipulation inform from new the action itself in relation to the work? I began by thinking how the interactive device could cooperate with the workshop environment and the practical constraints – tools, noise from their operation, fumes, and equipment – and explored how it could allow me to respond within a co-compositional process.

Hespos’s use of a welder in *Tightrope Dance*, played the role of an instrument that was operating in-between modalities, towards a transformation of the visual to the sonic (Steiert, 1994). Test Dept (2014) involved built tools in their performances, which acted not only as percussive instruments but also contributed to a multi-sensory experience of light, smell and physical tension. Performing with these instruments along with electronic sound, involved as in Hespos’s work, moments of fusion and interaction between the two. The role of the sculptural tools in performing co-composition differs from Hespos’s and Test Dept’s work in the sense that it serves both for the manipulation of sculptural material and for processing sound. In contrast with the group performance of

Test Dept and Hespos, the solo situation of co-composition has been challenging in terms of the multi-tasking activity required for the formation of this type of interactions.

Performances with amplified objects and electronic processing such as Jeff Kolega's *Desert Wind* (Kolega, 2012), a reminiscent of Cage's *Child of Tree* (1975) and *Branches* (1976) in terms of using "amplification as the main means of making music out of everyday material...incorporating these sounds within a musical performance context", looked at interactions and actions applied to objects for generating sound (Van Eck, 2017, p. 107). Mark Applebaum's sound manipulation in *Echolalia* focused more on the actions themselves rather the everyday objects that he used (Sanchez, n.d.). The material-action-sound relationships that are in constant interaction during the performance of these works form examples of how such relationships could be incorporated in a co-compositional context. Regarding the development of the interactive device, I am concerned with the articulation of relationships among the elements of co-composition: physical material, movement and sound. The *co-* of co-composing becomes at this stage inherent to the notion of response, which is happening in a solo environment. I view this situation in relation to my *adaptation* to the new material received from the feedback of the interactive device. The main challenge during this process is to achieve having control over the outcome of both the sculptural process and sound, simultaneously. This relationship retriggered the *paradox* of co-composition and introduced new questions of balance-dominance⁴⁴ concerning compositional decisions in both modalities. Additional challenges were generated by the environment of the workshop: the loud percussive sounds from welding and handling the material and the constant fan operation noise of the welder along with the sustained sound of the grinder. This created particularities in terms of the sound setup.

⁴⁴ The term 'balance-dominance' does not refer to aesthetics of form but of the space-in-between the two modalities and the hierarchical relationships that are produced.

5.1.1 First Version

The first version of the software device used MuBu for Max by Ircam⁴⁵, as a repository of sound libraries of recordings from the making for programming the computer to recognize these sounds during the performance (Schnell, 2008; Ircam, n.d.). The idea for prototyping this interface was based on the previously discussed action-driven understanding of spectromorphology and sound sources (Chapter 3). Spectral analysis was used as a condition for the real-time manipulation of the live sound and the generation of visual-verbal feedback in the form of instructions for the performer on the computer screen (Figure 5.1). A library of recordings from the making was used during the training process of the device. Following a testing phase with new samples from recordings of the same actions, the software would respond to live sound input upon spectral analysis and recognition, while realizing no action or producing no sound was set to pause feedback. Sound was then the *operator* of the device and was used “as the primary interface in a system between performer and computer” (Furniss, 2018, p. 65).

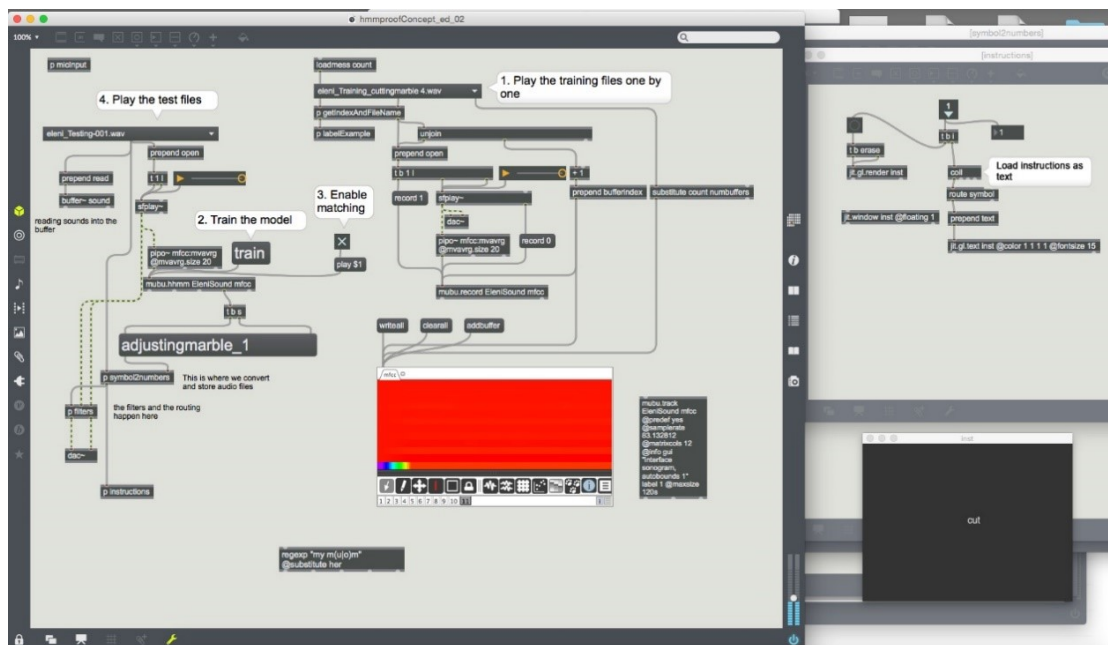


Figure 5.1. The first version of the device using MuBu. Screenshot

⁴⁵ “The models are implemented in an Interactive workflow in the Max programming environment” (Cycling'74, 2016). “The implementation is extensively based on MuBu, a multimodal data container used to build, visualize and annotate the training data” (Françoise, 2014).

Furniss outlined the practical advantages of the approach, among which, the most important here, was to simplify the physical setup for the facilitation in the multi-tasking activity of co-composing (ibid.). This mode of interaction allows the performer to activate the system in more than one way, creating in this manner a performance in the form of a “learning process” for both the performer and the computer (Acconci, 1970). The aim of this implementation is to realize an instruction-feedback situation in which verbal initiators for sculptural actions would be generated by sound processing techniques and vice versa (Di Scipio, 2003).

Sound was processed using the externals *granary 2.1* by Brendan McCloskey and *grainstretch~* by Timo Rozendal with an aim to restructure the sounds of the making by breaking them into smaller sections and turning them distant from the associated actions (Appendix 2, Folder ‘Actions (Processed Sound Samples)’ file 52) (McCloskey, 2009-2014; Rozendal, 2012). Parameter presets were explored and adjusted over experimentation with the device and according to each action. The electronics were derived from these presets and the input from the environment of the workshop, and were mapped to verbal instructions, which were communicated via a screen. In turn, the output produced by this process would influence the continuation of the performance by nurturing a mode of thinking about the following actions, their variation and the changes they may cause in the process. For this, I wrote a list of potential feedback for each action of the process in order to design and have control over the interactions (Figure 5.2). This list was driven by the actions of making and brought together instruction scores in a sculptural context such as in Morris’ *Performance Box* to the more abstract thinking behind Serra’s *Verb List* focusing on the process itself. Sonic and verbal feedback aimed to structure sculpture making and its outcome, and in that sense, they functioned more like Morris’ set of instructions rather than Serra’s *List*. Layers of new instructions would give a semi-abstract direction for the continuation of the process as in Morris’s *Performance Box*. For instance, in realizing a cut, the new instruction would be to change/modify the action already executed: *Cut* then *change angle of cutting for x time*. The modification of actions

was based on position, direction, angle and duration. How could this specific type of instructions influence my co-compositional response to the process? How could this inform the interactive process?

Material Process	Action	Further instructions	
Cutting Marble, Wood, Glass	Place	Change position	
		Lift	
		Combination of the above	
	Rotate	Change direction	
		Adjust	Change direction
		Cut	Change angle
			Change duration
		Change direction	
		Combination of the above	
		Welding steel	Place
Lift			
Combination of the above			
Adjust	Change direction		
	Cut		Change angle
			Change duration
	Combination of the above		
	Weld		Change direction
			Change duration
			Combination of the above
Grind	Change direction		
	Change duration		
	Combination of the above		

Figure 5.2. Potential instruction feedback for the sculptural process

Throughout my research, notation has been a tool for exploring the notion of co-composition. At this stage it returned in the form of text that would act as a repository of instructions for co-composition through words that indicate successive actions for sculpture making, which correspond to specific operations for manipulating sound. Emerson discussed the “...distinction between reply and response. Reply suggests something simple, sometimes factual...a true response adds value or meaning, solves problems or develops ideas” (Emmerson, 2012, p. 12). The interface would reply, and the performer would respond. Instructions acted as a “causal chain” for the development and design of interactions (ibid.). The reply to the performer was therefore partially defined by the scripted instructions: in executing the action of cutting, the feedback would indicate a modification of the action in terms of the handling of the material and

the tools. Verbal instructions required visual attention that was problematic inside the workshop: looking at a monitor, while anticipating the verbal feedback, I had to switch off the machines and stop my actions, which resulted in a fragmented process.

5.1.2 Feedback Relationships

Agostino Di Scipio mentioned that “the performer is first the initiator agent of the computer’s reaction, and only secondly, and indeed optionally, might become the very *locus* of feedback, injecting some noise into the overall system loop” (Di Scipio, 2003, p. 270). Working with this mediated process, co-composition was structured as a set of relationships over time that were intended to be actively changed and manipulated by the performer. This type of interaction intended then to set up situations through the reaction of the instrument to actions initiated by the performer and the performer’s decisions in response to that.

...the agent is indeed the interface between the computer and the environment, and, at the same time, it is the only source of energy and change [...] the sound-generating system is not itself able to directly cause any change or adjustment in the ‘external conditions’ set to its own process, i.e. it has no active part in determining the control data needed for its changes of internal state to take place. The only source of dynamical behaviour lies in the performer’s ears and mind. (Di Scipio, 2003, p. 271)

The reality of co-composition is bound to its workshop-based conditions. It exists not in a sterilized environment, but in a space where the performer is engaging with a network of interactions and the material inherent to the sculptural process (tools, physical movement and effort). It is not then about showcasing the software’s functionality, rather achieving co-composition by thinking and acting in such a multi-layered and interactive manner. In contrast to Robert Morris’s idea of a “blank form”⁴⁶, the performer, is here at the centre of the work, as the

⁴⁶ In his letter to John Cage on 8 August 1960, Morris expressed that “in the process of working on an event with elements of smoke, water, compressed air, mirrors, small explosions, etc....I need some way of giving these things existence and at the same time removing the “me” which would make them occur too much in terms of habits – their continuities, even their non-continuities I wish to remove from my expression” (Morris, 1997, p. 71). This was noted by Brandon LaBelle as “Blank Form” (LaBelle, 2015, p. 84).

performer's response transforms the output of the interface and influences the continuation and evolution of the co-compositional process in question.

For this reason, my aim was not to perform co-composition in a systematized manner through a mainly automated or generative process, but based on my real-time response and thinking through actions and the network of interactions these would trigger across material. Establishing plans for action and potential new instructions, partially restricted this intention. Ingold argued that,

...the 'as if' actor [programmed with this knowledge, and provided with the requisite material equipment] and the skilled practitioner employ different kinds of intentionality. The first is the kind entailed in orthodox Cartesian accounts of volitional behaviour, in which to have an intention is to prefix that behaviour with a thought, plan or mental representation which it serves to deliver. The second is a kind of intentionality that is launched and carried forward in the action itself, and corresponds to the attentive quality of that action. It is the intentionality not of an isolated mind, of the cogitating subject confronting an exterior world of things, but rather that of a being wholly immersed in the relational nexus of its instrumental 'coping' in the world. (Ingold, 2000, p. 415)

What Di Scipio considered as a condition for composing interactions, is viewed by Ingold as thinking through the practice itself. The "coping" of co-composition in a performance environment involves action-feedback dynamics, which are created by the computer, were part of structuring the interactions of co-composition. The control of the software is then based on the co-dependent interaction between actions and the sounds produced, which also depends on the three-dimensional and visual outcome of the sculptural output. According to Di Scipio,

...the interactions mediated by such interfaces often have direct influence on the structure and the internal development of the output sound. The interface design becomes then the very object of composition (Hamman, 1999), and the array of DSP algorithms, and the methods by which they communicate among themselves, should be seen as the material implementation of a compositional process or concept. This approach, by which one invents and works out interdependencies among real-time control variables, already reflects a paradigm shift from interactive composing...to composing interactions. (Di Scipio, 2003, p. 270)

The design of the interface influences the structure of co-composition but it does not constitute the only factor that defines the output. As it can be seen from the diagram below (Figure 5.3), co-composition is not only about sound interacting

with the computer, it has a multi-layered and multi-sensory outcome through the interactions formed between the two modalities⁴⁷. For the concept of the work of this research such interactions are material-driven and specific to the nature of this inquiry. The triggering of the interaction and the production of the sonic output is initiated and controlled mainly by myself, the performer, through my real-time aesthetic decisions, as a response to the co-compositional environment rather than by a solely processual situation.

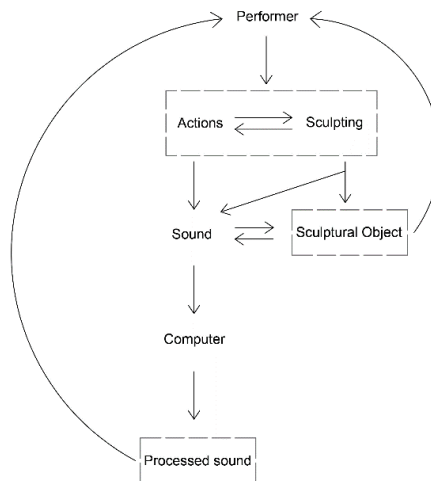


Figure 5.3. Co-compositional interaction as feedback loop

In exploring such relationships between interface and performer, I question the role of feedback in co-composition. According to Osbourne (2002), the feedback generated from interactions was considered as a learning aspect of performance. Here, this concerns both for myself, the performer, and the audience's familiarization with the situation of co-composition. Therefore, the loop serves both aesthetically and as a method for co-composing. To explore a live flow of co-composition, the development of this first version of the interface achieved was an interactive exchange of sounds of the working and processed sounds triggered by the first. During practical experimentation with the software, I observed that the mappings between input (sounds of making) and output (processed sounds and verbal instructions) used by the programmed recognition process narrowed my space for response physically in the space of the workshop: I kept thinking

⁴⁷ The diagram revisits by Di Scipio's "Implicit feedback loop in interactive system design" (Di Scipio, 2003, p. 270).

about actions in relation to sound in the form of a sequence as ways for triggering the software.

An additional experimentation was realized with a foot pedal MIDI controller for adjusting sound processing parameters in Ableton Live in a more flexible and responsive manner. The pedals were mapped into an Auto Filter effect in Live, which manipulated the frequency, LFO and envelope of the sound input in real-time (Figure 5.4; Appendix 2, Folder '5.1 Interfaces' file 62). The multi-tasking character of the implementation of this setup in the workshop space also introduced practical limitations of controlling the pedal: ensuring the proper operation of the machinery, while thinking about the development of the sculptural object and responding to the processed sound was overwhelming in terms of health and safety. Furniss referred to a negotiation of control in sound performances that use pedal controllers and stressed that pedals "...become accustomed to the requisite adjusting of body weight distribution and coordination. Distribution of weight may disturb (Kimura, 2003), and when a lot of pedalling is required, it may feel like playing two instruments at once (Pestova, 2008, p. 62; Nicolls, 2010, p. 23)" (Furniss, 2018, p. 68). Such complexity added here external relationships to the co-compositional process and thus prevented me from using this setup. I started exploring a further version of the interface.

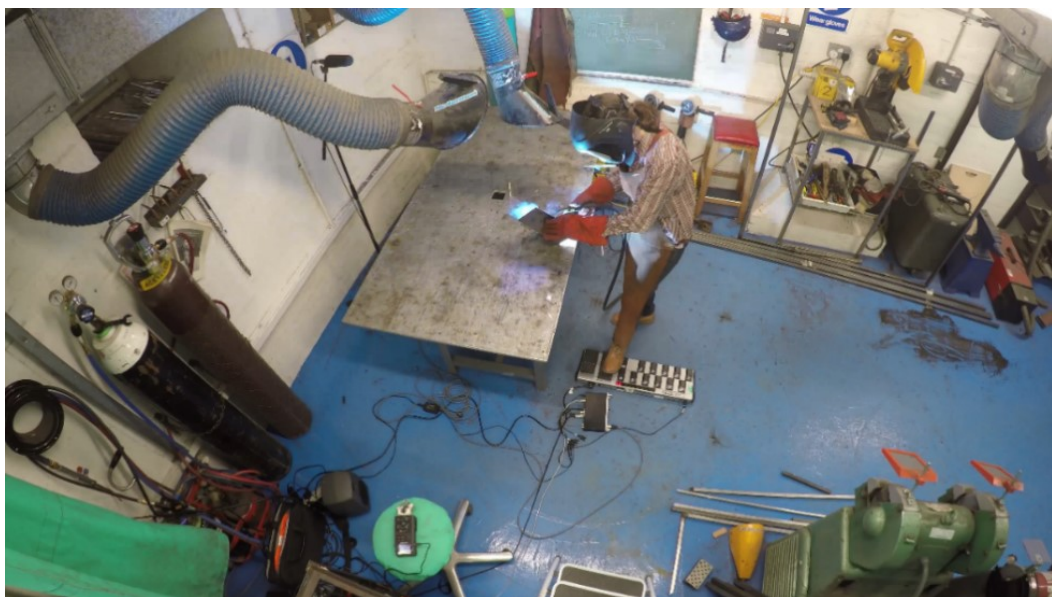


Figure 5.4. Rehearsing with the foot pedal controller. Still from video

5.1.3 Second Version

In bringing aspects of the two above setups together, a second version of a software device aimed at developing a flexible and adjustable interface, which would also give solutions to the multi-tasking challenges. As I regard material manipulation inherent to the generation of unknown situations in terms of co-composition, I pursued the development of an interface that would be responsive to the actions themselves and their intensity rather than focusing on producing sounds that would trigger the device. Live sound was passed from a microphone into the sound interface connected to a computer running Ableton Live and Max For Live. Compositional decisions for sound processing were structured through automations, which were controlled by a custom-built device developed in the Max environment named *inputPlay* (Appendix 2, Folder '5.1 Interfaces' file 63). The device operates based on an amplitude threshold; reaching the maximum value of this threshold would trigger an effect of delay that was preselected but could also be changed during the performance (Figure 5.5). In triggering the threshold, the device would start recording a predefined duration of the live sound into a buffer and release it processed, back to the performance environment (Figure 5.6).



Figure 5.5. *inputPlay* device

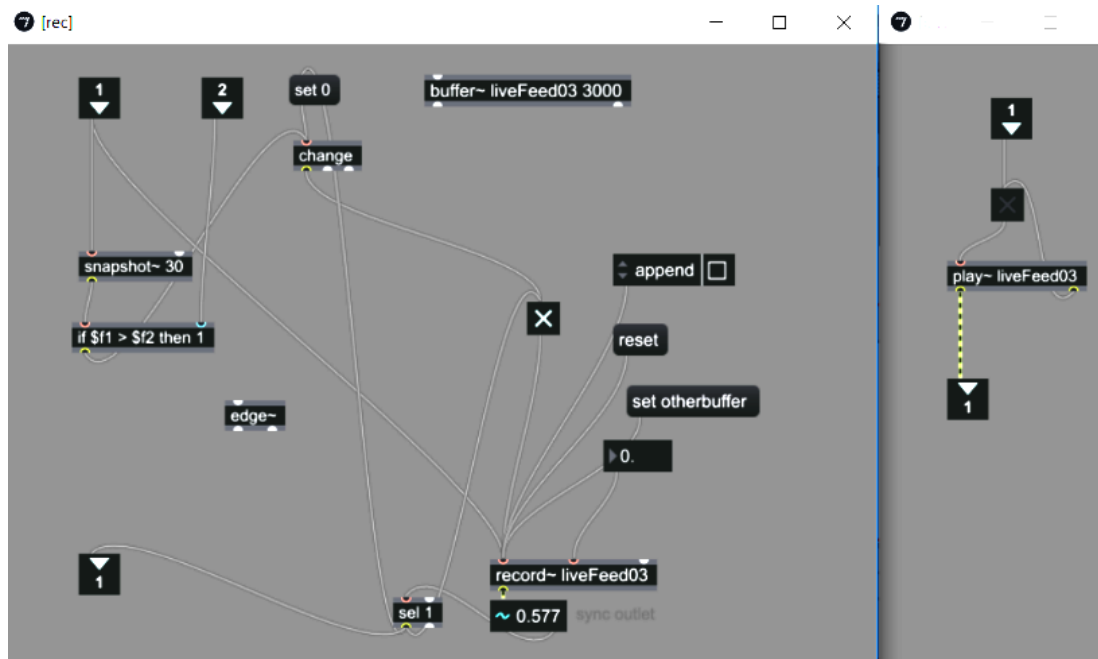


Figure 5.6. *inputPlay* recording and playback patch

The role of the element of delay in the design is twofold: a) to create a situation of disassociating and connecting sounds with actions, and b) to allow the flow of processed sounds not to entirely coincide with the much louder sounds of the making. This option creates space for more flexibility in structuring interactions and is more manageable in terms of this specific type of performance; less distracting from making sculpture and operating the tools in the workshop environment. Actions in this version were not thought of in sequences that would generate new instructions, but as part of a layered form of co-composition, which touched upon Di Scipio’s idea of “composing interactions” (Di Scipio, 2003, p. 270).

In rehearsing with *inputPlay* (Figure 5.7; Appendix 2, Folder ‘5.1 Interfaces’ file, 64) the aim was to familiarise with the software device inside the space of the workshop, while realizing sculptural actions and exploring ways for processing the sounds of the making. During the rehearsal, no practical restrictions interfered with the simultaneous operation of the interface and machinery-tools. The simpler type of recognition featured in this version was more flexible in terms of performativity; I was no longer concerned with providing the interface with specific sounds that would trigger the recognition process, but with working

based on the intensity of my actions. The rehearsal enabled me to experiment with the responsiveness of the device in relation to my actions by performing and “training”, while reflecting on the interactions during and after each trial (Furniss and Parker, 2014). This enhanced the development of a range of interactions, of learning through performing, not only about the instrument itself and its potential, but also about the act of co-composing. Rehearsals and trials took place in both the music studio and the workshop.



Figure 5.7. Rehearsing with *inputPlay*. Still from video

The devices have been developed to contribute to the formation of situations within a live environment of co-composition. They can be understood as flickering among instrument, device and interface: instrument as it allowed me to perform co-composition and for the way it reacts to the performed actions, what Cathy van Eck named “interacting resonance and resistance” (Van Eck, 2017, pp. 49-50); device for employing the compositional thinking into a software, and interface for bringing together both modalities in a common space and creating a live environment for co-composing. It is not my objective here to define the software itself, but to discuss its role and aspects of mediation that it brought into my practice. What matters is the co-compositional response and how it can be mostly controlled by the performer in both modalities at the same time through the chosen type of mediation.

5.2 Performing With: Attempting co-composition I

Process/Procedure is the final work of this research, a performance that employs the device *inputPlay* for creating a non-narrative work of a spatial-sonic experience and a multi-layered, responsive process of sculpture making and sound. During this first version of the performance, I constructed a sculptural object from steel sheets in the form of a cube, using a welder and angle grinder, with a sonic environment enhanced by computer manipulation of the sound of the making. This created a blending spectacle of smell, light, sound and *risk*⁴⁸. As a performer, my concern was to respond to the live and the processed sound through actions of sculpture making and vice versa. I use the proposition ‘with’ in the title of this section to stress that co-composition is viewed and evolved in relation to a sculptural object. The aim of this first version of *Process/Procedure* is to bring together sculptural and sonic material through performing.

The work centres on the notion of process in relation to actions and their reflection through physical material and the sounds produced. It is within this live environment that *Process/Procedure* began by engaging the idea of material transformation conceived of as sounds, which are delayed and manipulated. The compositional aim for the transformation of sound of making was for it to act in a haunting manner; to dissolve traces of the physical material manipulation and create an abstraction of the already executed action⁴⁹. The joint composition of the earlier explorations of this research becomes here a fusion. The minimalist aesthetic present in the conception and shape of the sculptural objects in the early works of the research is brought together with a temporal aesthetic of

⁴⁸ The term *risk* refers to the state of uncertainty and “agony” (Coyne 2010, p. 10) that the performer is in and the audience encounters during the performance. It also denotes the physical struggle with metalwork conditions of heat, sparks and light, fumes and the tools involved; the *aesthetics of effort* discussed in 4.2.

⁴⁹ This touches upon Jacques Derrida’s definition of trace not as “presence but the simulacrum of a presence that dislocates itself, displaces itself, refers itself, it properly has no site—erasure belongs to its structure...” (Derrida, 1984, p. 24). It relates to his notion of *haunting*, which is analyzed in the context of performance by Benjamin D. Powell and Tracy Stephenson Shaffer (Powell and Shaffer, 2009). It is not my aim here to further introduce such notions from a philosophical perspective in my work, but to describe the connection to the idea of self-reference.

sustained sound and liveness (Botha, 2017). In merging these two characteristics, this work invites the audience to experience the qualities of material interactions as they appear and merge; “to be open to the material”, as described by multimedia artist and composer Thomas Köner (Rebler and Köner, 2009).

To guide the audience’s experience of time through states of material traces and actions of making, my aim is to use raw aspects of sound from the working such as sounds produced from machinery and the more percussive sounds produced by handling and placing the steel sheets, as dynamic points within my performance. The approach to sound processing is structured in an echoing manner: variations of the raw sounds of sculpture making are feeding directly into the process of physical material manipulation. The rationale behind sound processing is to treat sound as an intrinsic part of the process, as material that is manipulated in relation to sculptural actions. To communicate the changes in the materials and to respond to them from new. In that sense, *Process/Procedure* looks beyond works that combine sculpture and sound such as Morris’s *Box* that took the form of a loop of fixed recordings captured from the start until the end of the fabrication process, which was completed when all the sides of the box were assembled.

In *Echolalia*, Applebaum used the processing “to not only complement the sounds of the actions being performed...but to also follow the contour of the piece. A rising intensity was the idea, with some effects appearing early in the performance in a mild form, only to return a little later in a much more frantic and noisy reimagining” (Sanchez, n.d.). Composer and sound artist Nicola Giannini performed in *Inner Out* (2015) with blocks of ice in shapes of cube, pyramid and semi-sphere with implanted hydrophones. Live sound was produced both from the actions and the tools used, as well as the material state and properties of the ice (Giannini, n.d.). Although the blocks were of predefined, prefabricated shapes and the process focused mainly on the sonic outcome rather than sculpting the objects, the performance acted as the link that brought together physical material and sound. Giannini’s performance involved a fusion

of percussive gestures and sawing, while showcasing composition in progress. The processed sounds informed Giannini's actions, and his decisions for the continuation of the performance, as opposed to Applebaum's *Echolalia*, whose composition pre-existed the performance and sound processing was triggered by a second performer. *Process/Procedure* sought to answer how sound and physical material could be brought at the same level in terms of their manipulation.

5.2.1 Decision-making

Structuring and experimenting with the sound processing parameters in the music studio prior to the performance involved practicing with individual samples recorded in the workshop based on an aesthetic of ambience, while focusing on the textural qualities of the sounds. The delay of the processed sounds in relation to the immediate occurrence of the sounds of the working created multiple levels of time in the audience experience. In integrating each processing idea in a multi-layered structure during the performance together with the original sounds of the working, would give a different outcome each time it was performed. The processed sounds communicated my interpretation of the sculptural actions, while inviting the audience to explore their own experience of the interdependent sculptural-sonic realities. How do we think about the traces of the one medium through the other, how do they evolve over time?

According to writer and curator Adrian Heathfield and theater director Andrew Quick, "performance and memory are delicately intertwined" (Heathfield and Quick, 2000, p. 1). In discussing Rilke's writings Katharine Norman suggested that:

Likewise, when Rilke observes the passing glance he feels that he chooses to slow perception's normal course, causing it to halt temporarily in its onward flow and in doing so become more analytical, and itself observable. Memory is implicit in comprehension, and in the images and metaphors we pull from memory in trying to make sense of our present perceptions. (Norman, 2016, p. 183)

The delayed sound environment gave then space for listening to the original source attached to each action. The processed sound that followed provided a

new reality of the action executed through its manipulation both for myself as performer and the audience.

Coyne argued that “[people] seek visual confirmation of sounds as if to settle the matter of their source” (Coyne, 2010, p. 11). Indeed, the idea of metalwork, brings in the mind of the viewer specific experiences, sounds, smell and energy. In this work this conception of sculpting material becomes combined and reconstructed in the audience’s mind through the co-compositional situation. Croft noted that,

...while there is a body, there is only a generalized mapping of the physical movements of such a body (pressing keys, moving faders, and so on) to the types of energy and gesture present in the music – the music remains, in essence, acousmatic, in the sense that what is known to be the source is visible but remains perceptually detached (Croft, 2007, p. 60).

It is then about the “energetic characteristics” between the sounds produced by the performer and the actions, and in that sense, co-composition encompasses a double effort of production of layering material over time. Different levels of causal relationships exist within the same work: sounds produced by the direct manipulation of physical material using an angle grinder and a welder, and sounds produced percussively, from the way I am handling, rotating and placing the material.

5.2.2 Setup

The first public performance of *Process/Procedure* (2017) was realized at the research workshop in Minto House at Edinburgh College of Art as part of the Prokalò seminar series⁵⁰, in a semi-scripted manner of a total duration of fifteen minutes (Appendix 1, pp. 35-36). It involved six steel sheets of the same dimensions (20x20cm) welded together into a cube. My intention in this first version of *Process/Procedure* was to make a sculptural object through a dialogue between steel and sound by considering sound as a trace of the process that might

⁵⁰ “Prokalò is a forum that *provokes* discourses to be revealed and shared through seminars; including students, researchers and people in practice” (Edinburgh College of Art, n.d.)

not always be evident in the sculptural object itself. I worked towards a transformation of materials through their previous and current states: the impact of actions on physical and sonic material and the form they take along the process. This work intends to express how the notion of time is changing from physical to sonic; how the combined material and the various temporal levels influence our understanding of the actions and the process itself.

The setup involved placing the working area and the performer at the centre of the workshop space using lights from both sides in order to emphasize the developing object and the actions around the area of the bench (Figure 5.8). A computer running the interface was located on another table in the front right side of the bench so that I could monitor the operating devices. In terms of sound, a pair of *Genelec 8030A* speakers were placed in front of the working area, raised and pointing toward the audience area. A dynamic cardioid microphone *EV - RE20* was connected to the sound card and to the laptop.

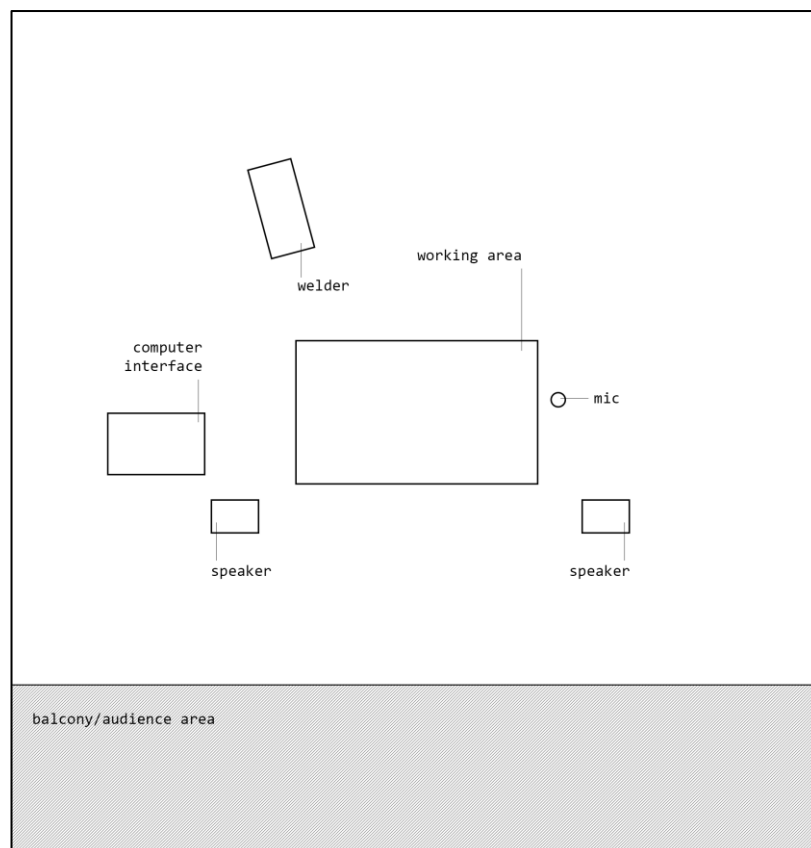


Figure 5.8. *Performing With setup*

Sound processing was designed in relation to each action of sculpture making with the aim to differentiate it from its original source, to take on other, ephemeral qualities. Driven by the actions it was structured in two sections the first of which had as input sounds of handling and welding, whereas the second sounds of handling and grinding. Processing was then realized in terms of morphology of the sounds of working and their duration and it included filtering, EQ, delay, reverberation and modulation. Using the Max for Live device *jo.Spectral Morph 1.0*, an FFT Filterbank developed by Jonas Obermueller⁵¹ (n.d.), different sound spectra models were designed before the performance and were automated and in cases randomized during the performance. Nils Nordmann's *FDC Generator 1.0*, a "randomized highpass-filter/delay/chorus hybrid" device (Nordmann, 2011) was also used together with the Max for Live AutoRingModulation and LFO, and ChamberVerb by the Pluggo devices (Cycling'74, n.d.). The rest of the devices were Ableton Live effects. Pre-decided signal processing parameters were applied through automations. These aimed at structuring the performance in two distinct parts and overcoming practical concerns such as distinguishing the very intense sound of grinding from the more spontaneous and less noisy sound of welding. Parameters were further adjusted through the intensity of the live sound, reflecting qualities of my actions, the materials and tools. The *inputPlay* device was set to record the live sound in a buffer of three seconds.

5.2.3 Performance

During the performance, moments of loudness and friction were interwoven with moments of stillness and rustle, creating in this manner peaks of tension among materials, sound, vision and bodily effort (Figures 5.9 and 5.10; Appendix 1, pp. 38-42; Appendix 2, Folder '5.2 Process-Procedure 'With' files 70-72). The

⁵¹ According to its developer Jonas Obermuller, *jo.Spectral Morph 1.0* is an "Effect based on an FFT Filterbank. It allows...to draw...own Spectrums or to have them being randomized in a defined range and density. Also...retrigger a new randomized Spectrum automatically and have them slide into each other...[and] save...different presets and morph between them" (Obermueller, n.d.).

processed sound acted as a murmur of the actions of physical material transformation (Appendix 2, Folder '5.2 Process-Procedure "With" files 73 and 74).

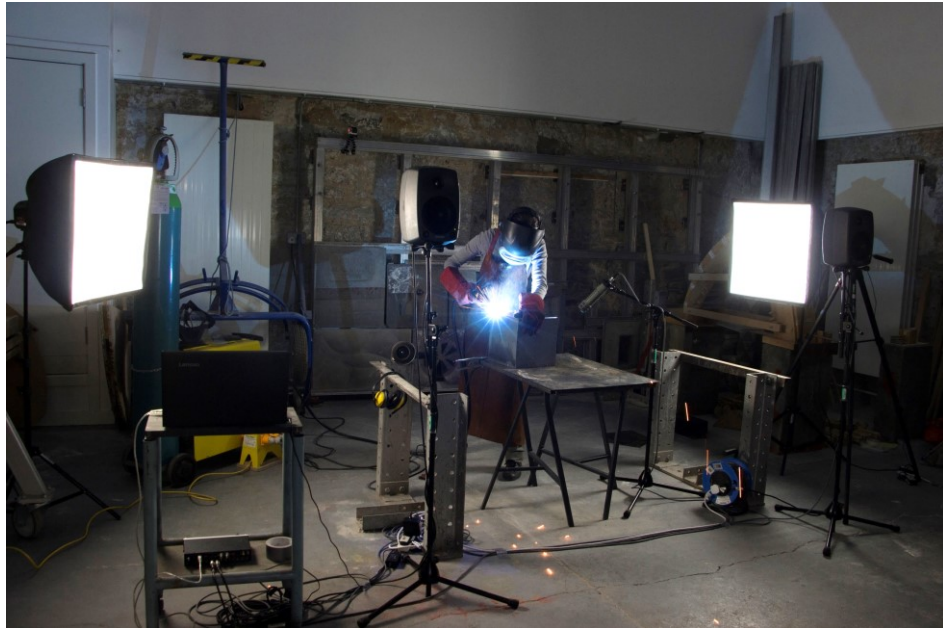


Figure 5.9. *Process/Procedure, welding*, 15 November 2017. Photographed by Beichen Yu



Figure 5.10. *Process/Procedure, Grinding*, 15 November 2017. Photographed by Beichen Yu

The immediate sound of sculpture making was followed by and merged with manipulated sounds, transforming the audience's experience of "presentness" (Hoffman, 2012, p. 37): what one was listening did not always seem to come from

the same moment in the sculpture making process. Interaction of sounds from sculpture making and processed sounds offered ways of thinking in a co-compositional manner, about how these materials are simultaneously produced and manipulated. Within this setting, the composer became the composing performer. Referring back to the diagram of the co-compositional interaction (Figure 5.3), this first version of *Process/Procedure*, achieved to create a live and real-time combination of the two modalities.

The audience was located on a balcony over the performance space and were wearing welding masks, which provided with a physical interaction between the performer and the viewer, an immersive⁵² experience through sharing aspects of exposure to this raw practice (Figures 5.11 and 5.12). Robin Nelson used the term “experienter” in order to describe

...a more immersive engagement in which the principles of composition of the piece create an environment designed to elicit a broadly visceral, sensual encounter, as distinct from conventional theatrical, concert or art gallery architectures which are constructed to draw primarily upon one of the sense organs – eyes (spectator) or ears (audience). (Nelson, 2010, p. 45)

Presenting *Process/Procedure* in this manner, I exhibited the full process I was in while co-composing – both myself and my actions as a performer, and the environment of the workshop, which came at the centre of attention of the viewer. However, my intention was not to communicate the script behind the electronic processing to the audience, but to stress the physical process and my interaction with the feedback. Although space arrangement and health and safety regulations made audience observation only possible from distance, aspects of the performance were shared between myself and the audience through the protection equipment they had to wear. Audience members were adjusting to the

⁵² According to Kurt Vanhoutte and Nele Wynants, “derived from the Latin *immergere*, meaning to plunge or dip into, immersion in digital culture refers to the sensory experience/perception of being submerged (being present) in an electronically mediated environment” (Vanhoutte and Wynants, 2010, p. 46).

process and the physical material of the work by wearing welding masks when necessary.



Figure 5.11. *Process/Procedure* performance, 15 November 2017, view of audience. Still from video

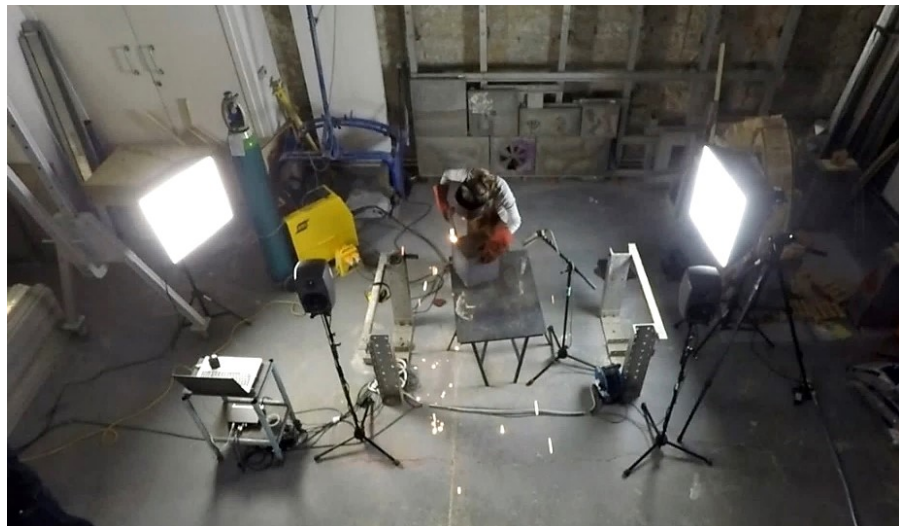


Figure 5.12. *Process/Procedure* performance, 15 November 2017, view from the balcony where the audience was located. Still from video

As in the performances of B-Team, audience was experiencing physical tension, dangerous acts and high levels of noise (sounds from the making) (Cash, 1999). Working with steel generated changes of colour, fumes, dust and light on the object and the space of the performance. It was not my intention to compose with light as Greg Pope did by directing multiple projectors “onto a fog making machine to create...a cloud of kinetic activity”, while manipulating leather straps and sound (Griffith, 2010). Instead, light, fumes and dust were here intrinsic

aspects of metalwork, which enhanced the audience's immersion and sense of liveness.

The documentation of the work involved three different camera views (front, back and bird eye – balcony view of the audience), stereo audio recording from the space of the performance and recordings of the mic input and processed sounds. Thermal camera stills were captured during the performance (Figure 5.13). Using this analytical tool, my intention was to explore the articulation of energy during each action and the type of change materials were subject to during the performance; to understand the way actions and tool operation are reflected through the dynamics of the process and its traces directly related to material properties. For instance, images of welding showed the heat all over the object, while images of grinding highlighted that heat was accumulated closer to the point of contact with the grinder rather than the whole object (Appendix 1, pp. 43-44).



Figure 5.13. *Process/Procedure*, 15 November 2017, thermal imaging. Captured by Roxana Karam

Being part of the Prokalò seminar series, an open discussion and Q&A session followed the performance (Appendix 1, p. 42), which included questions about the geometry of the object and how this affected the process; the ideas behind the sound processing methods; the space of the performance and the ideal setup. Following the performance, I held one-to-one semi-structured interviews with members of the audience (Appendix 1, pp. 45-49). Interviewees were asked to

express their understanding of the performance as a whole and as a process, as well as to comment on the sound-sculptural object relationships and talk about the interaction between actions and the sonic outcome. The aim of interviews was to acquire an understanding of the work through the experience of the audience.

Common threads existing behind the responses were mainly observed with regard to action-sound relationships. It was very interesting to me the way some of the interviewees made connections between sound, its source and the process itself. How sound-movement-actions on material, blended processed sounds that were more “remote...to the energetic characteristics of the performer’s sound and action” (Croft, 2007, p. 60) with the live sound of the making. Material traces seemed to play a key role in the experience and understanding of the co-compositional work as they enabled connections between actions and outcomes. Sound offered new perspectives of navigating through the physical material manipulation in a range of levels as “*a zoom into the process*” (interviewee’s comment). Through this post-performance reflection and in discussion with the interviewees, it became apparent that co-composition was more about creating a situation rather than solely an object. The dialogue between appearance and disappearance could be further explored toward a state of improvisation in terms of actions and the multiple outcomes of the process.

The workshop environment at Edinburgh College of Art formed a practical restriction upon which this performance was built. Following this first public presentation of the performance I would see it fitting better in a larger industrial space in which scale would play a central role in arranging the different elements of co-composition, as well as the experience of the audience.

5.3 *Performing For: Attempting co-composition II*

The public presentation of the first version of the performance contributed to a familiarisation with the elements of interactivity and the control over both

materials concurrently. The interdependent relationships developed during the first performance echoed Morris's example of "The self's presentation to itself", based on George Herbert Mead's conception of the self as the "I" and the "me":

The former has to do with the present-time experiencing self, consciously reacting. The latter is the self reconstituted from various remembered indices. Or as Mead put it:

The simplest way of handling the problem would be in terms of memory. I talk to myself, and I remember what I said and perhaps the emotional content that went into it. The "I" of this moment is present in the "me" of the next moment. There again I cannot turn around quick enough to catch myself. I become a "me" in so far as I remember what I said. The "I" can be given, however, this functional relationship. It is because of the "I" that we say that we are never fully aware of what we are ... (Mead, 1934, p. 174, as quoted in Morris, 1993, p. 177)

There seems to be a fundamental distinction between real-time interactive experience and every other kind. The "I" is that part of the self at the point of time's arrow which is present to the conscious self. The "me" is that reconstituted "image" of the self formed of whatever parts-language, images, judgments, etc.-that can never be coexistent with immediate experience, but accompanies it in bits and pieces. (Morris, 1993, p. 177)

I found Mead's insight and Morris's observation closely related to the self-referent state of co-composition through a dialogue between materials and their multi-layered condition during the performance. This guided me to a reconsideration of the way the processed sound exists in relation to physical material and how the two affect each other, as well as the process itself. Having a predefined shape as the intended sculptural outcome in the first performance, prevented an entirely interdependent situation. To achieve this, I proceed from making something to *making* the interdependent relationships among the elements of the process: sculpture, sounds and actions. Aiming to purely work with the materials themselves beyond a fixed geometry and form of the sculptural object, I am reconsidering *Process/Procedure* in terms of interaction and duration. Expanding further the idea of presenting the process of co-composition to an audience, I regard the prolongation of duration as an instrumental element of my work. Having more time to perform could contribute to an on-going negotiation with materials and the relationships formed.

Heddon and Klein stated that "durational performance consequently exacerbates the problem of knowing where the live art begins and ends, frustrating the desire

to master the 'whole' of the performance of making it, the process itself becomes the work" (Heddon and Klein, 2012, p. 47). I question the way Heddon and Klein's view could relate to having a predefined shape as outcome of the performance. Would the performance end when the cube would be completed? Returning to Paul Klee's conception of an artwork as "active form", I examine how a durational event could expand the structure of co-composition and allow for a continuous process of making-readjusting-remaking through reflection-in-action (Klee, 1973, p. 269). The term *co-composing* was then not only about performing a preexisting form but pursuing the development of multiple forms concurrently and continuously. The cube developed during the previous version of *Process/Procedure* made obvious the stages of the process, whereas a constantly evolving sculptural object could give a different experience of this struggle with materials and interactions in terms of time and liveness. I use the proposition 'for' in the title of this section to stress that co-composition is viewed in this version in terms of duration.

In referring to the process-oriented works of the *Anti-Illusion* exhibition, Marcia Tucker claimed that "they do not evolve from a preconception of order which the artist is trying to express, but from the activity of making a work and from the dictates of the materials used. A relational logic has been replaced by a functional one" (Tucker and Monte, 1969, p. 27). Similarly, the second version of *Process/Procedure* did not concern a fixed outcome, but a constantly changing state of material; for "the forms and the order of their work [Pollock and Louis] were not a priori to the means" (Morris, 1993, p. 44). The multifaceted aspect of co-composition contributed to the formation of interdependent relationships between the elements of the work, bringing together a way of thinking that is both "relational" and "functional" (ibid.). This approach involved performative aspects that could be characterized as improvisational: the starting point of the performance with regard to physical material, was a stack of steel sheets cut in various shapes and sizes, which were further cut during the performance in response to the sound environment.

5.3.1 Decision-making

This version of *Process/Procedure* addresses the initial ideas of material traces and liveness from a different angle. Physical material transformation allows the recollection of what Roger Alsop described as “short-term” memory, whereas the temporal developments within the structure of this durational version of the work the “long-term” (Alsop, 2003). For observation according to Alsop, “...it is essential that the perceiver be able to appraise the salient points in the performance, their internal relationships, and their relationship to the whole” (ibid.). Extending the temporal scale of the work could enable both types of memory to negotiate through a combined type of material transformation, a result of co-composition. Marc Botha noted that “the sustained presence or absence of sound, often undetermined by the composition itself, draws attention not only to duration...but also to the manner in which sound emerges and persists” (Botha, 2017, p. 116). In this version, disappearance is considered as pausing, ceasing the actions of working but also distancing the sounds from their source. Moments of pausing were included as the improvisational elements of the performance, aiming to make the process more fluid and at the same time intriguing and less predictable for the audience. In that sense, co-composition involves a notion of repetition different from the minimalist one: the repetition of sounds depends entirely on the repetition of sculptural actions and my response to material qualities; it does not aim to structure “a relationship caught in a repetitive cycle” (Botha, 2015, p. 756), but to express the idea of “inexhaustibility” that is inherent to the notion of process and to the state of interdependence of the elements of co-composition.

The sound processing of the first version included moments when sound was turning into a more distant effect in relation to the co-compositional process; a less self-referent state, which was more open to interpretation in terms of sound-source relationships. Actions and their traces were brought at the same temporal level by using processed sounds whose original source was still recognizable. On the other hand, heavier processing distanced sound from the source and made

the relationship in question to *disappear*. In this version I attempted to augment this feeling by processing sound to a higher degree. The second version of *Process/Procedure* structured relationships of actions and their traces through sounds that distanced from their original source. Informed by the way Köner used sound to express “depth, distance and disappearance”, live sound was processed into a decaying and slowly evolving sound environment (Köner, 2015). Köner’s *Novaya Zemlya* (2012), *Permafrost* (1993) and *Daikan* (2002) and SleepResearch_Facility/Kevin Doherty’s album *Deep Frieze* (2007) are examples that reflect the more sustained aesthetic behind the sound processing in this version (Sleep Research Facility, n.d.). The combination of sounds of the workshop and the processed output, changes the ambient aesthetic of the above examples into a more discontinuous structure that is directly related to actions of making.

Artist Sarah-Jane Norman discussed about her durational sound performance *Stone Tape Theory*:

...it’s not a reservoir, nor a linear progression, but a loop, on continual playback, continually re-writing itself. This perpetual oscillation of data is fundamental to human consciousness: our ability to perceive and understand the present is contingent on our ability to narrativise our past. (Norman, 2015)

The aesthetic of a looped situation is viewed here in relation to materials for grasping co-composition through traces; this concerns not only the audience experience, but also from the performer’s side, as a tool that provides me with a prolonged understanding of the process. I argue that after experiencing a durational version of co-composition, members of the audience will not solely focus on the sound of working and its transformation, but the formation of relationships among performer-actions-sound-space; that they will get immersed and think through the complexity of this co-compositional environment as a metaphor of relationships, actions and events over time. The experience each member of the audience forms by focusing on the traces of the actions during the performance, contributes to the formation of personalised views of this process and its temporal levels (Gardner, 2011; Raffaseder and

Parker, 2008). Depending on the time each of the member of the audience enters the space of the performance and on the duration of their attendance, they would experience different views and moments of the process (Gardner, 2011). Botha discussed that a shift “from the temporality of the real to the temporality of reality...comes to express a logic of *continuity*... tension between immanence and absence” (Botha, 2017, p. 116). The act of pausing is employed in the version of the work not only to structure the duration of co-composition, but also to enhance continuity through the absence of actions – to give space to experience the traces of the process.

Mikes Poppe’s durational performance *De Profundis* (2017) involved carving a marble cube to which he was attached until he was freed – turning himself and the process to a durational exhibit stretched over a period of 19 days (Figure 5.14). Poppe’s raw practice had a strong conceptual background and a specific aim: to break free from the heavy cube of marble that represented the history of art (Poppes, 2017). Escaping seemed possible in the beginning of the performance. As the days were passing, Poppe was creating a state of agony concerning his success, which seemed at times achievable and at other moments impossible. The sense of something happening has here, no fixed goal for the process itself, but a limit to time in relation to effort.

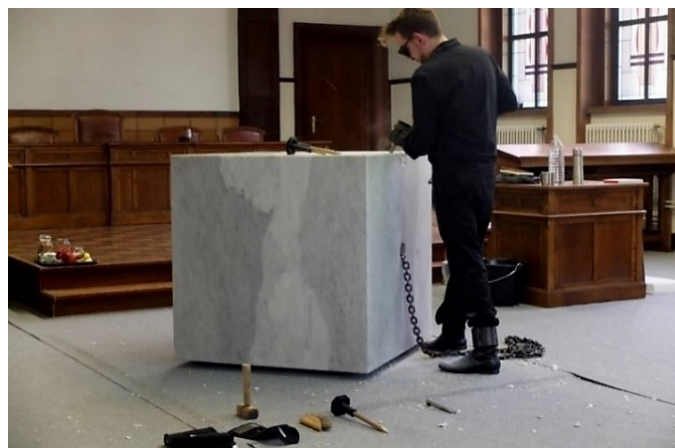


Figure 5.14. Mikes Poppe *De Profundis*, durational performance, 2017 (Poppes, 2017)

Physical effort and material qualities were at the core of Charalampopoulos’ durational performance *Justify My Existence* (2016) in which “the dimensions and

forms of the sculptures are in constant flux” (Figure 5.15) (NEON, n.d.). In both works duration was included as an element of physical endurance: the dynamics of the performance were dependent on bodily effort in a struggle with the material, the amount and the scale of it. How does this prolonged physical response to material manipulation affect the interactive process of co-composition?



Figure 5.15. Spyros Chalarampopoulos *Justify My Existence*, 2016, durational performance (Marina Abramovic Institute, 2017)

The feedback to myself for continuing the process of co-composing was partial in the previous version of the performance as the predefined shape of the cube left no space for further interaction. Using a range of actions during the making could allow producing a wider variety of sounds and the transformation the whole process in real-time. To achieve this, I employ an improvisational mode of thinking throughout the process for responding to new input and creating new situations. In this version of the performance, co-composition intends to evolve stretched over time, in a continuous manner with sounds returning in different forms, as traces of the process.

5.3.2 Setup

The second performance of *Process/Procedure* (2018) was realized as a durational event of three hours at the research workshop in Minto House at Edinburgh College of Art (Appendix 1, p. 50). This version of the performance did

not have a specific end in terms of form but depended on the time limitation of three hours. The defined time in the workshop space was bound to practical restrictions of physical effort, fumes, intense light and loud sound due to machine operation. The performance was meant for the audience to come and go, revisit or leave on their wish, as co-composition took the form of an open-ended and constantly evolving experience. In this version of the work, the minimalist approach shifts from object-focused to on-going: from the making of a cube to the *procedure* and the actions realized, further through situations that are bound to constant change. The starting point for sculpture making were steel sheets cut in various shapes. The setup of this version included a subwoofer together with two more powerful Meyer speakers, which were raised higher than in the previous performance to project the sound closer to the balcony area where the audience was located. Two monitor speakers *Genelec 8030A* were placed behind me together with the computer and the sound interface (Figure 5.16).

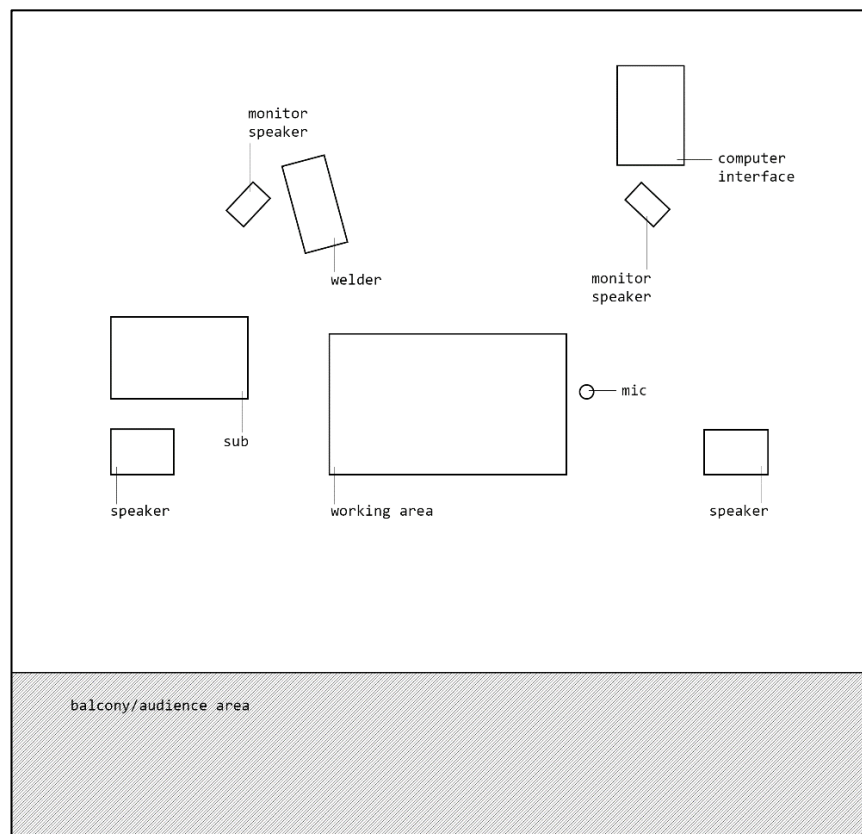


Figure 5.16. *Performing For* setup

In intending to showcase the interdependent aesthetic decisions within the co-compositional process, I was manually adjusting sound processing in real-time via a controller, as well as using automations of effects as in the previous version. The aim was to set up situations that would trigger my response to the environment and the performance at specific moments. My experience then involved what Acconci named a “learning process” (Acconci, 1970).

I adjusted sound processing parameters using a MIDI controller (*Korg nanoKONTROL2*). For this, I placed the controller together with the computer closer to the area of working. The *Gain* and *Saturator effect* were mapped to the controller to manipulate the live input and part of the pre-compositionally defined processing in Ableton Live. Multiple versions of the *inputPlay* device (buffer recording for 2sec, 3sec, 5sec, 10sec) were applied in a successive manner in three different processing channels for creating variations of the action-feedback events during the performance. In addition to the effects used in the previous performance, *Grain Delay* by Live was included for making the sound more distant from its source using pitch-shift and transforming sound into small parts-grains and controlling their size (Sasso, 2012).

Distancing the sounds from their source involved a wider frequency range, as well as processing and manipulating their duration. With the original sounds of the making in mid- and high frequency range, I looked at transforming some of the sounds to low-end, while stretching them over time, resulting into a more sustained and hypnotic-like sound environment. Structuring the live set, the duration of the multiple *inputPlay* devices and sound processing in the music studio was followed by rehearsing in the workshop space prior to the performance. This was not only for familiarizing with the device itself as in the previous version of the work, but also with layering the interactions over a longer period of time. To improvise within this live setup required learning and trialing its potential.

5.3.3 Performance

During the three-hour event, interaction and effort were at the core of co-composition and aesthetic decisions were realized according to them (Appendix 1, pp. 52-57, 59-60; Appendix 2, Folder '5.3 Process-Procedure 'For'' files 76 and 77). I started without knowing what form the sculptural object would take and how this would influence the co-compositional relationships of the work. Such decision consisted an improvisational element grasped through my response to the interface and the environment of the performance. Each piece of material that I was holding in my hands was considered at times in relation to a specific shape (Figure 5.17) or in a more abstract manner, as I kept cancelling the formation of a specific form. Acting in this way, introduced a shift in agency: sound informed the decisions behind the sculptural actions.

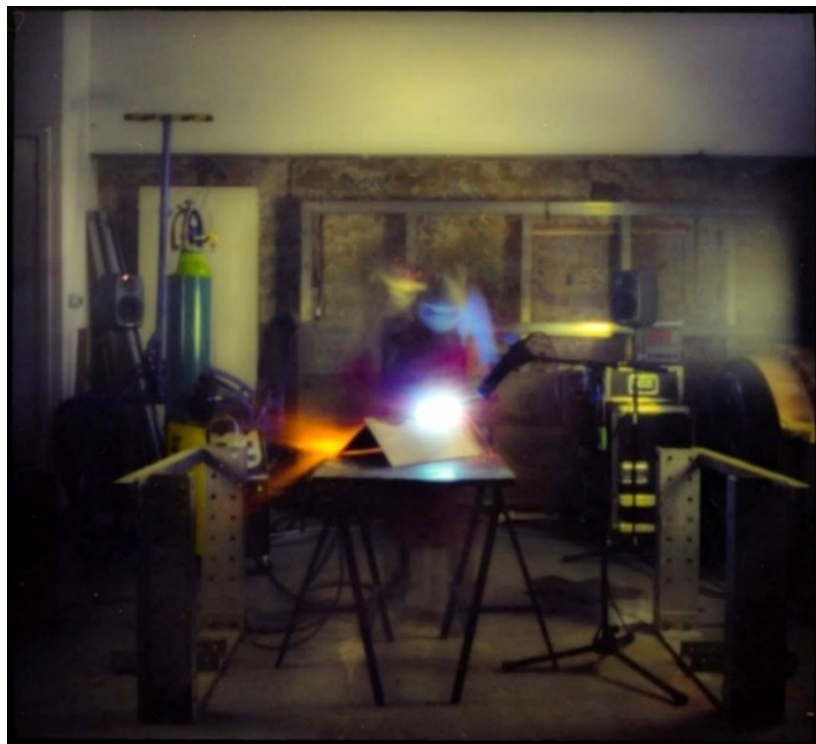


Figure 5.17. *Performing For*, 24 April 2018, the more defined shape of the object.
Photographed by Sam Cornwell

In the previous version of the performance, by the time the cube started to become obvious to the audience, it uncovered any aspects of the unknown and unpredicted continuation of the process. Introducing additional actions of cutting

and folding the sheets, as well as cancelling the welds by cutting, allowed me to return to the previous stage of the process or further manipulate the initial shape of the steel pieces (Figure 5.18). In this version of *Process/Procedure*, the material particularity of steel, which involved both an additive and subtractive manner of working was used as a condition for a continuous and reversible material transformation of the sculptural object.



Figure 5.18. *Performing For*, 24 April 2018, the more irregular shape of the object. Still from video

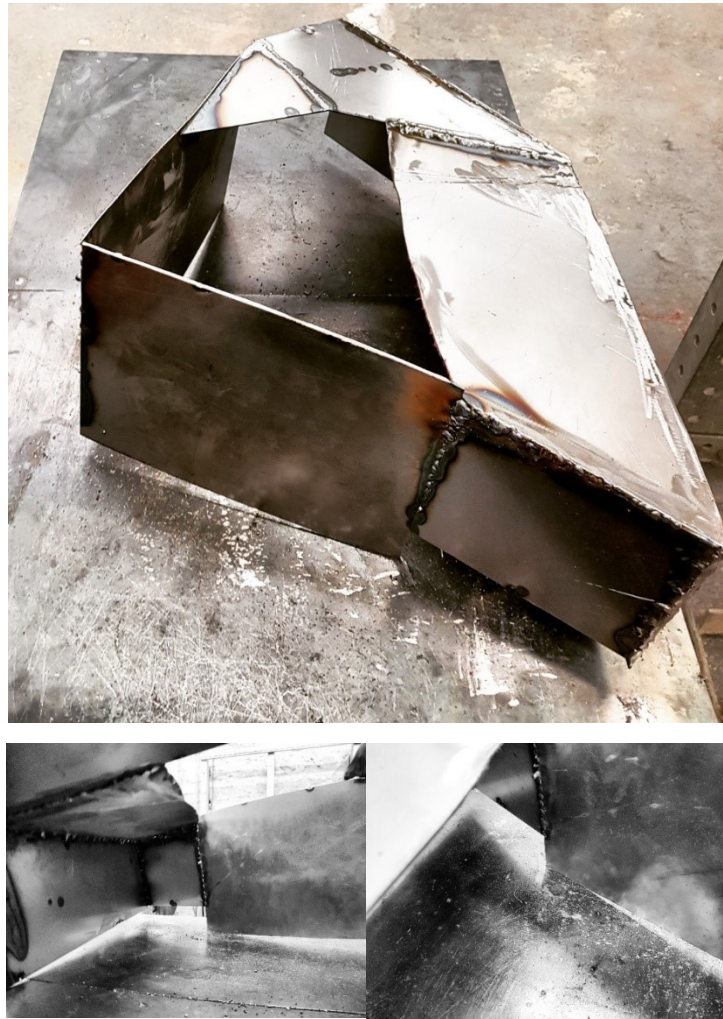
Concerning sound, there was a merge of the different processing channels. How did they affect the relationship between the body of the performer, the visual connection to actions and sources mentioned by Croft? Sound that was more stretched over time was used to layer the process of co-composition both in terms of frequency range and as complementary to the intensity of the actions of the working. This resulted in a combination of a sustained sound environment with the more immediate and fragmented sounds from the actions of making, which was more satisfactory in terms of sonic output, yet at times confusing in terms of interaction (Appendix 2, Folder '5.3 Process-Procedure 'For'' file 81). Changing sound processing parameters during the performance not only through my actions of making sculpture, but also using the controller introduced moments of pausing (Figure 5.19).



Figure 5.19. *Performing For.* 24 April 2018, adjusting sound processing via the controller. Photographed by Yulia Kovanova

Such decision had a similar effect to the improvisational approach to the sculptural object, discussed above. As I was pausing from sculpting, I was also pausing, changing or eliminating the operation of the sound processing devices. In attempting to form a real-workshop experience during the performance, I took breaks and distance from the working bench, which extended the more linear development of the performance in the first version 'With'. Pausing and approaching the controller for adjusting sound, brought the process outside the working bench, which was a spatial limit in the previous version. At the same time, the controller increased the complexity of this already multi-tasking process.

The object that resulted from the performance was an 'unfinished', 'open' structure, which introduced a geometry *in-flux* (Figures 5.20-5.22; Appendix 1, pp. 57-58). Therefore, sound was not only evolving alongside the sculptural form and the actions as in the previous version of the work, but also informed their emergence.



Figures 5.20 - 5.22. *Performing For.* 24 April 2018, views of the sculptural object post-performance, general dimensions 47 x 47 x 21cm. Photographed by Roxana Karam

It became apparent that the improvisational element created a pace in performing that alternated depending on the interactive process. The pace slowed down in the second half of the performance, when I paused for longer and reflected on the shape of the object, as well as the sound processing. While observing the video documentation of the performance and in recalling my actions, I questioned how pausing related to interventions on the object and sound environment. Toward the end of the performance, I switched off the sound processing in response to the state of the sculptural object: I had decided on the last actions and felt that additional sounds would not add to the whole process. I took more frequent breaks, and realized the last actions with a clear aim and more decisively, which created distance between actions and sounds. In this way, both modalities were brought at the same level of interaction (Figure 5.23).

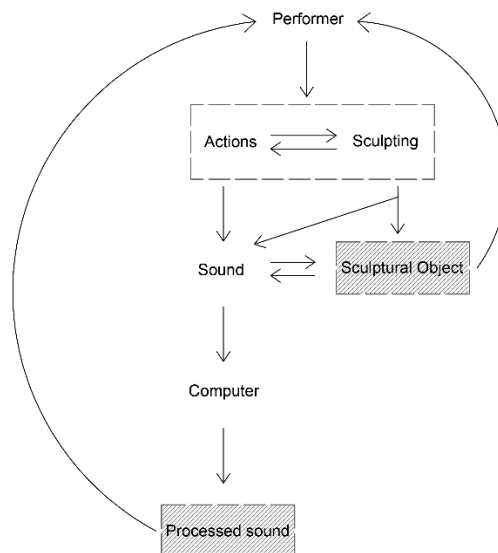


Figure 5.23. Co-compositional interaction during *Performing For*, sculptural object and sound processing were brought at the same level of interaction

Process/Procedure achieved a transformation of presentness, a notion that became central to the structure of the work; as Ingold stated “inwards on the self: in other words...reflexive” (Ingold, 2000, p. 148) by fading out the reference to the cube and taking an improvisational turn with the actions of sculpture making. The sculptural object was worked for longer and concluded to an open form. Due to the extended duration of this performance the element of performing became more central to the work. As a consequence, the notion of co-composition developed here in a threefold manner: through the actions and the environment of the performance, the ‘open’ sculptural object and the sounds. What about the relationship of the actions, the act of performing, with the sculpture-sound interaction? As in the previous version, steel was used in a percussive manner for triggering sounds, louder, and sometimes for the sake of the action. I regarded this intensity in movement as a way for the audience to engage in the performance actions. However, it produced higher levels of noise, which affected the sound environment and prevented the performance from being a ‘real’ sculpture making process.

Following the public presentation of the second version of the performance *Process/Procedure*, I held semi-structured interviews with members of the audience, which documented responses of their experience during the

performance (Appendix 1, pp. 61-65). The purpose of the interviews was to acquire an understanding through the audience's perspective, and to take this into consideration for the development of the elements of my work. Interviewees focused on the way pausing affected the overall performing process and the relationships between object-sound: *"It was important in terms of breaking the linearity of the process, to create an anticipation of the next step of the performance. The intensity of the action as well as the sound... there was a variation because of the pauses"* (quote from interviewee). From the feedback, it became clear that alternating the pace of the actions was creating a more immersive situation for the viewers than in the first version 'With', as it gave them space to observe the space, the object itself and reflect upon the past stages of the performance. Audience members expressed that pausing contributed to the development of multiple levels in their perception of time during the performance. The interaction between sound, physical material and actions seemed to become better understood than in the previous version of the performance as the element of performing became more central to the work. Handling the object and rotating it while thinking about the next action was mentioned as an immersive element that influenced members of the audience in sharing the perspective of the object with me as I was performing: *"your movement that was very specific... I was trying to change my perspective of the process according to it"* (quote from interviewee).

Interviewing the audience contributed to a reconsideration of the role of movement and pause during the performance. What I had not thought about before realizing the performance was the way intervals of time in-between pause and action affected the experience of co-composition and provided not only myself, but also the audience with space for thought. The performance and the reflection that followed, triggered questions of pace, scale and quantity. How could I reach a temporal structure, which would allow for more reflection on the actions and the traces, to make pausing part of the performance? Pausing did not cease the creative process: I kept composing (co-) through thinking about the interactions between materials and my actions. The nature of the previously discussed aesthetic of effort became twofold: physical and mental. Co-

composition was then not only about the combination of sculptural and sonic material, but also a third element, the actions, and therefore, the performance (shaded rectangles in Figure 5.23). What would change if the performance was longer and if multiple objects were created?

Using six camera angles, the multiple viewpoints in the documentation of the work aimed to involve aspects of the audience's immersion in the space of the performance, to give the sense of the state of the performer's body and the sculptural object in space together with the development of the sounds.

5.4 Performing At: Co-composing

In reconsidering the work *Process/Procedure* in terms of structuring interdependent actions over time and involving a more immersive audience experience, I realized a third version that took the form of a performance-installation (2018) (Appendix 1, p. 66). I investigated the idea of pausing during the process and how the performance environment and my presence in it could be included more strategically in the unfolding of co-composition. Using the proposition 'at' in the title of this section, my intention is for co-composition to be viewed as a situation and installation, as well as performance. The audience was encouraged to visit, leave and return to the space of the performance and not only observe the performance from the balcony area.

This third version aims at composing the interactions that were achieved in the two previous performances and to explore the presentation of the traces of co-composition outside the time of the performance. By reviewing and merging elements from the previous two versions 'With' and 'For', my aim is to achieve clarity in movement and in the way sound emerges. Drawing from the more direct response between action and sound in first version 'With', I expanded the structure in a larger scale by performing for three days and by including longer duration of delayed sounds for creating layers of successive processing. The low frequency sound environment that was developed in the second version became

at times remote to the process and the actions executed during the performance, while percussive sounds of handling the object added to that remoteness. The purpose here is to listen to every sound, to make every decision directly relevant and referent to the physical material transformation.

5.4.1 Decision-making

Stretched over time, a “reality” of a workshop experience enabled in this version the elimination of any actions that could seem remote and theatrical from the self-referent state of co-composition (Botha, 2017). Movement in the space of the workshop is considered as an essential quality for sculpture making and not for the purpose of challenging the electronics or the visual outcome. To focus on the compositional actions themselves and the interactions, rather than in ‘performing’ for the sake of a spectacle, went with eliminating any intentional percussive sounds. To manifest co-composition solely by executing actions for sculpture making, I revisit ideas of emergence and disappearance through a more controlled pace of my actions, of pausing and stopping the performance for longer periods of time. In order to work with the ‘fundamental’ parts of sculpture making, I look at how steel is being manipulated to become something with the minimum actions and for the minimum of shape: the object produced in the previous version was not a complete form, but an ‘open’ one. My aim is to show the potential the various states of its form as the performance progresses. The intention in this version is to make multiple objects and to place them in the space of the workshop on the working bench and on the ground, for the audience to observe and experience their shapes, textures and traces during the installation time together with an environment of processed sounds. Therefore, my concern is to ‘inhabit’ the space of the workshop by making it viable in terms of performance and *lived* in terms of audience experience. This reflected what Botha referred to as “tracing the process of generation in real time, presenting a concrete accumulation of significant moments” (Botha, 2017, p. 124).

To achieve this, the performance-installation was structured as a durational event, lasting for three hours per day over a period of three days (Appendix 1, p. 66, 68). To develop the experience in terms of movement, dynamic relationships involved pausing as part of the work, resting, as well as switching to a different space, this of the installation. Inhabiting the workshop was employed in terms of physical effort and expressed the on-going, continuous the state of co-composing, while exhibiting the multiple elements of co-composition over a temporal form of 45 minutes of performing and 15 minutes of installation time for each hour of the performance. This involved exhibiting the objects, the sounds, the actions and the space of the performance itself; it also contributed in making the duration of the work viable, to allow some break time for the performer.

The structure of the performance-installation was informed by Florian Hecker's installation work *Resynthese FAVN* (2017) that involved "eight different versions of this piece can be heard in the course of a day – and with each version, the work becomes gradually more crystallized, acquiring a sharper...outline with each iteration" (Müller, 2017). The slowly evolving piece was forming in this way different experiences for each member of the audience depending on the time they entered the space of the installation. The sustained sound environment of the installation in this version of *Process/Procedure*, aimed to revisit the traces of the performance. Drawing from SleepResearch_Facility/Kevin Doherty's album *Dead Weather Machine Re:Heat* (2004), sound events keep reappearing slightly changed throughout the piece in the form of layered textures. This logic of iteration formed a basis for the arrangement of my installation and of the whole work: having the same starting point for each day – the sound processing and the steel sheets – for generating variations that are based on the interactions between sculptural actions and sound processing.

B-Team's installation at the Robert Lehman Gallery at UrbanGlass in Brooklyn presented glass objects together with sounds, lights and smells. Cash mentioned that the "show gave the team an opportunity...to consider ways in which it [glass] can relate to other art forms... Made tinny by its interaction with the glass, the

sound seems to be originating from far away, creating yet another sensory disconnectedness and a sense of auditory tension...As the viewer progresses through the space, the sound and light intensify; this, together with the physical shrinking of the surrounding space, can result in feelings of confusion and even anxiety” (Cash, 1999). *Soundforge* by Gabriel Craig and Michael Remson was presented as an exhibition that included videos of the making process, while objects that resulted from the metal forge were built together to form “interactive xylophone-like sculptures and invite us [the audience] to play” (Risse, 2016). Both installations created relationships across actions, materials and sounds from what had been performed, which informed the structure of the installation time in *Performing At*. However, my approach is different in the sense that performance and installation are presented as one work for emphasizing on the multiple temporal levels through traces of synchronous material transformation. In that approach, the arrangement of the installation refers directly to the performance. Closer to this was the durational work of Raegan Truax *Exchange* (2012), which involved

...breath as a material to provoke an intimate encounter between performer and spectator. In the performance, I offer passersby a deflated balloon to blow up. I then take the balloon from the spectator and inhale their breath into my body. I exhale our combined breath onto one of the shards of glass in the installation and place the balloon on the floor. (Truax, n.d.)

Sound was “created simultaneously with the live performance by sound artist Derek Phillips. Phillips captured sounds of the body, the sculpture, and the space over the ten+ hour duration and played these sounds back into the performance space in the live moment” (Truax, 2018). The sound environment kept feeding the performance with traces of Truax’s breathing activity and movement in the space of the installation.

5.4.2 Setup

My intention in this setup was to share the ‘block’ of space in which I am performing. This was achieved by employing a temporal organization of the audience: they would at first observe the performance from the balcony above

the space for 45 minutes, then enter the space of the workshop for 15 minutes to experience the installation. The diagram below shows this intersection of the space of the performance with the space of the audience and the overall setup plan (Figure 5.24). In terms of sound, the addition to the previous version was a quad-like system for combining processing channels and for using panning to enhance the immersion of the audience. Two speakers were placed on the balcony area and two right below in the space of the performance, paired with the two speakers in front of the working area. In moving between performance and installation, I was switching between the two speakers on the balcony (performance) and the two speakers in the workshop space (installation).

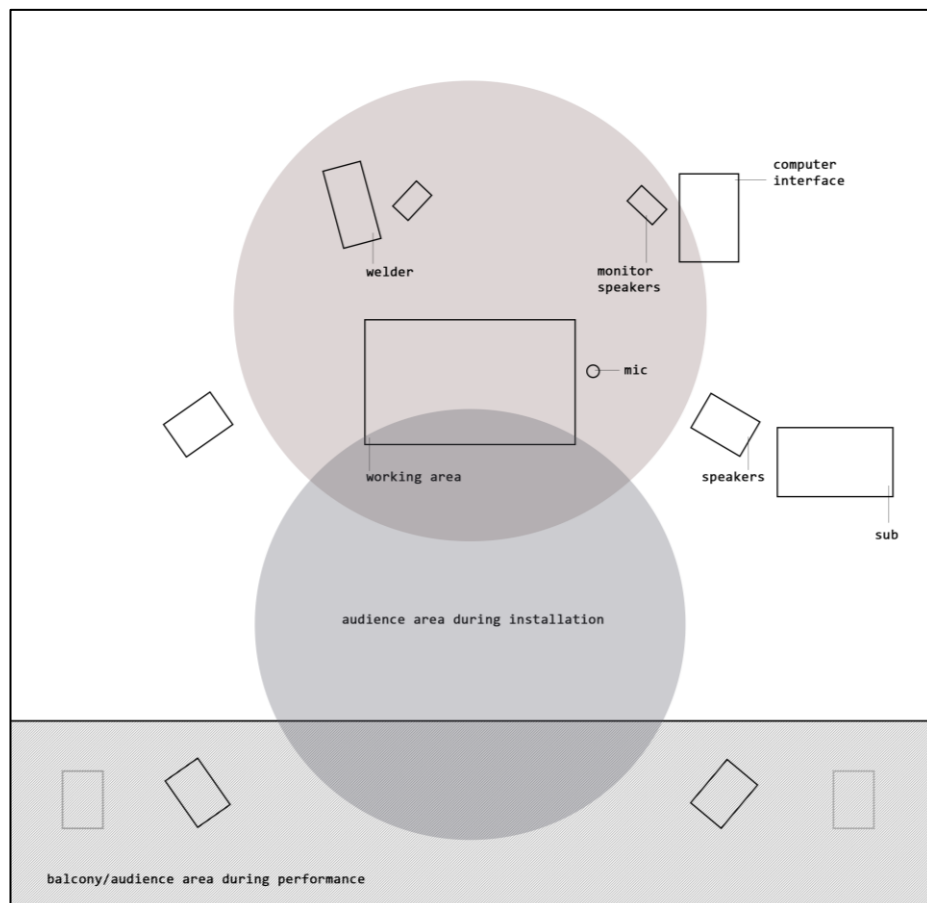


Figure 5.24. *Performing At*, plan of the performance setup, highlighting the merge of spaces between performer and audience

The software device *inputPlay 2.1* was enhanced with a graphic user interface, which allowed me to experiment during rehearsals with a range of buffer sizes (duration of delay and recording), while monitoring more precisely the function

of the device via a waveform display (Figure 5.25; Appendix 1, p. 30; Appendix 2, Folder '5.1 Interfaces' files 65-69). The controller used in the previous version of the work was replaced by adjusting sound directly from the computer that provided me with a full view of parameters in every device. Sound processing used the same devices and effects as in the previous version 'For' with an addition of *Transient Designer 1.01* by David Braun (2013), but this time it was driven closer to materials and their manipulation, emphasizing on the specific texture of sound produced by physical actions on materials such as in Giannini's *Inner Out* and in Applebaum's *Echolalia*. As the compositional decision was to make the processed sound become gradually more distant from the sound of the working each hour of the performance, the live set involved three channels of audio processing ranging from sounds directly related to the original source of the sound to more distant ones. Using the live set of the previous day as starting point created a link between the different days of the performance, while allowing the generation of a series of variations that depend on my actions, the interactive relationships and the traces of the process. The sound environment of the installation involved a playback of the processed sounds of the live performance mixed together and layered in a form of a piece of 15 minutes.

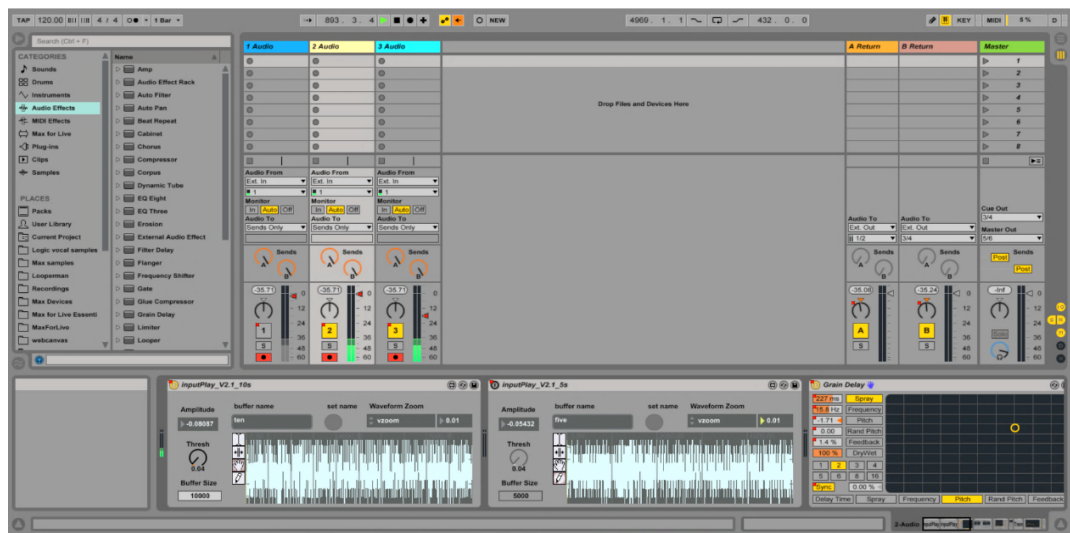


Figure 5.25. Ableton Live set for *Performing At*, showing the multiple *inputPlay* devices automated in each of the sound processing channels

I looked at the parts of co-composition individually: working separately on movement for achieving the meditative state and awareness of my body and

actions within the process, while thinking about the visual-sculptural outcome. The sound processing arrangement and the sensitivity of the software devices were rehearsed separately in the music studio and were later merged with the rest of the elements inside the space of the workshop. Rehearsing toward a meditative state for creating a relationship with the object and the processes of making enabled me to think about my actions as both the performer and an observer, and with constant reference to my grasp of the environment of the performance (Figure 5.26; Appendix 2, Folder '5.4 Process-Procedure 'At" file 86). To eliminate any 'theatrical' or percussive manner of handling the object during the performance, I realized sessions of 15 minutes focusing on the body-movement-object relationships without interacting with sound. It was important to slow down the process and think about the next stage through the qualities of the developing object and my actions as response to that: to perform informed by the current state of the developing object, the workshop environment and the tools. Documenting the rehearsal and observing my movement in the space of the workshop in relation to the changing object allowed me to perform more sculpturally by limiting the percussive manner of handling the object to specific actions for the physical material manipulation and not for interacting with sound processing.



Figure 5.26. Rehearsing toward a meditative state inside the workshop. Still from video

It was not then about the physical endurance that was attached to duration in the performances of Poppe and Charalampopoulos, but about being immersed by the interactions, the space of the workshop and the materials. The awareness of my presence within the co-compositional environment, and the way this could affect the interactive setup, aimed at answering the question: how is each moment related to the entire duration? In bringing all aspects of co-composition together, I realized a series of rehearsals in the workshop space. I found that the success in co-composing was attached to the way the sound environment was informing my response to the actions of manipulating the physical material, which at the same time triggered the processing of the sound environment, and vice versa.

5.4.3 Performance

Each hour of the performance started with the same number of steel sheets cut in rectangular shapes, which varied in size. As in the previous version 'For', I used a both additive and subtractive manner of working with steel. Carving and folding were added to the working process that enabled a faster and more substantial yet traceable transformation of the object. The improvisational manner of making concerned in this version all aspects of co-composition: sculpture, sound and actions (Appendix 1, pp. 69-82; Appendix 2, Folder '5.4 Process-Procedure 'At'' files 87-89). During the performance, I was moving between the working bench and the computer for adjusting processing parameters and the sensitivity of the interactive devices. Listening guided making as I was changing the sound processing according to what I was listening, handling and seeing. This introduced a two-way feedback during the performance. I kept focusing on my awareness of each of the elements of co-composition together with my grasp of the space, the interactive process and my actions. Such physical aspect to liveness was essential for the performance; to be aware of the whole and of each individual element together was the condition of my performing. Returning to the previously discussed aesthetic of effort, the particularity of physical making required managing bodily effort in relation to fumes and UV light from welding and the heavy equipment that I was wearing in ways that would make the

performance viable. Along the nine hours over three days of performing, co-compositional interactions kept changing based on my active response to the simultaneous transitions across materials.

Sculptural objects were thought of in a fluid manner, on-going and changing directly informed by the processed sound environment (Figures 5.27 and 5.28). This time, I was not only concerned about the visual outcome, but also about gravity: how do objects stand, and how does this contribute to the three-dimensionality that results from handling and rotating throughout the performance? Regarding objects in this manner, offered a range of possibilities for the developing relationships with the rest of the interactive process. Having similar starting point each hour enabled focusing on the transformation of the object as an endless state rather than one final outcome and a fixed geometry. Placing sculptural objects in the space of the workshop influenced the way the performance was experienced both by myself and the audience: it allowed a reflection on previous decisions and co-compositional relationships. Acting as traces of the process, the objects provided with multiple temporal levels (Appendix 1, pp. 83-95).



Figure 5.27. *Performing At*, September 2018, Day 3 Hour 2: sculptures during the performance, approximate dimensions of each 40 x 35 x 25cm. Photographed by Jack Walker



Figure 5.28. *Performing At*, September 2018, Day 3 Hour 3. Photographed by Jack Walker

There was a similar take on the way sound processing was developing (Appendix 2, Folder ‘5.4 Process-Procedure ‘At’ files 90-96 and Subfolder 97). The semi-scripted live set operated as the starting pieces of steel, which set a first relationship between the modalities. The delayed sounds kept reminding me of the previous state of the object, while I was looking at the current one. Their transformation directed my thinking toward the future potential of the object. Being immersed by all elements as an overall state, contributed in performing in-between the modalities, manipulating then not only the physical and sonic material but also the spaces in-between. It was a constant effort of adjusting the qualities of both material types in order for the one to speak through the other. Appearance and disappearance were what highlighted the interdependence of these transformations. Co-composition was therefore triggered from the activity of *seeking a form*, and not an outcome, what Celia Lury mentioned: “from process of forms to forms of process”⁵³.

⁵³ Personal notes from the keynote ‘Composing methods: on the limits of problem spaces in a time of rendition by Celia Lury, Director of Centre for Interdisciplinary Methodologies, Warwick University, during sIREN Conference 2017: Arts and Digital Practices held at Edinburgh College of Art, Scotland, 30-31 May 2017 (sIREN University of Edinburgh, 2017a).

The above discussed adjustments regarding the structure of interactions and the constant awareness of the whole and the individual elements, achieved an ‘alignment’ between the roles of actions, sculpture and sound (Figure 5.29). An alignment not in the linear sense, but in terms of considering each of the elements equally significant to co-composing.

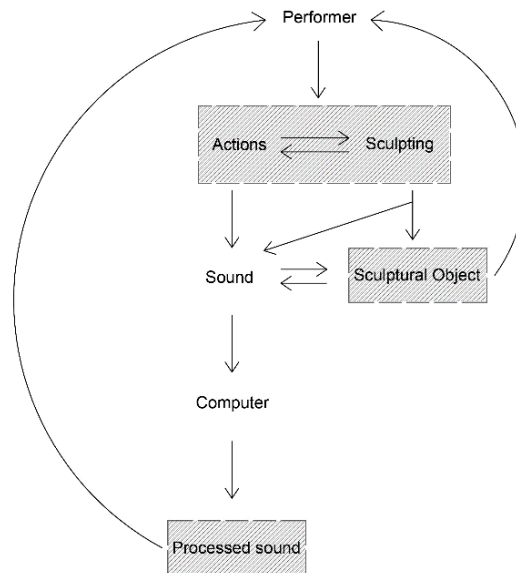
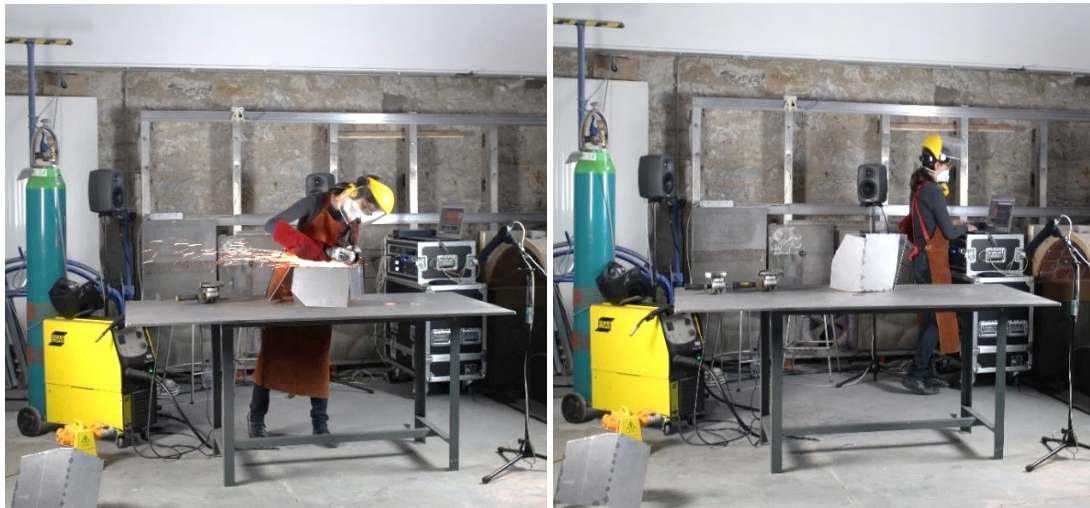


Figure 5.29. Alignment of the levels of interaction of co-composition

It is through material “presence and its reproducibility” (Søchting, 2017) that one is able to navigate through the two modalities and to achieve transitions across them. Such reproducibility did not concern here solely a repetition of something as in Morris’ *Box*, but a stream of interactions. From the audience’s perspective (Appendix 1, pp. 96-100), the observation and experience of the multiple and continuous transformations brought a drift between decisions being made, contesting the choices being acted, while experiencing the changing sounds and actions (Figures 5.30 and 5.31). The processed sound was characterized by some as “invisible sculpting” which, created an interdependent situation between the two modalities:

It was sometimes easy to see the relationships between the sounds produced by your tools and the sounds produced by the loudspeakers. However, the mapping between acoustic and electronic sound material varied significantly throughout single performances, and again throughout multiple iterations of the piece. Furthermore, the impact of the tools on the sound environment seemed to change according to how you interacted with the software on your computer. (quote from interviewee)



Figures 5.30 & 5.31. *Performing At*, September 2018, Day 1 Hour 3: sculpting (left) and adjusting sound processing (right). Photographed by Jack Walker

This came to contrast the sound environment during the previous versions, which was more independent to the rest of the co-compositional elements:

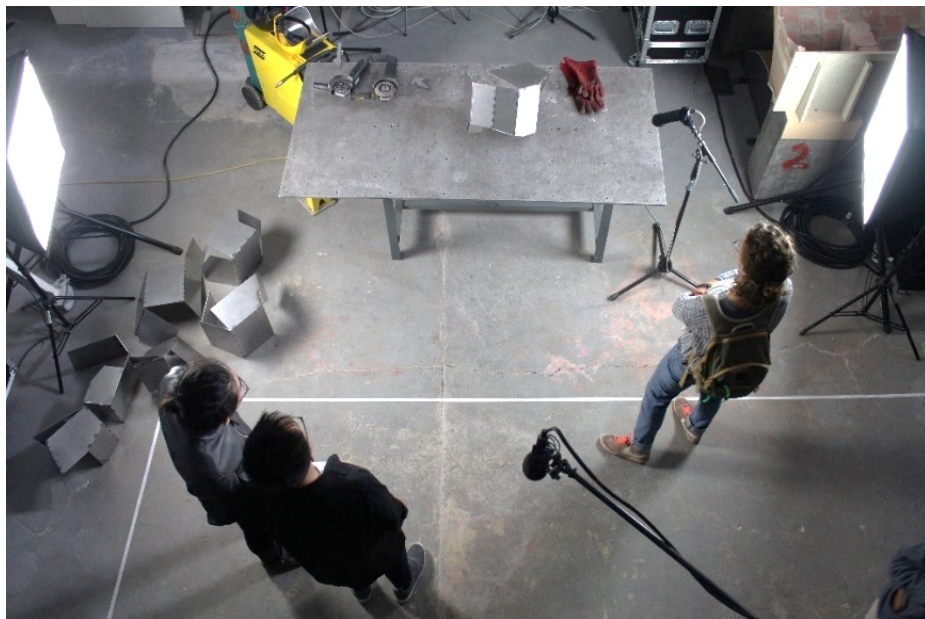
...not sure whether it was the sound of the movement, which was triggering the system...I was wondering whether the processed sound was live generated responding to the sculpture... Atmospheric, spatial sounds. The object was sharp, square and made from steel, very industrial, raw-looking object. (quotes from interviewees)

The more self-referent approach to sound processing in *Performing 'At'* version was successful as it brought the work closer to the material qualities of steel and the performed actions beyond a 'satisfying' outcome, which rather provided with an awareness of the interactive process to both myself, as performer, and the audience.

5.4.4 Installation

Following the 45 minutes of performance during each hour of the work, I was leaving the workshop space, while the audience was invited to descend from the balcony area to the workshop space in order to experience the installation. This intended to give a different view of the co-compositional process and allow the audience members to become more immersed by the objects, the sound environment and the space of the performance. It introduced a temporal organization of the audience experience. An invigilator was leading the audience

inside the workshop in a designated area next to the working bench. The sculptural objects were placed on the ground and on the bench, while the processed sound environment was coming out of a quad-like system (Figures 5.32 and 5.33).



Figures 5.32 & 5.33. *Performing At*, September 2018, views from installation.
Photographed by Jack Walker

The sound processing was different during the installation in terms of time and quantity. It layered temporal levels of the interactive relationships and the synchronous material transformation by reproducing and rearranging the co-

compositional interactions realized during the performance. Time during the installation was then different than during the performance – 45 minutes were presented as 15 – which provided with an accumulation of actions through sound enabling a dense view of the process. Within this installation setup audience experience involved a closer contact with the iterations of the interactions across material developed during the performance. The previously-made objects presented together with the just-made one that was left on the working bench at the end of each hour, expressed a longer manifestation of the temporal level of co-composing than during the performance, while sound *“felt quite ambient and environmental at this point, and seemed more like a thumbnail sketch of the preceding performance”* (quote from interviewee). Following a series of interviews with audience members, they stressed that being in the workshop space enhanced their experience of *“both material and immaterial elements by seeing/hearing- and the whole process which was magnified by the processed soundscape”* (quote from interviewee). Some audience members were also interacting with the objects by touching or approaching them very closely.

The combination of performance and installation provided with two ways of experiencing co-composition that were complementary to each other: the performance time for experiencing the co-compositional relationships as they were evolving, and the installation time for encountering the generated material traces. This expanded the work in terms of scale, variation and multiplicity by showing the potential of co-composition in simultaneously experienced spatiotemporal levels through “equating the immediate past with the onrushing future” (Bishop-Stall and Zayne Bussey, 2013).

5.5 Meta-state

The performative process of co-composition demonstrated the potential of interaction and interdependence between the two modalities beyond limitations of analogies and the translation of the one modality to the other or a mono-directional interpretation or response to material. *What Process/Procedure*

generated were not only the performance itself and the products of the process (the sculptural objects, the sounds and the actions), but a co-compositional thinking that continued after the live performance (Figure 5.34).

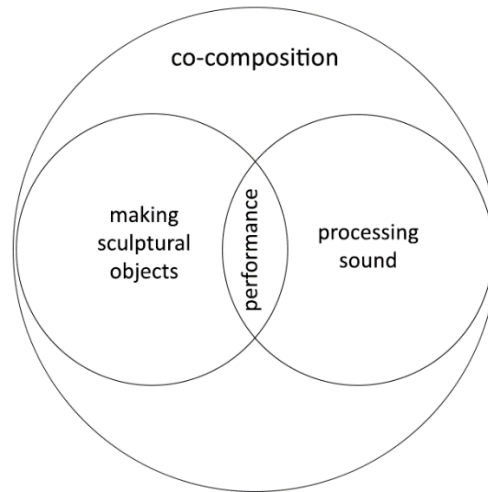


Figure 5.34. Diagram of co-compositional intersections

Traces of co-composing were experienced during the installation of the last performance as an encounter with the materials in a meta-state of co-composition. The multiple 'products' were then a property and a consequence of co-composition and could be further developed as a way for expanding the performance, but also on their own. So, how is this different than working in a more traditional manner? In what way are the relationships formed during the performance apparent in the products themselves? Are they completed when the performance ends or can they be used post-performance independently, as separate artworks or as starting points for developing a new piece?

In reflecting on individual elements based on the documentation of the performances, I found that listening to the processed sounds alone, without having video documentation or the original sounds of the making for reference, they seemed to depend on an action-feedback situation. The installation sound environment could be considered as more autonomous, however still referent to the performance. Concerning the objects, the cube developed in the first version seemed independent to the process, whereas the unfinished objects from the

second and third versions showed the time and traces of the process, which brought them closer to the actions of the performance. The interdependent state of the modalities makes most sense in terms of co-composition when these are presented together in relation to each other. Individually, each outcome brings with it a 'combined material history', which makes it different from something that has been produced in a traditional manner and a single medium. This brings the work beyond hybrid forms, as it is not operating as a single form, rather as means for creating spaces of interaction and transition. *Process/Procedure 'At'* achieved such relationships by combining the different temporal levels during performance and installation.

Documentation was considered as a representation of certain aspects of the event, which is not entirely able to communicate the sensorial experience of the live situation of co-composition as Phelan suggested, but could articulate the structure and the decisions made during the live work. The liveness of the performance could be revisited by members of the audience through documented material that would activate their memory (Phelan discussed by Lycouris, 2000). The specific choice of filming the performance from multiple views had as aim to capture footage from various angles (front/back/bird-eye/side) to give a spatial sense of the workshop space in relation to the actions performed, and to encompass the space, the multiple layers of activity and the three-dimensionality of the unfolding objects. As an attempt of documenting sound in a way directly related to the live performance, recordings were mixed in a 5.1 surround format for creating a listening experience similar to this in the workshop space: the central speaker is used for the sounds of working, while the other four (L, R, Ls, Rs) for the processed sounds imitating the quad speaker setup (Appendix 2, Folder '5.4 Process-Procedure 'At'' Subfolder 97).

Presenting the traces of the process through video edits for activating elements of the performance, while focusing on actions applied to the physical material through the sonic response (Appendix 2, Folder '5.2 Process-Procedure 'With'' file 75). Slow shutter photos by Sam Cornwell highlighted the traces of energies

and materials in the space of the performance (Appendix 1, pp. 59-60). Thermal imaging showed the transformation of the sculptural objects and the sound by focusing on more detailed aspects of the performance such as material properties and the energy behind actions (Appendix 1, pp. 43-44). LiDAR 3D scans were realized for documenting movement, traces of physical material transformation and the space of the performance (Appendix 2, Folder '5.4 Process-Procedure 'At'' Subfolder '3D scan', files 98-108). Such record of traces of co-composition are considered as sketches of documentation, which could be developed into future projects.

Future development of my research will explore the exhibition of the sculptures and the sounds as a post-artwork installation, alternative listening experiences of the performance recordings highlighting the spatial arrangement and the interactive process, as well as further edited footage of the performance expanding on the multilayered situation and temporal levels of the work.

Chapter 6

Afterword

6. Afterword

In pursuing the combination of the modalities of sculpture and sound within a solo creative process, an alternative, novel way of thinking was required throughout the research. This was achieved through a reflection on existing ideas adjacent to the notion of co-composition such as spatio-temporal couplings and analogies, for developing alternative ways of working with sculptural and sonic material that overcame existing ones. The highly practical approach to co-composition contributed to the underpinning of the research challenges. It became necessary to distance my work from predefined forms, representation and meta-processes, notation and analogies by focusing on a temporal, performative and process-driven mode of looking and listening, making and thinking. In this way, this research involved accessing knowledge of different artistic disciplines through the structure of co-composition. To meet this challenge, I worked with processes of sculpture making and sound and their mediation through concepts, performative tools and technologies to promote the critical engagement and understanding of co-composition. The methodology employed involved merging existing frameworks, methods and ways of thinking from sculptural and sound practices and theories. Unfolding as the research progressed, this ongoing dialogue between practice and theory supported a new contextual area for co-composition and laid the foundations in thinking through this specific creative process. Throughout this research, I have worked with a range of disciplinary, interdisciplinary, analytical, practice-based methods and theoretical concepts, which centre on connections of visual, spatial/sculptural dimensions and sound, as well as notions drawing from minimalist traditions. The complexity of co-composition generated multiple and challenging directions along the research path.

6.1 Review of outcomes

At the first stages of the research, I sought to develop compositional analogies between sculpture and sound by considering the one as the starting point for the

generation of the other. In attempting to navigate and create a fusion of these two modalities in Chapter 2, I began to explore the visual and spatial qualities and structure of sculptural objects in relation to sonic material through ideas of calculation, proportionality and seriality using methods of visual representation: graphic notation, staff notation and drawing/graphic representation (*Sounding Stile*). In mapping qualities across the two modalities, I pursued interpretations and transitions from the one to the other. At that early point, the *paradox* of balance and dominance between the two modalities became clear; working toward specific outcomes in sculpture introduced problematics in controlling the sound outcome and vice versa. I began to question the re-interpretation of material qualities that was introduced by the meta-processes and served the formation of analogies. Being concerned with developing sculptural objects, I shifted toward ideas of regularity/irregularity in terms of shape, while distancing from serial and proportional thinking by setting more flexible rules for notation (*Sides*). To go beyond analogies and graphic representation, the following stage was to look at co-composition from a temporal perspective through actions. This was realized by notating sounds using musical staves in an improvised manner inside the workshop during the making process (*Actions in sound*). I found that notation reflected my actions of manipulating material and their qualities through rhythmic patterns used in the score. This practical exploration brought both modalities at a synchronous state of 'making' along with a direct response to the sculptural process through sound.

In Chapter 3, I considered listening as a central aspect of the co-compositional inquiry and explored the process of making sculpture by listening to the source of the sound for achieving an understanding of sculptural material manipulation through sound. The physical and sonic material of sculpture making were examined through Chion's notion of "ergo-audition" and an alternative interpretation of Smalley's ideas of spectromorphology (*Sculptural Spectrograms*). I untangled the actions of my sculpture making process according to the sounds produced by revisiting them as structural functions of the process informed by ideas of repetition, causality/efficacy and reproducibility. This

involved a consideration of sound as trace of the sculptural actions (*Of Blocks*) and promoted a way of thinking about sculpture through its material qualities and not only its visual form. Approaching sculpture through actions and the sounds produced directed the research toward a more performative interaction with sound, physical material and time. This formed a way to think about the two modalities not as separated elements within a whole, but as one *thing* through the interactions developed. It provided an understanding of sculptural practice through the sounds produced by tools and physical material manipulation and at the same time, of the relationship between such sounds and actions.

In Chapter 4, I brought together process-driven sculptural practices, performance art and sound performances that use physical material and objects by employing the notion of action as a commonplace. I worked with sound processing for manipulating the recordings from the sculptural actions with an aim to distance them from their sources. This was realized in a twofold manner: from a sculptural-visual approach by drawing filters in the shape of the sculptural objects in a visual-based sound processing method, and from a sound perspective driven mainly by material qualities away from any visual reference to sculptural objects. *Digital interactions* created an interplay between digital and physical through actions; this involved the development of a digital interface for co-composition in which three-dimensional digital and sonic material were concurrently, manipulated and transformed through the mediation of 3D animation and sound synthesis. I revisited ideas of calculation to inform such spatial-sonic couplings. By introducing a framework of an aesthetic of effort, I sought to readdress ideas of process by bringing back physical material manipulation into the articulation of co-composition. By replacing the sounds of making with processed ones in an excerpt of video documentation from the workshop, *Marble sounds* explored how sound can affect the experience of the process of sculpture making and thus co-composition. At that point, a decision to perform became central to my practice. Both *Digital interactions* and *Marble sounds* functioned as models for developing a live performance environment for co-composition using technological mediation as means to achieve a real-time

interaction between the two modalities. To fulfill this purpose, I looked at liveness and discussed the temporal levels of co-composition informed by interactivity, performance art and sound practices and theories. I argued that co-composition exists in the *here* and *now* and that only this temporal state of liveness can bring together all elements under one situation. Following this, I started investigating potential live setups.

Chapter 5 brought together the previous explorations and highlighted the real-time, performative manifestation of co-composition through *Process/Procedure*, the final work of this research. *Process/Procedure* was explored in terms of audience experience, duration and multiple levels of time through three versions. These have been developing in complexity for over a year. Based on ideas of liveness and interactivity, I developed an interface in the form of a responsive feedback system that enabled interdependent and live relationships between materials and actions. The multi-layered and multi-sensory situation of co-composition was structured in the first version (*With*) as a semi-scripted performance and enacted the interdependence and synchronous manipulation of both types of material. It employed a predefined shape in the sculptural object – this of the cube, which determined the performance duration and part of the interactions. The second version (*For*) went beyond the fixed shape and made clear that co-composition concerns a durational situation. Elements of improvisation specific to this inquiry were introduced, which brought the two modalities at the same level of interaction in terms of material transformation. The performance produced an unfinished, open sculpture and explored heavier sound processing by taking distance from the original sounds of the making. The third version (*At*) expanded the durational performance by inhabiting the space of the workshop and presenting the work as a fusion of performance and installation. In engaging with the idea of continuity, it demonstrated variations of co-compositional processes, as well as the multiple objects and temporal levels by sharing time between performance and installation, and bringing the audience inside the space of the performance. Redirecting the focus of the work to the notion of self-reference, this version eliminated the *paradox* between the two

modalities by making each decision on actions, physical material and sound directly referent and relevant to each other.

Below, a diagram highlights the above-discussed interweaving relationships between theory and practice, as well as the shifts that this research involved by mentioning concepts and their relationships progressing together with the practical explorations (chronologically 1-11) (Figures 6.1 and 6.2).

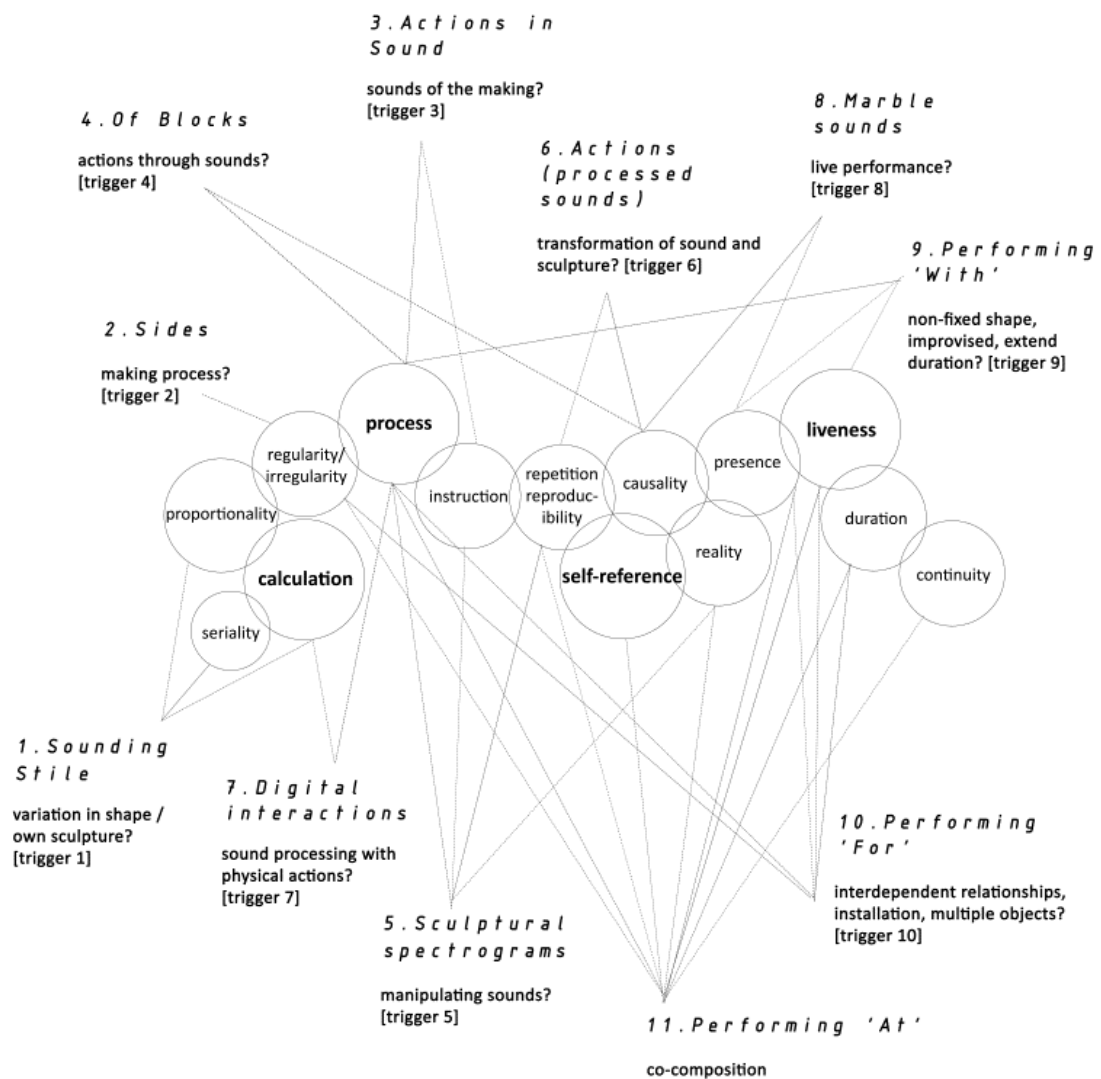


Figure 6.1. Research focus diagram, between theory and practice

<p>1. Sounding Stile Andre's sculpture to graphic notation to music notation to sound</p> <p>Theory of minimalism: calculation, proportionality, seriality</p> <p>Context minimalist sculpture graphic notation object notation serial composition</p> <p>Trigger 1 variation in shape / own sculpture?</p>	<p>2. Sides own sculpture to graphic notation to improvised music notation, variation in shape and music</p> <p>Theory of minimalism: object, regularity/irregularity, variation</p> <p>Context minimalist sculpture graphic notation object notation</p> <p>Trigger 2 making process?</p>	<p>3. Actions in Sound in workshop: music notation during making</p> <p>Theory of minimalism: process instructions</p> <p>Context minimalist sculpture process art verbal notation</p> <p>Trigger 3 sounds of the making?</p>	<p>4. Of Blocks sounds of making: actions-object-sound via 3D models, frequency script</p> <p>Theory of minimalism: repetition, reproducibility, presence sound studies/theory: causality/efficacy</p> <p>Context process art 3D & sound sound texture field recording</p> <p>Trigger 4 actions through sounds?</p>
<p>5. Sculptural spectrograms material process, actions-sounds-patterns, action-material through sound, spectrograms as instructions for sculpture making</p> <p>Theory of minimalism: instructions, process, calculation spectromorphology</p> <p>Context verbal scores instruction-based art list</p> <p>Trigger 5 manipulating sounds?</p>	<p>6. Actions (processed sounds) time-stretching, filtering, cross-synthesis, sound sequences</p> <p>Theory process</p> <p>Context process art visual notation/spectra actions to notation sound practices</p> <p>Trigger 6 synchronours transformation of sound and sculpture?</p>	<p>7. Digital interactions 3D object mapped to sound synthesis, simultaneous transformation based on actions</p> <p>Theory process/processual of minimalism: calculation</p> <p>Context process art isinstructions digital art audiovisual</p> <p>Trigger 7 processing with physical actions?</p>	<p>8. Marble sounds processed sound in the workshop, replacing the sounds of the making</p> <p>Theory physical actions: <i>an aesthetic of effort</i></p> <p>Context process art performance art sound performance with objects</p> <p>Trigger 8 live performance?</p>
<p>9. Performing 'With' live performance of sculpture making & processed sound (15 minutes): cube, semi-scripted processing</p> <p>Theory performance liveness interactivity feedback/response, experience</p> <p>Context performance art sound performance with materials/objects interactivity texture sound</p> <p>Trigger 9 non-fixed shape, improvised, extend duration?</p>	<p>10. Performing 'For' live performance of sculpture making & processed sound (3 hours): improvised object, controller, low-frequency processing</p> <p>Theory of minimalism & performance: self-reference, durational, continuity</p> <p>Context performance art (durational) live art sound performance texture & ambient sound</p> <p>Trigger 10 interdependent relationships, installation, multiple objects?</p>	<p>11. Performing 'At' live performance-installation of co-composition (9 hours): multiple improvised objects, improvised processing via computer, variation, interdependent control of relationships, simultaneous transformation of both material, multiple temporal levels, on-going</p> <p>Theory of minimalism: self-reference, presence, continuity, reproducibility</p> <p>Context performance art (durational) sound installation sound performance texture sound</p> <p>Co-composition</p>	

Figure 6.2. Research focus diagram details

6.2 Reflections

Over the journey of this research, co-composition has been sought through analogies, mapping, technological mediation and performing. It has been sound-driven, notation-driven, sculpture-driven, process-driven, performance-driven and approached from multiple angles within the different perspectives (Repko, Szostak and Buchberger, 2017). Also, outward (audience observation), inward (as maker) being analytical and reflexive. The qualitative feedback of the audience provided additional insight about the understanding of co-composition and contributed to the way the performances were structured and further developed. Through a fundamental change in the way I think about and approach sculpture and sound, I have achieved a body of work that reflects a new, interdependent way of thinking about the two modalities. This key transition point in my work involved: a) moving beyond the initial ideas of analogies between the two modalities; b) changing the way of working in relation to audience experience: from working in private and then exhibiting the work to performing live in public; c) approaching sculpture through physical material qualities and ideas of process beyond a solely visual-spatial understanding; d) distancing sound practice from Western music syntax to sounds focusing on spectral texture within environments of sound installation and performance with computer. Skills including electronic and digital music technology and performance techniques, were further developed to meet the challenges and particularities of each shift.

Co-composition is not only something that is used as a creative process by the artist, but also a mode of thinking and experiencing. It is about creating performative situations of a physical-sonic experience that centre on layered levels of time and synchronous material transformation. Moving beyond established relationships between sculpture/three-dimensional objects and sound, I have suggested a direction to co-compose in a temporal, responsive, live manner. Co-composition takes a fluid state, which demands multi-layered effort in order to be formed and developed. It is not material specific in the sense that

using a different material, the thinking behind co-composition would not change – it is the traces, actions and decisions behind this joint manipulation that matter.

Following an extensive review of relevant practices and theories across sculpture, sound and performance, co-composition itself and the specific approach of navigating between and across the different modalities, which has been proposed and completed during this research, is underexplored. Works such as Oscar Wiggli's used a common compositional thinking across sculptures and sound pieces, yet not in a synchronous and live manner. Sound performances with physical material and objects such as Giannini's *Inner Out* that involved a live and synchronous manipulation of both types of material in a solo environment focused on the sound outcome without being concerned with a sculptural thinking regarding physical material transformation. Other collective approaches such as in the work of Test Dept, Hespos, B-Team, Pope, Truax and Applebaum that are highly related to the final work of this research, did not concern a solo and self-reflective situation upon which co-composition is based. Translations and interpretations of the one modality to the other, and 3D animation combined with sound generation ignore physical material aspects and an embodied experience of *making*, which were core to this inquiry. The research demonstrated that a 'translation' of sculpture to sound and vice versa limits the creative process and leads it toward a state of analogies ignoring aspects of the material itself. The self-referential take on co-composition enabled me to challenge and move beyond the above by engaging with ideas of actions, ephemerality and multiple levels of time.

6.3 Contribution

This research has provided the means to develop a new framework by integrating elements of different strands of thinking, making and performing. The co-compositional inquiry undertaken brought together theoretical and methodological work from both sculptural and sound practices and traditions; it merged concepts and working methods, which contributed to forming a specific

area of exploration by bridging gaps across sculptural, sonic, performative, audiovisual and hybrid forms. Leading the inquiry by practice and in a solo situation engraved novel paths not only about the two modalities, but in terms of new knowledge that emerged at their combination and crossings, at the spaces 'in-between'. I find that the most original contribution of this thesis is the co-compositional thinking that is an outcome of the dialogue between theory and practice; a methodology that provided ways for achieving this type of joint and synchronous composition by transitioning across the individual elements and traditions. This research expanded both sculptural and sound practices in ways that generated new insight about temporality through relationships of material and immaterial aspects of the work. It developed novel methods for controlling complex relationships in a solo and multi-modal environment.

The methods and approach of this research resulted in developing new processes and compositional thinking. Performance and technological mediation have brought together the question of this research. This achieved an expansion of co-composition through performance: multiple outputs from performing and a post-artwork state. Those multiple aspects and elements of co-composition have created spaces for future research branches across areas including sculpture, sound art, installation, performance art and interactive design. A 'two-way' and interdependent response to making contributes insights of value to both sculptural and sound practices: a) it enabled treating sculpture in a manner that is temporal, performable and directly informed by the sounds produced and the processed sounds; b) it used sculptural practice to form a new approach toward a material-driven aesthetic in sound performance and production; c) it provided a novel understanding of the relationships between the two modalities, which took a range of forms throughout the research: mediated, interactive and interdependent. This research looked beyond hybrid or dual forms of art as it explored and provided with ways and spaces for transition between and across the different types of material. The work of this research provided the audience with what Reilley Bishop-Stall and Natalie Zayne Bussey referred to as an "ideologically impossible view of spatial and temporal simultaneity" (Bishop-

Stall and Zayne Bussey, 2013). The traces of such synchronous material state are imprinted and revisited through sound by creating new types of relationships between material-immaterial, ephemeral and fixed (object).

Throughout the research it has been a challenge to control the multiple elements and perspectives of co-composition. It has been very tempting to deviate and explore potential areas that branched out from this process both practical and theoretical, as well as to disguise this co-compositional inquiry with external concepts. In my effort to maintain clarity in the process of the research and its articulation, I followed the role of self-reference in minimalism not only in my practice but also throughout the writing of this thesis to direct the *flow* of the questions addressed toward co-composition. In the following part, I mention potential developments and future directions that emerged as ideas during the final stages of this research.

6.4 Further research and practice

Future developments of the research completed will deepen the exploration initiated in *Process/Procedure*, the final practical work realized in this research, which opens up new ways for artistic inquiry beyond the scope of this research. Co-composition has formed additional spaces for exploration, and future branches of research are derived from its individual elements. There is further potential to apply this way of thinking to both sculptural and sound practices, to work with 'augmenting' physical material with sensor technologies within the co-compositional context established by this research, as well as to involve more complex interactive design and machine learning algorithms, physical sound modeling techniques connected to physical material properties as they are being manipulated, to explore spatial sound and acoustic properties for this type of performative work.

Another venue for research will be to explore the idea of co-composition and its aesthetic in the form of installation art both as a medium in itself and by

introducing aspects of site-specificity and audience participation; to investigate how such a process could be choreographed and co-created; and from a theoretical viewpoint, to examine how co-compositional thinking and material traces could reflect upon and contribute to notions within the newly established area of the philosophy of memory (Bernecker and Michaelian, 2017).

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