Dissertation

Wandering Recurrence: Openness and Identity through Spatialization

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vorgelegt von

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Abstract (Deutsch)

Dieses Projekt befasst sich mit der Gestaltung musikalischer Situationen, die Kontingenz zulassen, aber dennoch Kohärenz bewahren. Komponisten haben versucht, unbestimmte Situationen zu schaffen, indem sie offene Notationen verwenden, die iterativ unterschiedliche Ergebnisse in jeder Aufführung erzeugen. Ein zentrale These dieser Arbeit ist, dass kontingente Situationen stattdessen erreicht werden können, indem mehrere Aktivitäten gleichzeitig an verschiedenen Positionen im Raum lokalisiert werden. Räumlichkeit ist in der heutigen Musikpraxis ein allgegenwärtiges Thema. Was diesen Ansatz auszeichnet, ist die Betonung der Beziehung von Form und Raum. Dieses Projekt zielt darauf ab, durch die Positionierung von Schallquellen ein facettenreiches und offenes musikalisches Werk zu schaffen. Es untersucht die Kontingenz eines lokalisierten Materials durch die Entwicklung einer Reihe von Kompositionsstrategien. Der Begriff eines offenen Musikwerks impliziert die Frage nach der Handlungsfähigkeit (*Agency)* des Materials und ihren Auswirkungen auf die Handlungsfähigkeit der Komponist*in. Als künstlerisches Forschungsprojekt zielt diese Arbeit auch darauf ab, mögliche Formen künstlerischen Wissens zu artikulieren und eine Formulierung experimenteller Praxis zu entwickeln.

Das Projekt wird mithilfe von drei Hauptmethoden durchgeführt: Erstens werden Kompositionsstrategien in einer Reihe von Fallstudien entwickelt und modelliert, die von einem im Rahmen des Projekts entwickelten Räumlichkeitsmodell unterstützt werden. Zweitens setzt das Projekt musikwissenschaftliche Forschungsmethoden ein und untersucht den zeitgenössischen kompositorischen Kontext und ihre Konzepte von Raum, Offenheit und Form. Drittens werden die Fallstudien in Verbindung mit Formulierungen der Konzepte von Raum, Offenheit, Form, Komponist*in und Experiment analysiert. Die Hauptergebnisse dieses Projekts sind vier Kompositionsstrategien und vier neue Musikwerke, von denen eines ein vom Südwestrundfunk in Auftrag gegebenes Orchesterstück ist, sowie die Rekonzeptualisierung besagter Konzepte.

Die im Projekt entwickelte Offenheit ist das Ergebnis der Begegnung verschiedener Schichten von Aktivitäten und Materialien im Raum, die von der Hörer*in während der Aufführung interpretiert werden können. Diese Praxis der

Abstract (Deutsch)

Offenheit schlägt eine nicht hierarchische Beziehung zwischen Komponist*in und Material vor, die eine feministische Neuformulierung der Figur der Komponist*in sowie des Begriffs des Experiments als kritische Praxis impliziert.

Abstract (English)

This thesis deals with creating musical situations that allow for contingency but still retain coherence. Composers have sought to create indeterminate situations by using open notations that iteratively create different results in each performance. A central claim of this thesis is that contingent situations can instead be achieved by simultaneously localizing multiple activities in different positions in space. Spatialization in today's musical practices is a ubiquitous topic. What makes this approach different is an emphasis on the relation between form and space. This investigation aims to create a multifaceted and open musical work through the disposition of sound sources. It explores the contingency of a localized material by developing a series of compositional strategies. The notion of an open musical work implies the question of the agency of the material and its repercussions for the agency of the composer. As an artistic research project, this thesis also aims to articulate possible forms of artistic knowledge and develops a formulation of experimental practice.

The project is conducted using three principal methods: Firstly, there is the development and modeling of compositional strategies in a series of case studies assisted by a spatialization model developed as part of the project. Secondly, the project employs musicological research methods and studies the contemporary compositional context and their concepts of space, openness, and form. Thirdly, the case studies are analyzed in conjunction with formulations of the concepts of space, openness, form, composer, and experiment. The main results of this project are four compositional strategies and four new musical works, one of which is an orchestra piece commissioned by the SWR (Südwestrundfunk), as well as the reconceptualization of said concepts.

The kind of openness developed in the project is the product of the encounter of different layers of activities and materials localized in space, which is open to be interpreted by the listener during the performance. This practice of embracing openness proposes a non-hierarchical relation between composer and material, which implies a feminist reformulation of the figure of the composer, as well as of the notion of experiment as a critical practice.

Acknowledgments

During this research project, during this wandering, I was fortunately not alone. Different persons helped me along the way. I want to thank first of all Christa Brüstle without her advice, support, feedback and inspiring comments this project would not have been possible. Furthermore, I want to thank my advisers Margaret Schedel for her encouraging conversations and comments and Clemens Gadenstätter and Federico Celestini for their feedback, questions, and advice. Of great inspiration were my conversations with Gerhard Eckel about space and perception, that motivated me to redirect this project at a moment when it needed it the most. An essential part of this project were the composition of the orchestra pieces, I want to thank Björn Gottstein for trusting me not only once but twice with the commission of two orchestra pieces for the Donaueschingen festival, and the SWR orchestra and its musicians for their professionalism and their willingness to experiment with sound in space. I want to thank the Doktoratsschule for its support, which was essential in the realization of this process. Moreover, I want to thank my colleagues in the doctoral program, for their conversations, camaraderie, and openness in sharing their own fascinating projects. I thank Kiko for our walks and for discovering new spaces during a time in which we all need to keep sane. I want to thank my parents for their unconditional support. Most of all, I want to thank Luc Döbereiner for *mitsein*.

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> Avant, il n’y avait rien, ou presque rien; après, il n’y a pas grand-chose, quelques signes, mais qui suffisent pour qu’il y ait un haut et un bas, un commencement et une fin, une droite et une gauche, un recto et un verso. (Georges Perec)[1]

> C’est comme si le son avait une vie propre qu’il faut respecter. Ce qui m’intéresse, c’est l’impondérable, ce qu’on ne peut pas mesurer, ce qu’on ne peut pas théoriser. C’est pour cela qu’il est très difficile d’en parler. (Éliane Radigue)[2]

1 “from top to bottom. Before, there was nothing, or almost nothing; afterwards, there isn’t much, a few signs, but which are enough for there to be a top and a bottom, a beginning and an end, a right and a left, a recto and a verso.” Georges Perec, *Espèces d’espaces*, Collection L’Espace Critique ([Paris] (32, rue du Fer-à-Moulin): Editions Galilée, 1974). trans. John Sturrock, Penguin Classics (London: Penguin Books, 2008), p.18.

2 “It’s as if the sound had an autonomous life which must be respected. What interests me is the unforeseen, that which cannot be measured, that which cannot be theorised. This is why it’s very difficult to speak about it.” Éliane Radigue, *Intermediary Spaces/Espaces Intermédiaires*, ed. Julia Eckhardt, Engl. trans. Eleanor Ivory Weber (Brussels: Q-02 Umland, 2020). p. 45.

1. Introduction

Sound is not only a temporal but also a spatial phenomenon. It happens in a specific place. It is transformed by the place in which it happens and in turn transforms that place and our perception of it. Sound situates us in space and through listening we can localize and embody our position in a place. In addition, sounds in our everyday life are contingent. They appear unexpectedly, and we as listeners do not have control over them. The photo of the plaza in the figure below lets us imagine how our aural perception while sitting in the busy terrace on the right bottom corner of the photo would differ from the calmer terrace close to the fountain in the upper left of the photo. Even if envisage and visualize are both visual metaphors, one can hear the auditive experience of being seated on the bank or of walking through the plaza with the “mind’s ear”. We can imagine the listening experience in the different positions and in relation to the different sounds, the conversations, the sounds of pigeons and sparrows, steps, the reverberation of sound off the walls of buildings and floor, cars on the nearby streets, the eventual ringing of the church’s bell, maybe the leaves of the trees, the water of the fountain, the sound from the windows and balconies, etc. Although our experience in searching patterns in random behaviors will teach us that these sounds could be expected in a public square, they are not guaranteed. All of these possible sounds are contingent. They may or may not happen, in one order or another, but also simultaneously. Their repercussions on us depend on our physical distance to their sources, but also on our perceived emotional involvement and closeness in relation to these events. Some sounds only occur under certain given conditions; the bell sounds maybe only occur on Sundays, while in winter the terraces and windows are closed. Unexpected things may happen as well; a plane, the irruption of a large group of people, a demonstration, the silence and emptiness of a lock-down. There are ongoing multiple experiences and perspectives of the square and its events, as many as persons and animals that pass it. Each will have a different lived experience of it, depending on their activities, their position, movements, and relation with the plaza.

1. Introduction

Figure 1.1: Plaça de la Virreina, Barrio de Gràcia, Barcelona. "Plaça de la Virreina" by Javier Cuchí Burgos is licensed with CC BY-NC-SA 2.0. To view a copy of this license, visit https://creativecommons.org/licenses/by-nc-sa/2.0/

Space and contingency are part of our everyday listening experience. The sounds of our daily experience are open for us to be codified and apprehended. Our localized hearing contributes to how we sense and relate to our surroundings and their contingent events. It defines and creates spaces and compartmentalizations. It causes comfort or discomfort and is part of our embodied perception of a certain environment. Ultimately, our situated auditory experience contributes to our understanding and consequent behavior in daily life. Our reaction to and involvement with unexpected situations depends on our distance to them. Similarly, the understanding and perception of a musical event depends on our particular spatial position in relation to it. In my

compositional work, I seek to enhance these differences of possible aesthetic experiences. I aim to create an open plaza that one can apprehend in active listening.

1.1. Research Object

Given that our position in relation to sound sources affects our perception and comprehension of the musical work, I want to investigate the aesthetic potential in relation to openness of the use of space in composition. Therefore, this project investigates the possibility of creating an ambiguous open musical work by offering multiple understandings through the positioning of sound sources in space, that is by activating various locations at once. In other words, I explore the possibility of opening form through space. The goal is an ambiguous and open musical work that offers a multiplicity of understandings and perceptions that depend on the location of the listener. Openness is thus not solely the product of a semantic interpretation by the listener, but also the result of the spatial relations of a contingent material.

However, the openness that I seek in this project is also autonomous, that is, it is not solely the product of the interpretation by a listener in a certain position. Our understanding of the contingent events of the plaza depends on our position and interpretation, still they are autonomous in their emergence and relations. In the same way, openness in my practice is the result of the contingent relations of localized materials. These relations are at the same time independent of listeners but open to be interpreted by them. Hence, the goal is to achieve an autonomous openness, by means of approaches that use localization of sound sources and allow for the agency of the material. The research object and the development of these approaches are investigated in a series of compositions, one of which is the main project, a piece for orchestra. In summary, the object of this investigation is to create a multifaceted and open musical work through the disposition of sound sources and the contingency of a localized material, and to develop the compositional strategies and conceptions that enable the creation of such a work.

1.2. Research Questions

The main question of this project is how to achieve a situation that is open, but still retains coherence through the use of space. In other words, how can compositional strategies and approaches involving space, material, and the localization of sound sources achieve such an openness? Moreover, is it possible to achieve this situation in the composition process or is openness only possible with the involvement of the musicians or listeners during the performance? There have been different conceptions of openness and space in composition which have resulted in diverse aesthetic outcomes. Against the background of these conceptions and in connection with current formulations of contingency, how does this project conceive of openness? What does contingency mean in the second decade of the 21st century, in the current context of ecological, economic, and health crises, and how can contingency be expressed in art? Moreover, what is the definition of space in the context of this investigation? Is it conceived of geometrically, as relative to the observant, or as relative to the actions that happen in it? What is its relation to contingency? In this context, what does coherence stand for? What is the nature of musical form in this conceptual and practical constellation? Is it still relevant to discuss the question of form? How do these different concepts relate to each other?

An open situation implies contingent events and unexpected things that escape rational necessity, that is, which – in the case of composition – escape the composer's control. Therefore, what are the consequences for the composer and their[3] agency to engage with openness in composition? Related to this question, there is the inquiry concerning the contingency of the material: How can a compositional practice foster the contingency of the material? How does the material's influence on the creation of the piece affect the agency of the composer? Since this project aims to create multiple perceptions and understandings of the same musical event, subsequent questions arise related to the aesthetic object and its perception. What are the causes of these different perceptions? Are they the result of an ambiguous multifaceted musical event or do they

3 In order to ensure a gender-neutral language, I use the singular "they" and its derivative forms "their", "them", "themselves", to refer to an unspecified third singular person. This singular use of "they" was recognized in the 17th edition of the Chicago Manual of Style, published in 2017.

rather reside in the perception of the listeners, or both? How does the position of the listener in space influence or enhance these multiple perceptions and understandings? Regarding a multifaceted, musical event, what is its aesthetic result? How can the aesthetic experience of this musical event unfold? What is the role of the listener in an ambiguous event? Can we think of an aesthetic experience that goes beyond the semiotic and semantic understanding of the listener?

The main goal of any research project is to produce new knowledge or to uncover new aspects of an already known phenomenon. In this sense, questions arise concerning the discussion of artistic research. What kind of knowledge is produced in artistic research? What form of knowledge is produced in this project? How is this project conducted as artistic research? A research project is realized according to specific methods in which experimentation can be involved. What are the methods of this project? How is experimentation conceived in the compositional practice? Can the compositional experiment be related to the experiment in the sciences or does it have its particular specificity? How can space and localization of sound sources be included in an experimental practice? What are the consequences of an experimental practice?

Some of these questions were present at the beginning of this research project and constitute the first stimulus, others only became apparent during the investigation and have guided the research project and sharpened its objectives and methods. This dissertation is a recount of the process of how these questions emerged and were addressed in the compositional work.

1.3. Other Positions and Relevance of the Project

In today's artistic practice the topic of space is ubiquitous. Spatialization, immersive spaces, ambisonics, and sound diffusion techniques, site-specificity or social aspects of space, are topics and ideas present in contemporary sound art and composition. Space in relation to openness has been present in musical composition since the 1960s and 1970s in the experiments with the disposition and movements of musicians or the spatialization of sounds in electronic music. In these experiments, space was a way of structuring and opening the musical form or a means to offer different experiences for

the listener. In the current musical context, the question of space in regard to openness can be roughly outlined in terms of two main approaches. One approach is constituted by experiences that seek to enhance different perceptions of the listener by means of the localization of sound sources. Some examples of this conception are *Fama* (2005) by Beat Furrer or *Chroma* (2003-2019) by Rebecca Sanders, which hark back to the late pieces of Luigi Nono, in particular *Prometeo*. A second understanding of space in relation to openness comprises experiences of sound art and composition that research the idiosyncrasies of specific sites and places and their influence and agency on the musical result. This conception also includes experiences that engage with collectives and their concrete places.

Furthermore, when discussing the question of openness in music, there are also two main conceptions that come to mind. On the one hand, there is the idea of openness as taking place in the composition process, which is understood as the use of chance and probabilities. On the other hand, there are those experiences that understand openness as the participation of other agents in the creation of the piece. In the latter case, contingency is either due to the performer's decisions regarding open scores or improvisation or due to the listeners' influence, which is exercised in terms of specific movements, adding their sound to the result or as their semantic interpretation of the musical work.

However, there is also a third contemporary understanding of contingency, which is related to sound material. Openness, in this case, is the result of the emergence of an unexpected material or material behavior. This is, for example, the case with compositional approaches dealing with parametric decoupling, in which the interaction of the different layers of sound production create unexpected sound results or with experiences that explore the performer's physicality, in which the sound result is the product of the corporeal energy of the musician's actions.

It is this third approach that resonates with my practice in the sense that openness in my compositional work is also the product of a contingent material. Yet, this contingency is not the product of decoupling but rather of the interaction of the different layers of a network of behaviors localized in space. As a composer, I am

interested in creating musical situations that allow for multiple readings and possible meanings. The type of situations I seek differs from the conception of form as an unequivocal translation of a composer's vision into music. This multifaceted work also diverges from a logical-necessary form, whose agency resides only with the composer. However, it also goes beyond a mere juxtaposition of unrelated elements. In contrast, I try to achieve ambiguous situations that do not impose a fixed meaning – a composer's absolute vision – but that rather offer multiple possible experiences stemming from the object itself. Likewise, I am fascinated by the relation between sound and location and with how our position in a specific place – with distinct acoustics and characteristics – and with reference to a sound source affects our listening, and in turn, our understanding of this sound. I am interested in the aesthetic possibilities of the use of space and in exploring its role in the creation of an ambiguous musical event.

There are two main aspects that I concentrate on in order to create this multifaceted musical situation, openness through localization of sound sources and through networks of behaviors. I create generative systems and networks of behaviors localized in space that, in the interaction of their different layers and due to their different placements, give rise to a kaleidoscopic open situation. In this way, openness is not the product of chance or probabilities, or of open scores, but it is rather the product of the relations that the different sound materials establish in space. Moreover, materials create virtual spaces as a result of the different degrees to which they are related. In this way, the material is not only spatial and open by being localized in the acoustic performance space, but also in the network of relations that they form. This ambiguous situation is still open for the listener to be understood in multiple ways, openness in my practice does not solely rely on the interpretation of the listener, since the contingent interactions of materials in space and in the space of musical relations that they create contribute to the openness of the experience.

Although the situations I am interested in are open, they concomitantly retain their identity, that is, they are open but remain recognizable as the same in each performance. Coherence, identity, or necessity is thus not achieved by externally giving form and signification but rather by means of *family resemblances* and relations that the

different materials resulting from the network of behaviors create among each other. The openness of the musical work is the result of the relations of the different behaviors, and, dialectically, these same relations are the source of its identity. The different layers of behaviors generate the contingent material and at the same time each layer potentially constitutes the common characteristics that relate the different resultant materials. Similarly, space in my practice has a dialectical character. The localization of sound sources promotes and enhances the ambiguity and multiplicity of perspectives and understandings of the musical work. However, it is the specific localization of the listeners in relation to the sound sources which aids their particular understanding. Form is multifaceted and at the same time particular to each listener. Form is thus not imposed but rather emerges in the composition process and in the perception of the piece in space.

There are several aspects that can be mentioned as relevant to this research project. Firstly, there is the development of a notion of openness in compositional practice. Openness is understood as contingency rather than chance or probability and it has its origins in the relations that the materials localized in space establish among themselves. This understanding of openness also goes beyond semiotic and semantic conceptions, since contingency is a characteristic of the musical work and does not rely exclusively on the understanding of the addressee.

Another important contribution is the understanding of space as a musical parameter of sound. Localization of sound sources is not done after the composition, but it is rather part of and guides the compositional process. By relating the different material behaviors in different localizations, the spatial dimension is inherent to the sound material. In this way, the dimensions of time and space are related in my practice. Moreover, the localization of sound sources is a means of enhancing the potential difference of experiences and understandings.

A significant outcome of an experimental practice directed towards openness is that it poses a different relation of composer and material. Hence, this project explores the possibility of a composer who, together with the material, co-creates a new situation that emerges in experimentation rather than imposing a form or idea onto the material.

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In this project, I connect the composer who emerges from the experimental practice with new formulations of subjectivity from feminist theory.

In addition, my practice proposes a formulation of the experiment in composition, which is characterized by its practical engagement with sound material. I regard the contribution of this concept of experimental practice and its relation to openness to the general discussion on artistic research as a relevant outcome of this project.

Another significant result is the series of new pieces created as part of this project. The pieces are *displaced* (2020) for chamber orchestra, *Parallax* (2019-2020) for symphonic orchestra, *MTRAK* מטרקא for fixed media (2018), *Dérive* (2017) for string quartet and live electronics and *ins Offene* (2012-2013, reworked in 2018) for ten instruments and live electronics. They represent the aesthetic outcome of this research project.

And finally, on the level of my own compositional work, this project has constituted an important stage that has broadened my compositional practice and thinking. I have developed techniques and concepts and composed a series of pieces that I would not have achieved without the experimentation and inquiry of this project. Thanks to this project, I developed my critical thinking with regard to not only the artistic context and compositional ideas in which my practice is embedded, but also concerning my own work and concepts. Furthermore, I have developed skills and techniques to describe and analyze my compositions and thinking in terms that can be shared with others. Experimentation, investigation, and reflection have permeated my compositional process and improved my critical thinking, and have now become an indissoluble feature of my practice.

1.4. Objectives

The objectives of this project can be summarized in terms of four main aims:

1. **Developments of compositional strategies and approaches that research the contingent potential of sound material through the localization of sound**

sources. This objective refers to the development of tools, software, systems, and compositional strategies that assist the research. Since this project understands composition as experimentation, the developments of the approaches is the compositional practice itself. Although some aspects of the strategies were tested in the course of the composition of the pieces, the strategies and systems were developed as part of the composition of the series of pieces created during this project and not prior to them. Each piece signifies a different aspect of investigating and understanding the research question. In this way, the pieces, rather than being a progression towards a preexisting goal, are the means to research an unknown outcome. In addition, the strategies and systems are critically evaluated with regard to their context in contemporary compositional practice.

2. **Rethinking and development of the concepts of openness, space, form, and subject in relation to my compositional practice.** This investigation raises questions in the practice that involves these four main concepts. Techniques, strategies and practices that open musical form through space are influenced by how the terms of openness, space and form are understood. Moreover, openness in my artistic practice implies a relation of interaction between subject and object. In turn, the understanding of these terms have an effect on the aesthetic result of the practice. Therefore it is essential to explore, contextualize, and develop formulations of the terms of openness, space, form, and subject in accordance with my compositional practice.

3. **Experimentation – composition of a series of pieces.** This project understands composition as an experimental practice. Hence, the experiments of this investigation as well their results are the pieces generated during and in relation to it. The main experiment is the work for symphonic orchestra *Parallax* commissioned by the SÜDWESTRUNDFUNK for the Donaueschinger Musiktage.

4. **Study of the epistemological status of compositional practice and the way a compositional practice can be a form of research.** The project aims to

articulate how compositional practice may generate specifically artistic knowledge and develops a formulation of experimental practice and its characterization as a form of critique.

1.5. Structure of the Dissertation

This dissertation carries out the description of the compositional practice and its results as well as the musicological research that aids the composition. Including this introduction, it is structured into five parts; 1) Introduction 2) Methodology, 3) Context, 4) Concepts, Strategies and Case Studies, and 5) Conclusion.

Chapter 2. *Methodology* is dedicated to the way in which this investigation has been conducted as an artistic research project. First, I discuss my position towards artistic research in general, and characterize relevant epistemological aspects of music. Later, I describe how this project can be characterized as artistic research, the knowledge that it generates, and how this knowledge is presented in this investigation. Afterwards, I delineate the phases and methods of the investigation to achieve its objectives. In the section *Experimentation,* I expound my formulation of the experiment in composition with reference to notions of the scientific experiment. This section also contains the introduction to the compositional strategies and the spatialization software model that have been developed and used in this project. Finally, the chapter ends with a few considerations on how experimentation can constitute a critique both of compositional practice and of the hegemony of language-based knowledge.

Chapter 3. *Context* recounts the musicological investigation of this project. In this chapter, I contextualize my practice with regard to other approaches that employ space. This chapter is a survey of what I regard as the main approaches regarding space and it portrays a representative selection of pieces and composers from a number of relevant different tendencies. Since this project is an artistic research project centered on compositional practice, this section does not intend to exhaustively describe the entire musicological research that aided this practice. It rather serves as a way to signal the points of contact and divergence of my work with its context. Moreover, in referring to my own compositional work, the context is circumscribed in space and

time to the Western (post)avant-garde since the second half of the 20th century, with particular emphasis on the 21st century. Essential to this chapter is the evaluation and discussion of the different approaches and examples of the context in relation to the research question and goals. In this way, I search for influences and differences between my practice and its context. The last section of this chapter is a conclusion that outlines the context and the response of my practice to it.

In chapter 4. *Concepts – Compositional Strategies – Case Studies*, is the core of this dissertation. It recounts the compositional strategies developed during the practice, as well as the concepts resultant from my work – openness, space, form, and subject. These concepts are contextualized, formulated, and evaluated with regard to my compositions. The strategies are put in relation to the four main concepts of the project. I characterize and describe the different strategies, and exemplify each with one case study. The case studies are three pieces developed in this project, *Parallax* (2019-2020) for symphonic orchestra, *displaced* (2020) for chamber orchestra, and *MTRAK (*מטרקא*)* (2018) for fixed media, and *ins Offene* (2012-2013, reworked in 2018) for ten instruments and live electronics. Instead of discussing *Dérive* (2017) for string quartet and live electronics as a case study, I chose to exemplify the strategy of space with *ins Offene*, which was composed before beginning this project although it was reworked in 2018. Yet, *ins Offene* initiated my spatial thinking and interest in open situations. Moreover, I regard *ins Offene* as a more distinct example of my strategy of localization of sound sources. The chapter is organized as follows: Each of the four sections starts with the contextualization and formulation of a concept and continues with the description of the compositional strategy associated with it. Finally, I characterize and evaluate the strategy with reference to a case study. The grouping of concepts, strategies, and case studies is the following:

- Openness – Form through *Family Resemblances* – Case study *displaced*.
- Space – Form created by localization of sound sources. Space inherent to the material – Case study *ins Offene*.
- Form – Form created by spatialization of sound parameters – Case study *Parallax*.

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- Subjectivity and Identity – Form through the use of generative systems – Case study *MTRAK (מטרקא).*

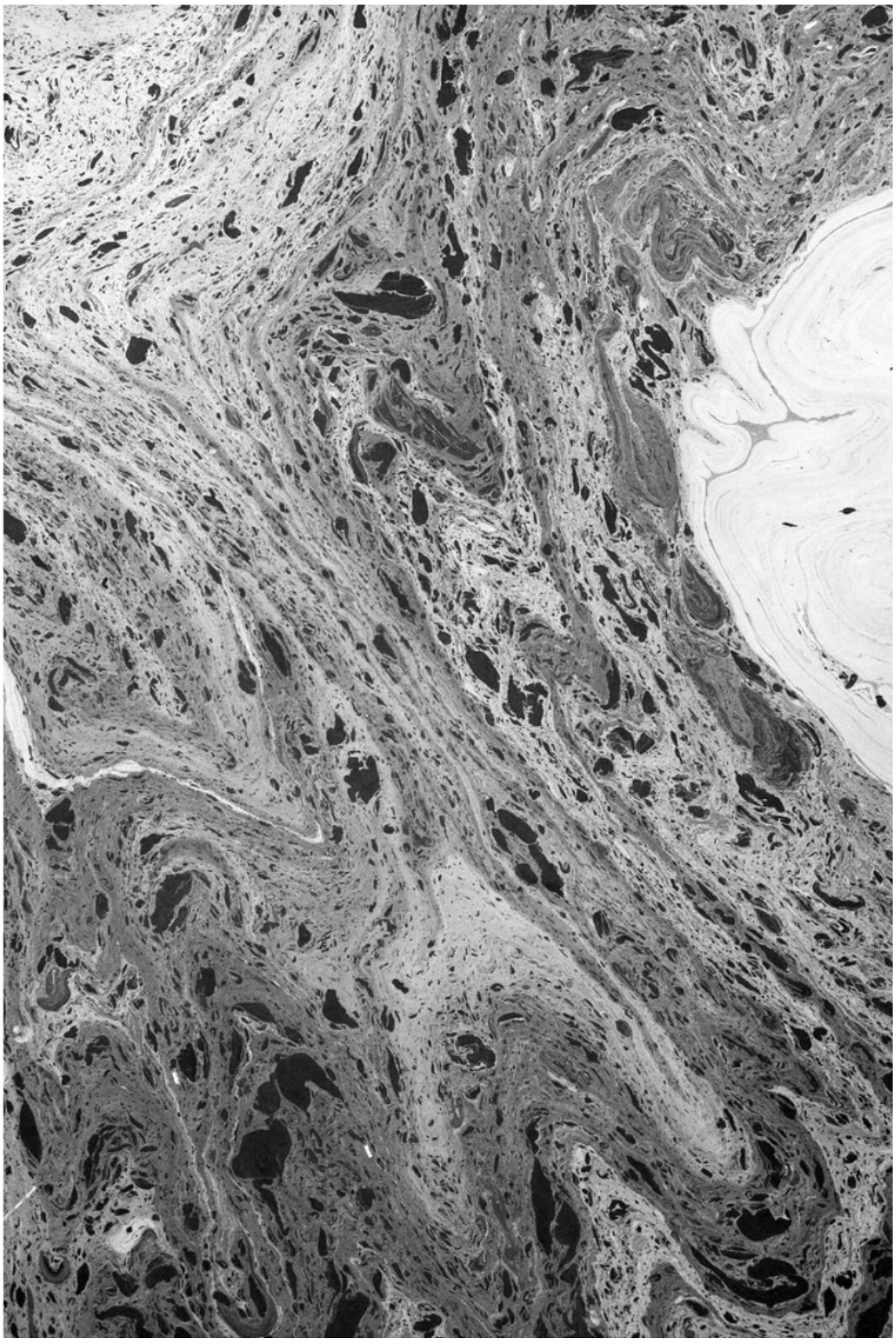
Chapter 4 ends with a summary of the formulations and strategies and their significance in the current compositional context.

Finally, chapter 5. *Conclusion* contains a summary of the results achieved in this project and identifies its contributions and relevance, as well as its influence in my own practice. In addition, some of the experiments in this project pose new questions open to be explored in the future. I end this dissertation by addressing possible aspects of the research object worth of further investigation.

The online repository of this dissertation includes the scores, as well as the stereo and ambisonics recordings of the case studies, which constitute part of the results of the investigation and its documentation. The online repository can be found at: https://www.researchcatalogue.net/view/1228054/1228025.

The online documentation of the spatialization software model developed in this project can be found at: https://github.com/lularomero/spatialization-model.

Illustration 1: "Oil on water (4)" by [Topguy] is licensed with CC BY-NC-SA 2.0.



2. Methodology

> In creating this indeterminate situation I began to feel that the sounds were not concerned with my ideas of symmetry and design, that they wanted to sing of other things. They wanted to live, and I was stifling them. It is not a question of controlled or a decontrolled methodology. In both cases, it is a methodology. Something is being made. And to make something is to constrain it.
>
> I have found no answer to this dilemma. [...] There is an old proverb: “Man makes plans, God laughs.” The composer makes plans, music laughs. (Morton Feldman)

2.1. Introduction

This chapter is dedicated to the description of the way in which this project was conducted. I also engage with the broader discussion of artistic knowledge and aim to contribute to this larger discourse with my formulation of artistic experimentation. In section 2.2. *Artistic Research* I outline my understanding of an epistemology of music as it pertains to this project and delineate the characteristics that make this project an artistic research project. I also describe the different types of knowledge generated in this investigation. The third section, *Methods* recounts the different tools used in the project, their relations and their sequence in time. 2.4. *Experimentation* relates the notion of the compositional experiment with current formulations of scientific experimentation and describes my conception and practice of experimentation in composition. This section also deals with the introduction of the compositional strategies conceived and employed in this project and to which chapter 4 is devoted. 2.4.2. *Spatialization Model in SuperCollider* describes the software spatialization model developed in this project, which was an important tool for the compositional process of the case study *Parallax*. The role of the model as a tool for composition and

documentation, as well as the experiments conducted with it are discussed in this section. Finally, in the last section 2.4.3 I describe how a compositional practice oriented towards experimentation and openness may constitute a critique of the practice itself.

2.2. Artistic Research

The notion of artistic research implies the production of knowledge. The literature about artistic research[4] distinguishes at least three possible different modes of knowledge generated in artistic research that concern this dissertation: A technical knowledge proper to the medium – such as musical notation, but also composition techniques –, an embodied knowledge – those skills that are embodied in musical practice, such as the fingerings on wind instrument, movements on the piano, placing the voice *into the mask*, or hearing harmonies and frequencies –, and finally, the knowledge produced by the experience of art itself, which is an aesthetic knowledge. This dissertation is engaged most directly with the first and the last mode of knowledge, but also with embodied experiences of listening and being in space. In the experience of the work an embodied knowledge of listening and space is researched and deepened. While the written dissertation constitutes a form of propositional knowledge and discusses the techniques developed in my practice and my intentions in developing them, the compositional work produced in this research project is at the same time the research method and the result. While the compositional practice constitutes the experiment, the experience of the musical work is its artistic knowledge. In what follows, I characterize the nature of knowledge specific to art and produced in

4 Henk Borgdorff, "Wo stehen wir in der künstlerischen Forschung?," in *Kunst und Forschung / Art and research*, ed. Janet Ritterman, Gerald Bast, and Jürgen Mittelstraß (Vienna: Springer Vienna, 2011): 29–79. See also Marcel Cobussen, "The Trojan Horse. Epistemological Explorations Concerning Practice Based Research.," *Dutch Journal of Music Theory* 12, no. 1 (2007): 18–33; Kathrin Busch, "Artistic Research and the Poetics of Knowledge," *Art&Research: A Journal of Ideas, Contexts and Methods 2*, no. 2 (2009): 1–7; Henk Borgdorff, *The Conflict of the Faculties: Perspectives on Artistic Research and Academia* (Amsterdam: Leiden University Press, 2012); Michael Biggs, Henrik Karlsson, and Riksbankens jubileumsfond, eds., *The Routledge Companion to Research in the Arts*, 1st ed. (New York: Routledge, 2010); and more recently Dieter Mersch et al., *Manifesto of Artistic Research: A Defense against Its Advocates*, 1. Auflage, Denkt Kunst (Zurich: Diaphanes, 2020).

the experience of art and describe this form of knowledge with regard to my compositional practice.

There are two dominant forms of conceiving of the epistemological character of art. One focuses on the relation between music and language and the other on the relation between music and truth.[5] It can be argued that art displays a specific form of knowledge different from language-based knowledge. This form of knowledge is more experiential and embodied, and it cannot be grasped by language, which deals with generalization rather than with difference and concreteness. Language reduces the particular to general statements, and in doing so it segregates and hides particular realities, i.e. that which does not fit the principle of identity. Artistic knowledge is based in practice (*poiesis*, creation) and it is manifested by showing or revealing.[6] Art is tied to perception, it reflects the perceivable through perception, and the experimental through experience, while language refers to the general in each particular entity. Nonetheless, artistic knowledge does not disregard or pretend to substitute the knowledge produced by language. Language represents a valuable tool to organize and create systems and in its generalization, it may unfold an artistically productive field of openness. This aspect is explored in poetry and compositional practice dealing with language as material. Moreover, language is an important means to reflect and encircle the notion of artistic research – as discussed when referring to the written part of this dissertation. Still, artistic knowledge proposes an alternative to language-based knowledge by showing experiences that escape discursive enclosure. Far from being a delusional belief in the ideology of "sound music" – as would be claimed by some postmodern advocates of conceptual and semantic referentiality – this approach is a conscious experimental practice, which focuses on the realm of sound and aims to generate another kind of knowledge different from the knowledge of – using Jacques Derrida's terminology – *phallogocentric* language, a knowledge of what is left over by language.[7]

5 Marcel Cobussen, "The Trojan Horse. Epistemological Explorations Concerning Practice Based Research.," *Dutch Journal of Music Theory* 12, no. 1 (2007): 18–33.

6 Dieter Mersch, *Epistemology of Aesthetics*, trans. Laura Radosh, Think Art (Zurich-Berlin: diaphanes, 2015).

2. Methodology

The relation between music and knowledge leads to the question of the relation between music and truth, and of the nature of this truth. There is a traditional concept of truth, proper to language: truth as a correspondence of concept and phenomenon. However, as Heidegger argues in "The Origin of the Work of Art," in order to build this correspondence between fact and concept, we first have to be aware of the existence of the fact itself.

> Truth means, today, as it has done for a long time, agreement of knowledge with the facts. In order, however, for knowledge, and for the sentence that forms and expresses it, to correspond to the facts it is necessary, first of all, that the fact which is to be binding on the sentence shows itself to be such. And how is it to show itself if it is unable to stand out of concealment (*Verborgenheit*), unable to stand in the unconcealed (*Unverborgenen*)? A statement is true by conforming to the unconcealed, i.e., to that which is true.[8]

The fact or phenomenon has to show itself first in order to be recognizable as such and give rise to part of a proposition that may create knowledge. In order to do so, the fact "has to stand forth out of concealedness; it has to stand in the unconcealed."[9] In order to be defined and identified, the phenomenon first needs to be revealed. For Heiddeger this revealing of what was hidden is central to a different understanding of truth, a truth different from the one delivered by language. The truth rendered by art is called *aletheia*. Art itself is not true but opens up a space of the unconcealed: "In the work of art, the truth of the being has set itself to work."[10] As the philosopher Marcel Cobussen puts it, art "opens a space in which concealedness itself can display itself, divulges a secret without encroaching it. […] It lets (en)closure be."[11] Composition does not imitate, show, or explain nature, it rather enacts a disclosure of being. Therefore, the experience of making art and of experiencing art gives us a sense of what cannot be generalized, of what escapes generalization and definition, of the particular. In this

7 See Marcel Cobussen, "The Trojan Horse. Epistemological Explorations Concerning Practice Based Research."

8 Martin Heidegger, "The Origin of the Work of Art," *Off the Beaten Track*. (Cambridge: Cambridge University Press, 2002): 1-56. p. 28.

9 Marcel Cobussen, "The Trojan Horse. Epistemological Explorations Concerning Practice Based Research," p. 24.

10 Martin Heidegger, "The Origin of the Work of Art," p. 16.

11 Marcel Cobussen "The Trojan Horse. Epistemological Explorations Concerning Practice Based Research.," p. 25.

sense, the knowledge created by art is beyond representation and reasoning and complements the knowledge created by the sciences. This experience is, as Heidegger characterized in *What is called thinking?*, receptive and active in the sense "*that* thinking, *qua* thinking, is essentially a call."[12]

The knowledge generated in my artistic research project is a form of artistic knowledge. It can thus only be discerned in the experience of the musical work generated as part of the project, whose goal is the opening of perception and understanding of a musical event through the use of space. Two of its presuppositions – perception and space – can only be apprehended in experience.[13] The results of this investigation rest on the experience of the musical practice. Even if the knowledge created by music is not to be conceived in terms of experiential unconcealment, the fact that my research question revolves around perception and space locates its results in the experience of the musical event.

The research question of this project revolves around the possibility of opening the understanding and experience of the musical event through space. Therefore, another central notion of this research project is openness.[14] An open understanding of an event is one that allows for multiple readings, meanings, and experiences. It stands against unequivocal definitions of an event or series of events. It promotes difference without the homogenization of language and without the violence of generalization done to concreteness. By the very nature of its research question – openness in the understanding and experience of the musical event through space – the artistic knowledge of this project resides in the experience of its results. It is therefore different from language-based knowledge and cannot be translated into language, it has to be experienced. In this sense, this artistic research project has to be evaluated on its own terms, that is within the context of artistic research.

12 Martin Heidegger, *What Is Called Thinking?*, trans. J. Glenn Gray (New York: Harper & Row, 1996). p. 161. Italic in original.

13 I mean a relativist and relational space which is a perceived phenomenon – see chapter 4.3 for more information about the concept of space in my practice. I am not referring to abstract space, such as geometrical space.

14 Discussion of my concept of openness and how it may be achieved in the composition process and in the experience of the work can be found in chapter 4.2.

2. Methodology

Besides the artistic knowledge produced in the practice and in the experience of the compositional work, this investigation also develops technical knowledge. A composition process guided by the research question develops technical know-how and tools to achieve an open result. In this project, the open experience of the sound result does not solely rest on the semiotic understanding of the listener or on the unexpected outcome of the experiment. If that were the case, my research project would not be different from any compositional practice with an experimental character. On the contrary, part of the result of this project is the development of strategies and systems that create an open musical event. The musical event produced in this practice is open due to its own contingency and offers its multiplicity to be understood by the listener. In this way, openness does not rely solely on the listener but also on the object itself, the musical work. This openness inherent to the object[15] emerges in the composition process not by using chance or probabilities, but by employing generative systems and compositional strategies related to space that were developed during this research project (see chapter 4). During the composition process, I conducted different tests to develop strategies and systems that open the experience and understanding of the piece. To facilitate the experimentation with spatial strategies, I have developed a spatialization software model (see 2.4.2). This model also constitutes an important technical epistemic outcome of this project. In addition, there was an investigation of instruments acoustics, psychoacoustics, and ambisonics, that assisted the development of the compositional strategies and the spatialization model. To summarize, the compositional process of my research project is an experimentation, in which a technical knowledge is developed and an artistic knowledge is revealed in experience.

Part of this research is also a musicological inquiry. The technical and aesthetic knowledge is compared and evaluated against its context. The musicological research includes the analysis and evaluation of other compositional practices that make use of space, searching for influences and differences. Concepts of space and strategies of spatialization and localization of sound sources in composition and sound art are researched and discussed in relation to my compositional practice. This musicological

15 For a discussion of the openness inherent to the object see 4.2.

research also includes the analysis, contextualization and further deepening of concepts and strategies that have been developed in my practice. The concepts of openness, space, form, and subject developed as part of this project and should not be understood as guidelines for compositional practice. They are rather products of the practice and they are further deepened and contextualized in the aesthetic and musicological research. Practice and the theoretical aspects of this project inform and influence each other. In this way, the musicological inquiry creates a framework for the development of strategies and thoughts for my artistic practice and serves as a place for reflection on the experiments and knowledge generated in the practice. Both modes are intimately intertwined and condition each other along the whole duration of the process.

The written dissertation contains the propositional knowledge of the investigation on the context and on artistic research, and the description of the technical knowledge of the strategies and the spatialization model, as well as the description of the research process. Furthermore, it constitutes an attempt to encircle the aesthetic experience of the musical work generated in the research project, which escapes language. The dissertation describes the research questions, the methods, the process, the experiments, the technical knowledge, and the context of the practice. It describes the intentions for the experiment, however, it cannot describe the experience itself. It can only circumvent the gap between the description of the practice and the experience of the musical event. Yet, I think it is essential to an artistic research project to thematize and explore this gap between experience and its symbolization.

In this dissertation about composition there is also a gap between the reflection on composition and its practice. Composition is a complex process that involves techniques, and thinking, but also intuition and sensing. Most of the compositional decisions are conscious, while others are unconscious embodied decisions which are not always possible to verbalize. During this research project, I have analyzed unconscious decisions in my practice in order to understand the reasoning of my decision-making. Although this knowledge would be of interest to other composers, some of the compositional decisions are not discussed in the dissertation, due to their resistance to objectivization. I try to circumvent this second gap between reflection and

my practice, through the formulations of the concepts of space, openness, form and subject (chapter 4). While stemming from my compositional practice, these concepts constitute a rationalization of it, and are an attempt to discuss the breach between reflection and practice.

Hence, this project creates knowledge different from language-based knowledge. It shows itself in its presentation and thereby enacts the possibility of its own aesthetic being. Art enacts a disclosure, it is not only "...showing the invisible, but rather showing the extent to which the invisibility of the visible is invisible."[16] Yet, most importantly, it makes present what was not yet present. Through practical engagement it creates a form of knowledge that is not a correct correspondence but an unconcealment in a form of an open-ended process, which is the artistic experiment.

In summary, this investigation can be characterized as an artistic research project that produces different modes of knowledge. It creates an experiential and embodied artistic knowledge in the experience and practice of the compositional work. Therefore the research object and the result of this project is the practice and experience of the musical work itself. This project also generates technical knowledge in the form of compositional strategies, systems, concepts, and tools that were developed during the project, which is described and discussed in this dissertation against the background of its compositional and aesthetic context. And finally, this project discusses questions of artistic research and its differences that contribute to the wider field.

16 Michel Foucault and Maurice Blanchot: *The Thought from Inside in Foucault / Blanchot*. New York, NY: Zone Books. (1997): 7-60. p. 55.

2.3. Research Phases and Methods

This project investigates the multiplicity of experiences through the use of space using a number of different tools in different phases of the project. These phases and methods influence each other and feed into each other's development. The practice informs the theoretical research, while elements found in the musicological investigation are later included in the experimentation and are researched in the practice. The methods are the following:

1) Development of strategies in compositional practice
2) Gathering and development of concepts on the basis of the practice
3) Gathering of information about psychoacoustics, instrumental acoustics, and ambisonics for the development of the spatialization model
4) Development of the spatialization model
5) Development of the strategies with the spatialization model
6) Contextual inquiry of compositional strategies and concepts
7) Evaluation of strategies and concepts in relation to the contextual inquiry
8) Readjustment of the strategies and concepts
9) Composition of the pieces
10) Performance of the pieces, conclusions and new readjustments
11) Reflection, description and evaluation of the process in the written dissertation

Development of strategies in compositional practice: It is the first impulse triggering the investigation. It involves the analysis of my previous works in search of key elements regarding space and openness. This first analysis brought me to conclusions about the possible strategies that I further experimented with in the composition of new works. In this experimentation phase, I developed the four compositional strategies that allow for the openness of form. The strategies are, *networks of family resemblance*s, *localization of sound sources, spatialization of parameters* and the *use of generative systems*.

Gathering and development of concepts from practice: In order to organize strategies to open the musical event through the use of space it was necessary to clarify

how the terms of openness, space, and form were conceived in my compositional practice. Later on in the process, I added the concept of subject to the list of concepts. Since openness in my practice means, among other things, to share the creation process with the material, it was necessary to evaluate how it was realized in practice and what this means for the conception of the subject-composer.

Gathering of information about psychoacoustics, instrumental acoustics, and ambisonics for the development of the spatialization model: For the development of the spatialization model I have conducted an investigation of the application of ambisonics in the computer music programming language *SuperCollider*. To deepen the development of the strategies, experiments, and model, I have studied literature on acoustics of musical instruments and on psychoacoustics.

Development of the spatialization model and tests of the strategies with the spatialization model: While researching strategies and concepts, the need for a method to experience the strategies in the performance became apparent. Since experimentation with multiple instruments in large spaces – as was originally conceived – is not always possible, a pragmatic and convenient solution was to develop a spatialization software model to emulate different spaces and the musicians' dispositions. The model simulates the auditive experience of a listener in a certain position in a hall in relation to the instruments. In this way, I can experience the same event from different positions and study the effect of the compositional strategies on the understanding of the event.[17]

Contextual inquiry of compositional strategies and concepts During the experimentation phase another study was conducted to relate my practice with its contexts, focusing on contemporary composition and sound art practices that deal specifically with space. The main focus of this investigation has been the spatial strategies used in these practices, the concepts of space immanent to them, and their aesthetic results. At the same time, I conducted an investigation of the concepts of openness, space, form and subject, in order to reformulate these concepts in accordance with my own compositional practice. The next step is the Evaluation of strategies and concepts in relation to the contextual inquiry which relates and evaluates my practice

17 See description and discussion of the model in 2.4.2. Spatialization model.

and concepts with regard to their context, in order to identify points of connection and divergence. In turn, this evaluation informs the phase of readjustment of the strategies and concepts.

During this project, I composed a series of the pieces which form the core of this investigation. Experiments were readjusted and formulated throughout the entire duration of this artistic investigation.

In the course of this project, the experience of the performances of the case studies – but also of other pieces that were part of this project but not included as examples – provides valuable information to evaluate the experiments on their own terms and to be able to further develop and readjust the strategies.

The last step is the written dissertation, in which the process, methods, context, strategies, concepts, and results are enumerated, described, discussed, and evaluated.

2.4. Experimentation

With the epistemological character of music emerges the question of the possibility of research through artistic practice and how to conduct such research. As discussed in section 2.2, artistic knowledge reveals itself in experience. As experience, it is a product of artistic practice, it is the result of an investigation and of an experiment. However, what does the experimental in composition mean? Can we equate its experimental character with the use of a method of empirical experimentation modeled after the sciences? Can we still, following John Cage, think of the musical experiment as an "action [...] the outcome of which is not foreseen"?[18] If we accept both conceptions, – an experiment similar to the scientific one, and the Cageian experiment – we can understand the experiment in composition as a practice whose method may be modeled after the sciences, that takes place in the realm of sound production, and whose goal is to create an experience of something that is not yet known. In other words, the experiment may follow the methods of scientific research and its results are unexpected.

18 John Cage, *Silence: Lectures and Writings*, 19. pr (Middletown, Conn: Wesleyan Univ. Press, 2011). p. 39.

2. Methodology

Hence, the questions to be asked will be, what is the nature of this artistic experiment and how does this project conduct and develop experimental processes and give rise to an open experience of the result? Furthermore, this project focuses on the revision and re-thinking of the conception of experiment in composition in light of current developments and understandings of experimentation from the philosophy of science and art and in relation with contemporary issues of gender and social equality. In addition, this investigation aims to re-conceive the notion of the musical experiment and study how its relation with openness – one of the main concepts of this project – can be understood.

As stated above, the experiment is open with regard to its results and the exploration of the unknown. This project understands openness in two stages, first during the composition of the work and secondly during its experience. Openness in the compositional practice implies sharing the agency with the material and the compositional system. Material in turn contributes to the emergence of an open result, that is, to the emergence of an object that is intrinsically open. During the performance, an open experiment allows multiple readings and experiences of itself, and it stands against unequivocal definitions of itself.[19]

Discussions on artistic research have related recent formulations of the scientific experiment with the artistic experiment.[20] The connection between both notions of experimentation is built on the fact that scientific and artistic experiments are the result of practice, rather than theoretical formulations and both engage with the material. I aim to contribute to this discussion with my own understanding of the compositional experiment, by relating contemporary approaches to material described by philosophers of science – mainly Karen Barad and Hans-Jörg Rheinberger – to my concept of experimental practice. Contrary to traditional rationalist approaches in the philosophy of science, for thinkers like Barad and Rheinberger, the experiment is not

19 See chapter 4.2 for an extended discussion about openness in the experience and the intrinsic openness of the musical work.

20 For an extended discussion on experiment in artistic research and correlations with Rheinberger's experiment see also Michael Schwab, ed., *Experimental Systems: Future Knowledge in Artistic Research*, Orpheus Institute Series (Leuven: Leuven University Press, 2013). See also Paulo de Assis, ed., *Experimental Affinities in Music*, Orpheus Institute Series (Leuven: Leuven University Press, 2015).

intended to confirm or falsify a previously formulated hypothesis, a previous assumption. Rather, it is the practice of the experiment – instead of its conceptualization – that allows for the emergence of new knowledge. Here, I can trace the first relation between this understanding of scientific experimentation and the way I conceive of experimentation in my compositional work, since both are tied to practice, rather than to the formulation of a hypothesis.

In a broad sense, my compositional process is a progressive immersion into a new object that I create but that I also discover in the process. In this sense, I understand the compositional process as the experiment itself. Experiments are not prior to the composition of the piece, there is no master hypothesis or plan to be tested in experiments. For me, composition is an experiment because it is not clear from the outset what the result will be, where the process of composition will lead. The experiment is not a process made up of discrete steps, because all the stages influence each other. It would be more accurately characterized as a continuous feedback loop, as a process of "thinking in doing", in which – through the act of composing – something new is being created. Here, I see a proximity with research practices in the laboratory as described by Hans-Jörg Rheinberger. In his conceptual analysis of scientific laboratory practice,[21] Rheinberger describes experiments as *experimental systems*, i.e. as complex systems involving an interplay of technological means, technical objects, machines, techniques, preliminary concepts, protocols, notes, and social and institutional conditions that play a role in the realization of the experiment. Rheinberger's experimental systems are not vehicles to test a hypothesis, to corroborate or reject it, but they are rather generators of knowledge. The *experimental system* is a vehicle to materialize questions, that in turn give rise to *epistemic things*, objects of knowledge, whose emergence is enabled by the experiment. Epistemic things embody the knowledge of a given research project at a given time. They are functionally different from technical objects, which are settled epistemic things, stable forms of knowledge that help to create new epistemic things in the experimental system.

21 Hans-Jörg Rheinberger, *Toward a History of Epistemic Things: Synthesizing Proteins in the Test Tube*, Writing Science (Stanford, Calif: Stanford University Press, 1997).

2. Methodology

Graphical visualizations and diagrams are essential to experimental systems. The *graphemes* in Rheinberger's *experimental systems* are not representations of nature, they rather constitute a chain of representations: "So the comparison here [in the *experimental system*] is not between 'nature' and its 'model', but rather between different graphematic traces that can be produced"[22] in the research process. Therefore, "the scientific real is a world of traces."[23] A world in which the real is at the same time present and absent, because

> the production of 'inscriptions' is neither a purely arbitrary process nor completely dictated by the material, technical conditions, and instruments of the respective system. In the process of production and differential reproduction in experimental systems, there is a constant interplay between presentation and 'absentation'.

The inscriptions are not arbitrary representations, without connection to the object. However, they are not purely derived from the research object. The *graphemes*, in their representation of the object, influence our knowledge of the object. The graphemes generated in the experimental system do not represent nature, they rather encircle it. Nature, on the other hand, is present as the object of research and because the sign represents it in its absence. Nevertheless nature is absent in the sense that it is only apparent during the research process.

During the composition process, I generate numerous diagrams, notes, sketches, and the score. For me, these *graphemes* (see figure 2.1)[24] are a way to encircle the sound work. In the same way that language in the written dissertation cannot grasp the experience of the compositional experiment, yet, it helps me to understand it and shape my knowledge, the graphical visualizations, diagrams and scores generated as part of the composition process do not completely capture the resultant sound event. The experience of the musical work is also more than its final representation in the score. The sound result depends on the interpretation of the score by the musicians. However

22 Hans-Jörg Rheinberger, *Toward a History of Epistemic Things: Synthesizing Proteins in the Test Tube*, p. 8.

23 Hans-Jörg Rheinberger, *Toward a History of Epistemic Things: Synthesizing Proteins in the Test Tube*, p. 8.

24 I am the copyright holder and author of all figures and illustrations, whose caption does not specify another author or copyright holder.

in the case of my work, it is also determined by the localization of sound sources, the experience of these localizations, the degree of relation among the materials, the different distances between the material's interaction, the acoustics of the performance space, the musician's positions, etc. In this sense, language, notation, abstraction, and representation are means to enfold something that is beyond representation. Likewise, my diagrams are traces of the sound event that will be the piece but are not the piece, and will be translated into other traces, the musical notation. The notation is neither a crystallization nor a concretization of the previous work, but part of the process as a whole. Moreover, the score is not a mere instruction with the purpose of achieving a sound result, since the way the music is notated by the composer is influenced by how the sound is imaged and conceived. It is part of the mental representation and understanding and will therefore be part of the sound and its posterior understanding. Diagrams and notation together create an encircling inquiry that keeps approaching the piece, understood as a formal-material sound event, without ever fully grasping it in a process, in which this event is always at the same time present and absent. The notation makes the sound phenomenon present because it refers to it on the basis of its representation. The notation partly constitutes the sound because it is a way of understanding, communicating, and explaining the sound. However, at the same time, the sound phenomenon is absent from the graphic notation, it is only until somebody decodes the graphic symbol in a concrete spatial, temporal, and material situation that the sound appears. Yet this sound is not a pure entity, it is mediated by the notation and the interpretation of the graphic representation.[25]

25 In this sense the sound could be paired with the status of the real in Lacan, which is at the same time present and absent in language. See Jacques Lacan *S.XX*, pp. 16-17.

2. Methodology

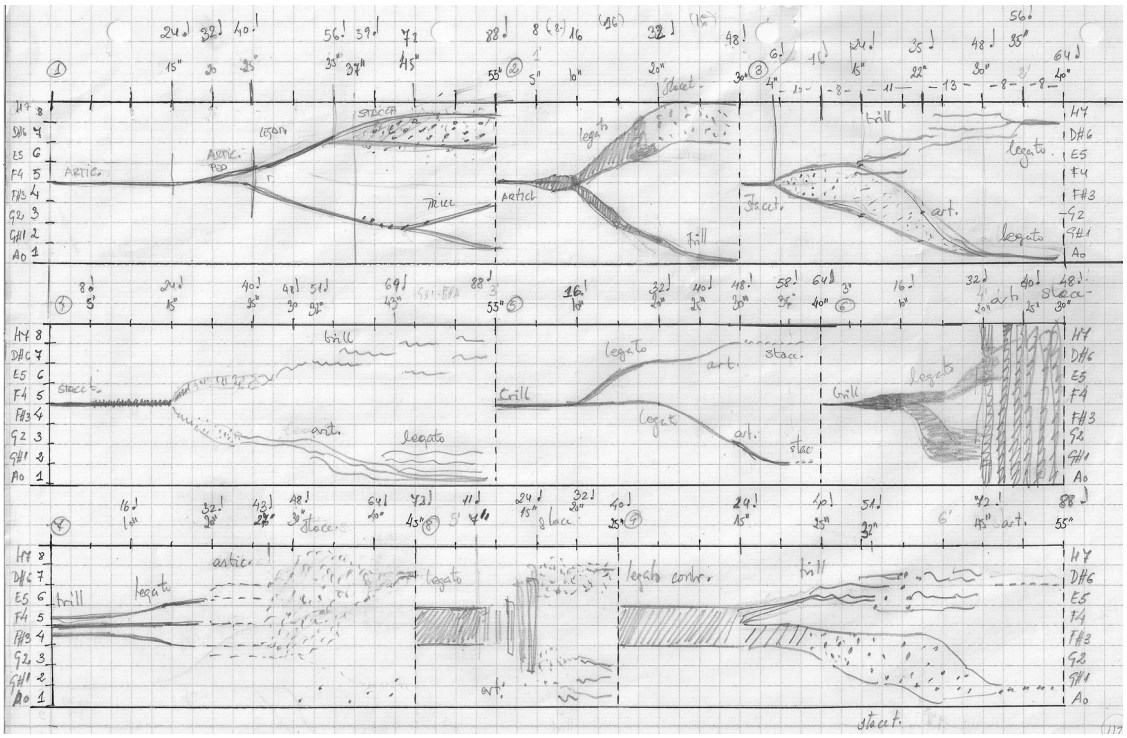


Figure 2.1: Example of grapheme

Similarly to Rheinberger's notion of the experiment, my process of composition may be defined as involving an experimental system shaped by my techniques and skills as a composer, by sound materials, previous knowledge, and experiences, previous pieces that together give rise to a system that will grow and change in the process. Composition starts with a cluster of sound ideas that are initially unconnected, rather than a plan or idea to be tested with the sound material. I create systems and relations to connect these initial hints, which are explored, developed and encircled via graphemes and other representational methods like the spatialization model discussed later in this chapter. The systems allow for the emergence of materials and for the materials' agency. Rather than leading to conclusions, these experiments give rise to new questions, to an open experience, a temporary knowledge.

An experimental process of discovery by doing, which is open to the material's agency, posits an alternative relation between composer and material. In this relation, the composer does neither form nor control the sound material in order to create the

piece, they rather co-create the piece with the material. In order to describe this alternative relation between composer and sound material in the compositional experiment, I refer to Karen Barad's concept of the scientific experiment. In *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning,*[26] the quantum physicist and theorist Barad develops the concept of *diffraction* as a method and metaphor for the creation of scientific knowledge. Diffraction is a wave behavior (figure 2.2). It is the interference[27] between two waves of water, light or sound. Diffraction describes how two waves combine when the waves encounter an obstruction. In their interaction, a new pattern is created, which is called an interference or diffraction pattern. Barad sees diffraction as a possible way to research nature, in which observer and nature create patterns and interfere with each other. Following Donna Haraway, Barad proposes diffraction as an alternative to the metaphor of reflection conventionally used to describe the scientific method. The reflection method mirrors our knowledge – or image – of the world into the world, and understands the identity between our image and nature as true knowledge. In contrast, the diffraction method searches for differences and patterns of difference. New knowledge emerges as a product of the *intra-action* of waves and forces, in the *intra-action* of material and subject.

26 Karen Michelle Barad, *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning* (Durham: Duke University Press, 2007).

27 Karen Barad understands and uses the terms "diffraction" and "interference" interchangeably.

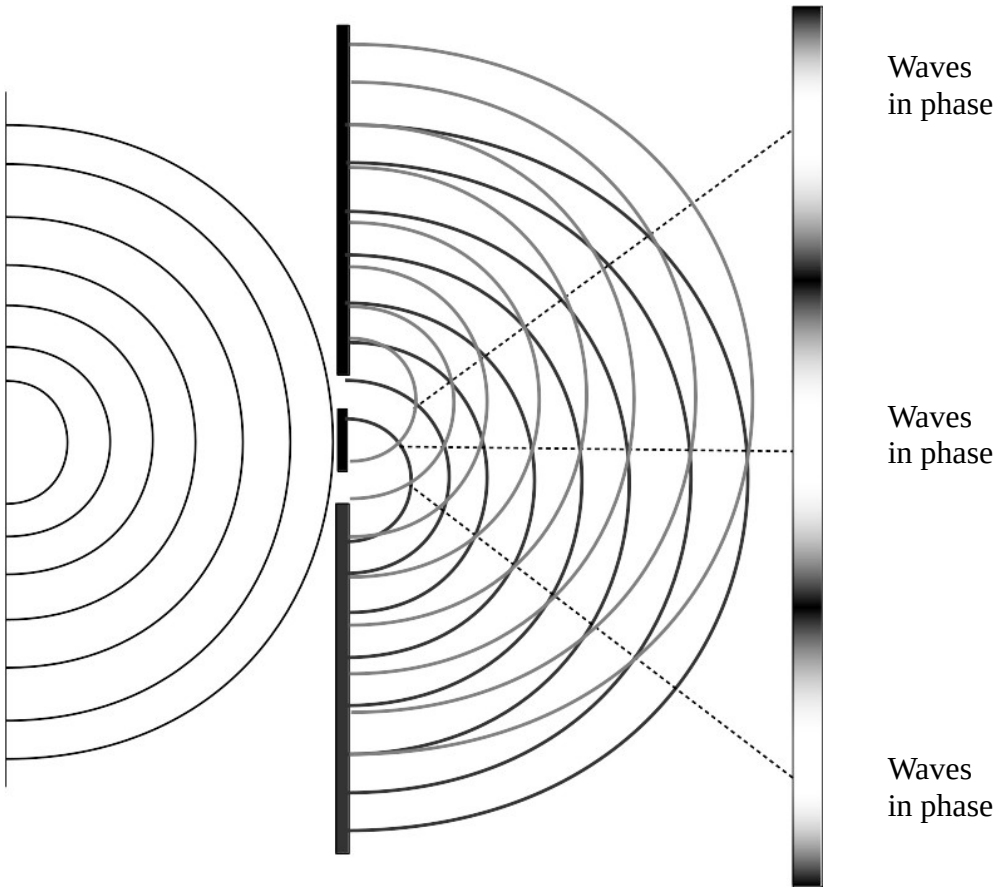


Figure 2.2: Diffraction patterns between two waves

I understand the compositional experiment as the interference between composer and material. The experiment is not produced when the composer imposes an idea or form onto a raw material nor does it prove or disprove a previously existing theory or concept. On the contrary, it takes place in the encounter of the material and the composer and results in the contingent patterns of diffraction created in this encounter. This type of experimental practice poses a critique of the composer, while proposing a different relation, in which the composer is not devoid of their agency. Hence, an experimental practice searches for the possibilities of the material and renders them audible in the musical work. In the intra-action between composer and material a new situation emerges, a musical event.

Before discussing this intra-action between composer and material in my own practice, I will exemplify it in the work *Bird and Person Dyning* (1975) by Alvin Lucier which I regard as a remarkably clear example of openness in composition. I regard this piece as an example of an experimental approach oriented towards something that is discovered in the process. The intra-actions between material and composer manifest themselves audibly in this piece.

Bird and Person Dyning is based on the phenomenon of heterodyning, in which two waves are combined in a nonlinear system resulting in two new waves, which are the sum and difference frequencies of the first pair. During the performance of *Bird and Person Dyning*, the composer searches for the emergence of this phenomenon between two sources: the recording of an electronic bird call and the feedback created by a binaural microphone and a stereo loudspeaker system. Feedback and heterodyning phenomena depend on the movement and position of the performer and on the characteristics of the space in which the piece is performed. The sound result thus depends on the contingencies of the performance. The sound is not designed a priori but emerges in the piece, as a result of the composer/performer exploring the performance space. The musical work is the discovering, research, and creation of the piece by the composer and the material. It is the result of their interference, of the – not only metaphorically but in this case also literal – diffraction between two waves, the recording of the electronic bird and feedback, as well as the diffraction between the agencies of material and composer.

I consider my piece *Dérive* (2017) for string quartet and live electronics[28] as a example of the chain of representation and of intra-action in the musical experiment. *Dérive* is the sonification of a walk in Berlin. It explores the aesthetic consequences of three different ideas, the role of subjectivity in sonification processes, the concept of *dérive* (Guy Debord),[29] and the notion of musical structure as a translation of a real physical space.

28 *Dérive* was commissioned by the *Sonifikationsfestival der bgnm* 2017. It was premiered by *Kairos Quartett*, in the Villa Elisabeth, Berlin, November 2017.

29 Guy Debord, “Theory of the Dérive”, (1958) in *Nomadic Trajectories*, John Sellars (ed.), Warwick Journal of Philosophy, Vol. 7, 1998. p. 7-12. The *dérive* is a method proposed by Debord that “entails playful-constructive behavior and awareness of psychogeographical effects;” (Debord, p.7). In a *dérive* “one or more persons during a certain period drop their motives for movement and action, their relations, their work and leisure activities, and let themselves be drawn by the attractions of the

2. Methodology

In sonification processes, there is always an element of subjectivity in the interpretation of the data into musical parameters or musical transformations. However, as Rheinberger points out, the data collected in scientific experiments are not themselves strictly objective. Data do not present the phenomenon in itself; they rather represent it, hence, they include an element of interpretation and thus subjectivity. Following this idea, the piece *Dérive* explores the repercussions of this element of subjectivity, not only in the translation of the data into music but also in the collection and creation of the data themselves. Hence, the project has two parts: the collection and creation of "subjective" data and their sonification in a work for string quartet and live electronics. In this way, this delivery embracing of subjectivity in the sonification process implies an intra-action between composer and the contingent events of the walk. The data to be sonified in the *Dérive* are the data collected by my subjective dérive with the duration of an hour in the city of Berlin. I installed a tracking application on my smartphone that recorded my path. The application also provided different tools for recording and attaching data and media files like text, video, and audio recordings, that were used to record particular observed details, impressions, thoughts, and decisions.[30] The sounds of the walk, either as direct recordings or as my transcriptions-interpretations of the events of the walk, are the sound material of the piece. The space covered in the walk and the events in time are the spatialization and the form of the piece. Another iteration of this subjective sonification process is the piece *alla deriva* (2017-2018) for violin, piano, and live electronics.[31] *alla deriva* again explores the three aspects; the subjective collection and sonification of data, the contingency of a drift in a city, and the translation of a real-physical space. In *alla deriva,* I translate a walk in the city of Venice into a musical structure. Therefore the specificity of this piece in relation to the previous project relies on the different aesthetic consequences that the translation of the medieval Venetian rhizomatic urbanism contributes to a musical structure. Moreover, an

terrain and the encounters they find there" (Debord p. 7).

30 See score of *Dérive* in the online repository: https://www.researchcatalogue.net/view/1228054/1255288. For an extended documentation on the sonification process and mapping, as well as audio of *Dérive* in its premiere see exposition in *Research Catalogue* "Dérive," Lula Romero, accessed April 1, 2021, https://www.researchcatalogue.net/view/375563/376038.

31 Commissioned by *Festival Mixtur 2018*, this piece was realized during my residence in the Deutsches Studienzentrum Venedig (Venice) 2017 of the German Government. The piece was premiered during the *Mixtur festival*, in Barcelona, in april 2018 by *Duo Hellqvist/Amaral* and myself controlling the live electronics. Program notes of *alla deriva*, accessed April 1, 2021. https://lularomero.com/alla_deriva.html

interesting aspect of both projects – *Dérive* and *alla deriva* – was to render audible the specificity of a place. The gentrified areas of Kreuzberg in Berlin and the small city of Venice overflowed with tourism – and water – are heterogeneous, complex places with many frictions and contradictions and with a very particular topography and idiosyncrasy. I wanted to explore these aspects in both pieces in an audible way and from a subjective perspective.

In *Bird and Person Dyning*, the process of composition takes place during the performance. In *Dérive* and *alla deriva*, openness is due to my subjective recollection, selection, and translation of the contingent events of a walk into musical material. Still, the achievement of openness and intra-action between composer and material are not always self-evident. Several strategies have been proposed in the past to embrace openness in the process and to foster the agency of the material, like in stochastic and aleatory music or open scores. More recently, there have, for example, been compositional experiences which investigate the sonic material through parametric decoupling, in which the sound result is the interaction between different layers of activity. I aim to open up my practice to the agency of the material through the use of space and generative systems. In this project, I have explored and developed four strategies that allow for such an opening and in turn for a multiplicity of experiences in the performance of the piece. By doing so, these strategies rather propose a different figure of the composer, who shares their agency with the material rather than controlling it.

2.4.1. Introduction to the Compositional Strategies

Compositional strategies are sets of conditions, processes, structures, and techniques used in composition to achieve a certain goal. In the case of this project, the goal is to create an autonomous open work which in turn also allows for multiple understandings in its experience. To achieve this aim, I have developed compositional strategies that – together with the spatialization model described in the next section – constitute the technical knowledge produced in this project. The compositional strategies allow the collaboration of other agents in the creation of the piece. However, these strategies

differ from openness through chance, probabilities, or improvisation from past and present experimentation in composition.

In this section, I briefly introduce the strategies, a detailed description including case studies can be found in chapter 4.

Network of family resemblances

Different sonic qualities, such as frequency, density, timbre, amount of noise, or distortion, are scaled, categorized, and localized in space. The encounter and different combinations of these sonic layers in their diverse degrees generate the sound material. The results of these interactions – the sound material – are then interconnected and related among themselves by means of numerous and diverse relations of family resemblances. These relations derive from my classification but they also stem from the resultant material itself. The form is open due to the contingency of the resultant material, but it remains coherent due to the relations that the different layers and relations create.

Localization of sound sources

I refer to different dispositions of sound sources that create and enhance a multiplicity of experiences and understandings of the sound event instead of displaying a single perception of it. These dispositions are:

- **Asymmetry in the localization of sound sources**, which creates different partitions of the space and thus different experiences.
- **Immersive disposition of sound sources.** These dispositions avoid a frontal perspective and the creation of a “sweet spot”, that is the position from which an ideal sound image is perceived. Instead of creating a single experience, since the listener is always subjectively positioned within the sound, immersion offers multiple experiences to the different listeners.
- **Movements and areas of activity instead of sound trajectories.** Sound trajectories between sound sources impose a certain direction of the attention and an unequivocal understanding of the information. Instead of creating sound

trajectories, I create areas of activity of different parameters or sound qualities. These areas can move, expand or shrink, and by doing so create different spatial partitions.

An important aspect with regard to this strategy is the role of the listener and their active listening. Since the position of the listener in relation to sound sources influences their understanding of the sound event, localization of sound sources allows for the agency of the listener in the understanding of the sound experience.

Spatializing sound parameters

Form is achieved by means of coupling musical parameters to spatial locations. A given parameter, such as pitch for example, may thus also be mapped onto space and creates localized frequency areas. The interactions of these different organizations contribute to the emergence of unexpected and open situations.

Generative systems

I refer here to non-linear systems or feedback processes whose outcome is not directly proportional to their input. The results of generative systems are sensitive to initial conditions and may create unexpected outcomes. As in the case of the strategy of family resemblances, I use generative systems to set up the initial conditions for the generation of a contingent outcome. In this way, the agency of the work is shared with the composer, with the system, and in the case of a feedback system, also with the material.

2.4.2. Spatialization Model in *SuperCollider*

An important development in the project is the programming and completion of a software spatialization model. This model simulates the performance situation and the way in which listeners will perceive the different instruments and sound sources in the performance space. It allows me to experiment in a more concrete manner with the possibility of achieving situations of openness and coherence determined by the localization of sound sources and helps to develop the compositional strategies.

2. Methodology

The model is a compositional tool. It emulates the acoustic characteristics of sounds in a certain hall and in a certain localization of sound sources. However, the model is not designed for the performance of electronic music, nor to substitute acoustic instruments in a concert situation. Instead, it is an essential tool to experiment with the spatialization of instruments and sound sources in the compositional process. It is particularly relevant to assist in the composition of orchestral or large ensemble pieces concerned with spatialization, in which the possibilities of physically experimenting with these formations in large spaces during the composition are very limited.

A software model of the position of the instruments, sound sources, and listeners

The software model is created in the computer music programming language *SuperCollider* and its functionality consists of three parts:

- **Calculations**: By entering the dimensions of the performance hall, the positions of the different sound sources (instruments), and listeners in this hall, the software calculates and models the real distances and angles between listener and sound sources. The model then computes these numeric data and renders them as the sound diffusion parameters of the instruments: gain (amplitude), angle of diffusion (direction of the sound), reverberation in the hall, and delay time.
- **Sound display**: The diffusion parameters previously collected are used to playback recorded sounds of the instruments using first-order ambisonics. The software then emulates the diffusion of the sources' sounds as they would be heard from the listener's position in the simulated hall. The software offers two possibilities of displaying the sound: through headphones or using a four speaker setup.
- **Graphical display**: The software has a graphical user interface that displays a schematic floor plan of the hall and the positions of the instruments and the listener in it. The graphical interface enables the user to move the listener. When doing so the software recalculates the position of the listener and with it the

aural simulation. The model also has the possibility of changing the instruments' positions and of adding new instruments by entering the appropriated data in the *SuperCollider* code.

Although the conception of space in this project is relativistic and relational as discussed in chapter 4.3, I regard mathematical and geometrical space as an important tool to imagine and represent space. Geometrical space serves as a tool to enable testing with the spatialization model. The model does not reproduce the specific acoustics of the performance space that it represents, it can nevertheless be easily implemented in the model through the use of convolution. That is because the model is not concerned with the simulation of a particular space. Since the model is not intended for performance, and rather as a tool for the development of the strategies, the representation of positions and its effect on listening is sufficient for the purposes of this project.

Evaluation – Experiments

As mentioned above, this project understands the musical works as experiments themselves. Therefore, the model is not intended to prove a theory that will later be crystallized in the score, but is rather a tool for experimentation and part of the composition process. The goal in these experiments was to achieve situations that were susceptible to be perceived differently depending on the listeners' positions, that is, creating an event that renders multiple and diverse situations, through the positioning of sound sources.

The experiments were mainly conducted during the composition of the piece *Parallax*. One set of experiments was carried out to create different areas of activities among the five different groups of orchestra instruments – one group is at the left of the audience, three on the stage and one behind the audience, see figure 4.14 – I made recordings of different categories of synthesized and instrumental sounds. Later, I assigned them to the different sound sources localized in space in order to create different areas of activity. An important part of the experiments with the model was listening. I listened to the same disposition of sounds from different listening positions

and drew conclusions regarding the material, musical processes, and the spatialization. I subsequently rearranged the sounds among the five groups under other criteria and again listened to the results from different positions. The conclusion of these experiments was that the areas of activity are perceived differently depending on the listener's position. *Parallax* is constituted and structured by these different areas of activity. In this way, the perception of the form of *Parallax* depends on the listening position.

Another set of experiments was intended to study rhythmic patterns and whether each pattern is perceived as a separate gesture or as part of a whole depending on its velocity and the listener's position. The experiments contributed to the realization of bars 132-213 of *Parallax* discussed in 4.4. In this passage, the rhythmic pattern is the result of the sonification of twenty paths of reflections occurring between two different points in the sports hall of Donaueschingen – the hall in which *Parallax* is to be premiered. I used six different rhythmic patterns in total – four of them contain twenty reflection paths and two contain only five reflection paths.[32] These patterns needed to be scaled in order to be used musically. I synthesized sounds in these rhythmic patterns and later scaled them using different factors. In addition, each rhythmic pattern follows a different harmonic scheme and is assigned to one of the orchestral groups. I recorded the synthesized sounds in different scales and then listened to their spatialization in the model. The scaling – by factor 420 – chosen for this passage allows for an understanding of each pattern as a single gesture while the patterns together are ambiguous enough to be understood as part of a totality. The created situation can be described as a *multistable stimulus*, which is a visual or auditory stimulus that can be interpreted in more than one way by the viewer. Multistable stimuli, such as the Necker cube (see figure 2.3), spontaneously alternate from one interpretation to another.[33] The rhythmic patterns can change to be perceived as patterns or as a sound mass. In addition, the focus on one of the different possible rhythmical patterns depends on the

32 The six rhythmic pattern were calculated with the tool *Amray*, accessed on March, 14, 2021 https://amcoustics.com/tools/amray

33 For more information about visual and auditory multistable stimuli see David M. Eagleman, "Visual Illusions and Neurobiology," *Nature Reviews Neuroscience* 2, no. 12 (December 2001): 920–26, Diana Deutsch, "An Auditory Illusion," *Nature 251*, no. 5473 (September 1974): 307–9.

listener's position.[34] These experiments have informed the development of this concrete passage but also the whole composition process and the work in connection with the other strategies mentioned above.

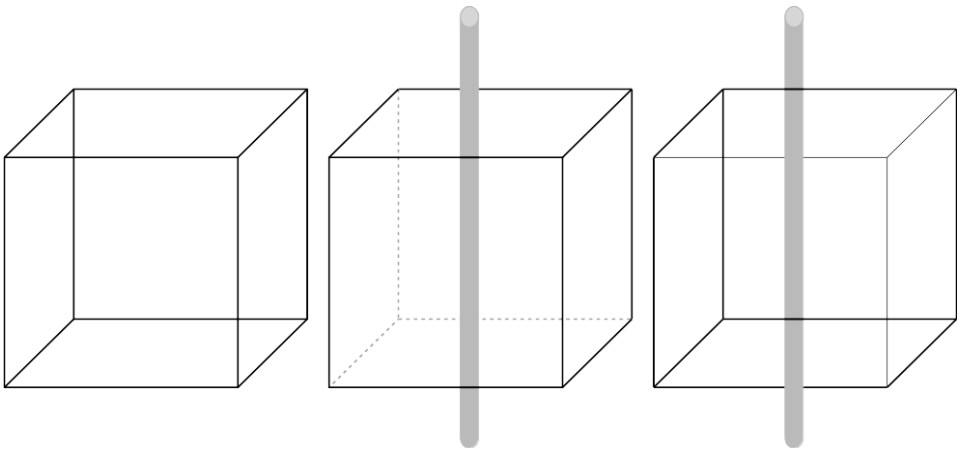


Figure 2.3: Necker cube

The spatialization model is also used to render the spatial simulations of two of the case studies of this project *MTRAK* and *ins Offene* (chapter 4). Since the spatialization in *MTRAK* is partly a result of the generative system employed to generate the sounds (see 4.4) and *ins Offene* was composed before the development of the software, the model was not used in the compositional process of these other two works. However, the model is an important tool to document the differences in the perception due to the localization of sound sources for these pieces. The model's rendition does not substitute the concert experience of the piece, but it is a valuable means of documentation and representation of the results of this project.[35]

Documentation

The code for the spatialization software model is available on the platform GitHub and is openly accessible at this URL: https://github.com/lularomero/spatialization-model

34 Link to the binaural recordings of this experiment: https://www.researchcatalogue.net/view/1228054/1253913.

35 Links and discussion of the case studies in chapter 4.

2.4.3. Critical aspects of openness and experimentation

To achieve openness in compositional practice is a difficult task for the composer and implies an element of self-critique. A practice that fosters openness, forces the composer to go beyond themselves and to share their agency with the material. A critique and a detachment from learned clichés is necessary in order to allow for the emergence of material and its transformations. However, self-critique is an ongoing and challenging goal – never entirely achieved – of detaching oneself from hierarchical thinking, generalizations and power relations, but also from expectations of what compositional practice is supposed to be. Different strategies can aid in pursuing this goal. As we saw previously, these strategies include different approaches and conceptualizations oriented towards material and composer and the use of different systems; a network of different layers of spatial activities or the use of generative systems. The construction of systems is an important part of my compositional practice. They are not a way to achieve a pretended "scientific" objectivity, nor a means to avoid creative decisions – the choice of the system is a creative decision itself. Systems are rather a way to overcome myself, to lose unconsciously assumed stereotypes as well as to allow the agency of the material to unfold, and by doing so, to co-create the conditions for the piece to emerge.

Furthermore, openness and experimentation imply a risk of failure, a risk is taken when the outcome of the compositional practice is unknown. This risk of failure is not related to its public performance, but to the fragility of the artistic experiment on the basis of its own premises. The success of a compositional practice is not the confirmation of an *a priori* idea but rather the existence of the experiment under its own conditions. The success of *Bird and Person Dyning* does not rely on the empirical demonstration of the heterodyning phenomenon but on the aesthetic experience produced in the encounter between recording, feedback, performance space, actions, and movements of the composer-performer. It relies on its own existence but also on the fragility of its existence, on the possibility that it may not "work." As the

philosopher Christoph Menke points out,[36] the fragility of art, this risk of failure of its own existence is what constitutes the experimentality and openness of art.

Due to its experimental character and its precarious existence and by taking risks, compositional practice affirms its position in the world. It criticizes society by proving its own existence and by displaying an alternative form of knowledge and practice. A compositional practice oriented towards openness exercises a different relation – one of intra-action – between composer and material and poses a concrete knowledge based on a form of experience that is different from the one of language. In this sense, it criticizes social assumptions, hierarchies and power relations, one's knowledge and the power structures inscribed into it. The compositional experiment offers a multiplicity of concrete experiences, meanings, and understandings. Its ambiguity hinders their categorization and prevents it from being turned into commodities. It poses a critique of the myths of the composer and composition. The critique inherent to my practice is not a didactic one, however, it does not show on a semantic level what is "wrong" with composition, but it rather displays a possible alternative in practice. Far from being a moralizing rebuke, this critique poses a "withdrawal of art to conform to the more violent violence of a society in which the art necessarily exists and to which it therefore responds," as described by Lydia Goehr.[37] This withdrawal of art is also its refusal to be complicit, which can also be a silent refusal to communicate, a withdrawal from structures of meaning and it is therefore fragile. The compositional practice refuses to capitulate under the social and formal powers of administration and criticizes the violence of social institutions and ideologies such as language, and generalization imposed onto difference.

By proposing a relation of open encounter between material, composer, and listener, musical practice may criticize hierarchical relations of subject and object, and the relations of exploitation by humans of their surroundings and of each other. In addition, it poses a new form of knowledge, a multifaceted event that is open for the

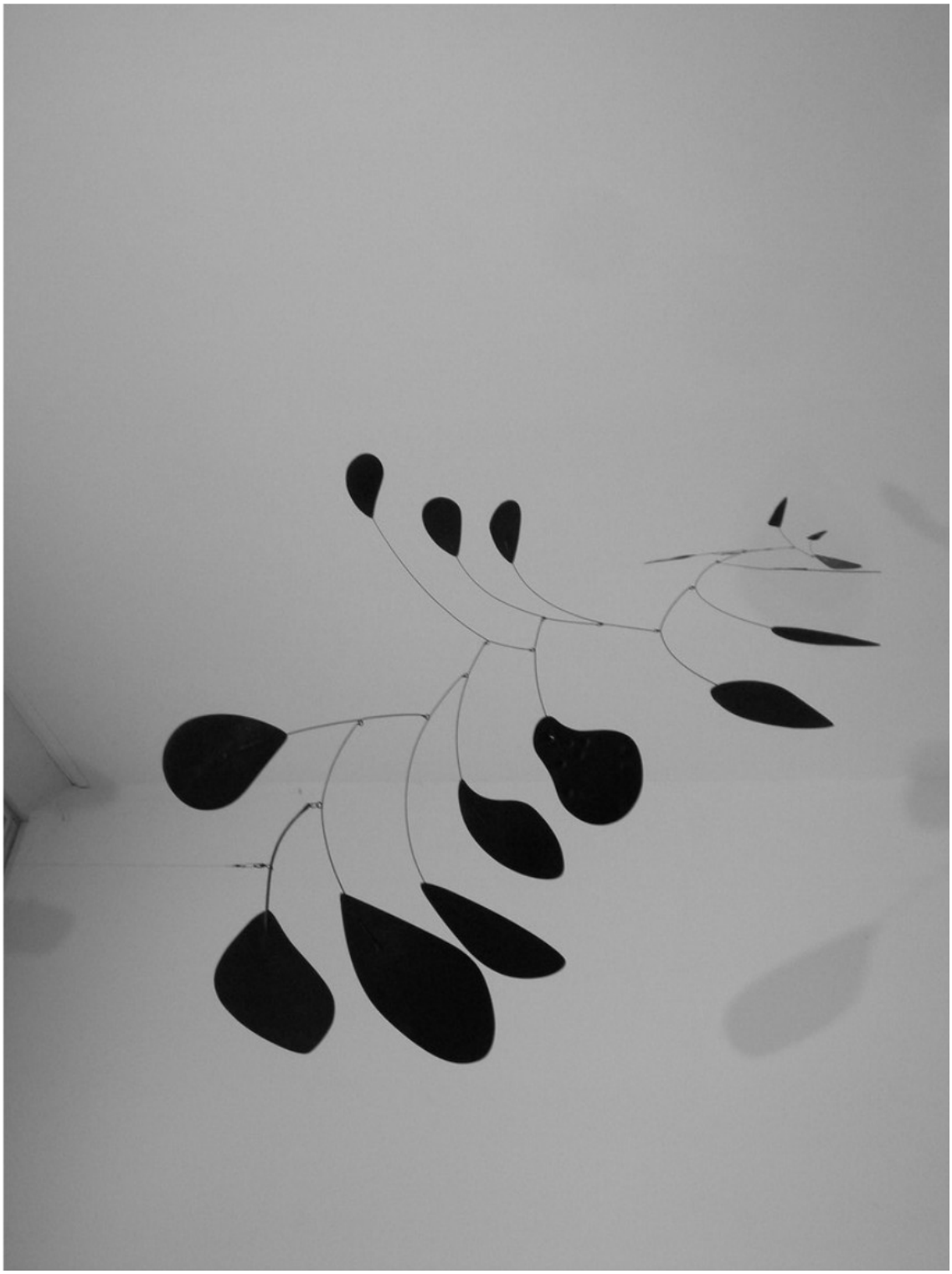
36 Christoph Menke, *Die Kraft Der Kunst*, Erste Auflage, Suhrkamp Taschenbuch Wissenschaft 2044 (Berlin: Suhrkamp, 2013).

37 Lydia Goehr, "Explosive Experiments and the Fragility of the Experimental", Paulo de Assis, ed., *Experimental Affinities in Music*, Orpheus Institute Series, p. 15-41 (Leuven: Leuven University Press, 2015) p. 36.

listener to be experienced and understood, not necessarily in a semantic way but as an aesthetic experience. This more subtle critique immanent to the practice of composition and outside of language locates itself in a fragile, subtle, almost silent place because it makes visible the invisible. Art shows what escapes language, what is repressed and hidden. It creates a sensory experience of what is ungraspable (invisible) by symbolization, of what is different. Art is critical by aesthetically displacing its own borders and thus by contributing to "a new landscape of the visible, the sayable and the doable."[38]

38 Rancière, Jacques. *Dissensus. On Politics and Aesthetics.* (London: Continuum, 2010). p. 149.

Illustration 2: Mobil (1941) Alexander Calder, Metropolitan Museum of Art New York, photo by Antonio Campoy Ederra is licensed under CC BY 2.0.



3. Context

Although music is considered a temporal artistic manifestation, sound is also a phenomenon in space and as such is interconnected with it. The shape, materials and characteristics of a concrete place modify the sounds produced in it, while our perception of a place and our position in it depend on the reflections of sound in that space. Musical performers and composers have long been aware of this interconnection and adjust their performances to the concrete spaces in which the music is produced. Moreover, concrete places have shaped musical styles. The long resonances of churches, for example, have influenced the tempo of the performance in Gregorian and liturgical music, while small court places allow for more rapid tempos. In this regard, the influence of the architecture and acoustics of the St Mark's basilica in Venice on the antiphonal style of *cori spezzati* during the 16th Century is well known.[39] On the other hand, musical genres have promoted the emergence of specific places for their performance, including opera houses or later symphonic music halls for orchestral performances.[40]

Musical performance as a form of bourgeois entertainment during the Classical and Romantic periods favored the construction of music venues in which sound is projected from the stage to the audience. This creates a unidirectional and frontal perspective of the musical event from the orchestra situated above the listeners on the stage, to the audience who are stratified in space according to their social and economic status. The goal has been to deliver the ideal sound image of the work by the composer

39 Dorothea Baumann, "Music and Space in the Renaissance," in *Kompositionen Für Hörbaren Raum*, ed. Martha Brech and Ralph Paland (Bielefeld: transcript Verlag, 2015): 45-66, p. 57-60

40 See also Dorothea Baumann, *Music and Space: A Systematic and Historical Investigation into the Impact of Architectural Acoustics on Performance Practice Followed by a Study of Handel's Messiah*, Natur, Wissenschaft Und Die Künste = Nature, Science et Les Arts = Nature, Science and the Arts, v. 7 (Bern ; New York: Peter Lang, 2011).

to the listeners who pay the most.[41] The acoustical characteristics of the performance hall and their influence on sound should not be noticed. The hall should only ensure the proper projection of sound under the aesthetic standards of classical music. Therefore, the aesthetic use of space from the 17th century until the 20th century is limited to dramatic or referential uses of positioning the musicians off the stage in the opera and in a few orchestral works, such as Antonio Vivaldi's *Concerto for two violins in A major RV 552 "per eco in lontano"* (1740), Hector Berlioz's *Requiem op.5* (1837) and Gustav Mahler's *2nd Symphony* (1893-1894).[42]

It is not until the beginning of the 20th century, with works like Charles Ives's *4th Symphony* (1910 – mid-1920s) and *Unanswered Question* (1906) that the dimension of space has been considered as a possible means for composition. However, it is from the second half of the century with the impulse of development in the use of electronics, with Edgar Varèse's seminal work *Poème électronique* (1958), that space has been more extensively researched as a provider of new aesthetic experiences.

Although traditionally musicology has centered on the study of the temporal aspects of music, there spatial and acoustic aspects of music have become increasingly come into focus since the beginning of the 20th century.[43] The musicologist Nina Noeske describes four different possible approaches with regard to the analysis of space in music. The first approach is to study the propagation of the sound waves in space. A second one is the analysis of the different conceptions of space in composition. A third approach studies space as concrete places, and the disposition of sound sources. The last possibility is to study the implicit spatiality of pitch and notation systems.[44] In any case,

41 Other halls that are not intended for a bourgeois audience also create a frontal perspective. This is the case, for example, with the disposition of musicians and the public in aristocratic courts, or later in rock and jazz music halls. Although for the latter the division of stage and public is similar to that of halls for classical music, the public in these spaces are not stratified according to status. Nevertheless, in both cases – courts and popular music venues – the sound is projected from the stage to the audience providing, as in the venues for classical music, only one possible sound image.

42 Maria Anna Harley, "SPACE AND SPATIALIZATION IN CONTEMPORARY MUSIC: STORY AND ANALYSIS, IDEAS AND IMPLEMENTATIONS" (Ph.D. in musicology, Montreal, Faculty of Music, McGill University, 1994), p. 123.

43 Gisela Nauck, *Musik Im Raum, Raum in Der Musik: Ein Beitrag Zur Geschichte Der Seriellen Musik*, Beihefte Zum Archiv Für Musikwissenschaft, Bd. 38 (Stuttgart: F. Steiner, 1997). p. 20.

44 Nina Noeske, „Musikwissenschaft", *Raumwissenschaften*, Stephan Günzel, ed., 1. Aufl, Suhrkamp Taschenbüch Wissenschaft 1891 (Frankfurt am Main: Suhrkamp, 2009), p. 259-269, p. 259.

according to Noeske, space is never neutral. Sound in space has a physical presence and is always embedded with social and historic aspect that influence the aural experience.

Taking into consideration these different aspects of space in the musical analysis, this chapter explores the influence on the musical result of different conceptions and uses of space in composition. It explores the different compositional strategies of space that can be identified in contemporary music and the aesthetic experiences they give rise to. More important to this research project is the question of the kind of relations that composers establish between form, understood as a sequence of events in time, and space? Can space contribute to the openness of the musical work? How do the dispositions of sound sources influence the experience of the listener? In what follows, I will discuss how these questions have been dealt with and how they have emerged in a selection of works from the second half of the 20th and the early 21st century. I will present different concepts of space and spatial compositional strategies and their influence on the aesthetic experience. This review of the context of my work does not intend to be a exhaustive account of tendencies and composers that engage with space in composition during this period. It is rather a discussion of a selection of approaches that engage with space, through the discussion of a few representative works. The selection of approaches and works is based on their relation to the objectives and aims of this research project and their influence in my own compositional work. Hence, this chapter undertakes a description and critical review of selected contemporary compositional approaches related to space and openness that are relevant to my compositional practice and this artistic dissertation.

3.1. Space in the 1960s and 1970s

Since the mid 20th century, space has been a central parameter in musical composition. It has been discussed extensively in its relation to form by post-serial composers since the late 1960s. The central motivation for the use of space by composers like Luigi Nono, Konrad Boehmer, Karlheinz Stockhausen, and John Cage[45] was to make possible new

45 Karlheinz Stockhausen, „Musik im Raum“, *Texte zur elektronischen und instrumentalen Musik. Bd. 1*. (Köln: DuMont Schauberg, 1963): 152-175, p 155. See also Gisela Nauck, *Musik Im Raum, Raum in Der Musik: Ein Beitrag Zur Geschichte Der Seriellen Musik,* p. 37.

ideas of form. In addition, there has been an interest in the democratization and individualism of the listening experience.[46] Alternative dispositions of musicians and listeners were intended to dismantle the hierarchical relation of stage and audience in the concert situation. This implies a critique of the bourgeois experience of music. New forms of spatialization asks for new locations such as galleries, factories, open spaces, etc. but also for the creation of new venues[47] like the *Philips Pavilion* for Edgar Varèse's *Poème électronique*, Iannis Xenakis' Polytopes or the Osaka Pavilion for the performances of Karlheinz Stockhausen.[48]

Although composers have been aware of different acoustics of halls and its effect on sound, the artistic use of space by the European avant-garde, was largely focused on geometrical space. Space was conceived of in terms of its quantifiable geometrical dimensions. In this way, space was used as a tool for organizing compositional material like frequencies – pitch space – and structure. However, there have been two other purposes of space in composition that are related with concrete spaces: the spatialization of sound sources for clarifying musical structure and the use of spatialization of sound sources to open the experience of the work.

3.1.1. Pitch Space

Since the 9th century, Western music has translated the listening experience of pitch into a visual representation of vertical space.[49] This representation of pitch space, being a cultural conception, was re-thought by composers in the 1960s. Pitches were conceived

46 „Nichtsdestoweniger wollen schon die hier erwähnten Entwürfe Spiegel einer Musik sein, die nicht nur Freiheit als utopischen Kern ihrer eigenen Intentionen durchscheinen läßt, sondern die jedem, der sie hört und bemüht ist, sie zu erfassen, vor allem die Freiheit der Wahrnehmung garantiert." Konrad Boehmer, „Raum-Formen" (1961) *Das Böse Ohr: Texte Zur Musik 1961-1991*, ed. Burkhardt Söll, DuMont Dokumente (Köln: DuMont, 1993), p. 79-89, p. 89. See also Luigi Nono, „Spiel und Wahrheit im neuen Musiktheater", *Luigi Nono: Texte, Studien Zu Seiner Musik*, ed. Jürg Stenzl (Zürich: Atlantis, 1975). p. 82-86. and John Cage, *Silence: Lectures and Writings*, 19. pr (Middletown, Conn: Wesleyan Univ. Press, 2011).

47 Harley, "SPACE AND SPATIALIZATION IN CONTEMPORARY MUSIC." p. 157.

48 During this decade the *Konzerthaus des Berliner Philharmonischen Orchesters* in *Berlin-Tiergarten* (1957–1963) by Hans Scharoun was constructed, whose disposition of the audience in different terraces around the stage allows the emergence of different aesthetic experiences also for classic repertoire.

49 See Marie-Elisabeth Duchez, "La Repŕesentation Spatio-Verticale Du Caractère Musical Grave-Aigu et l'élaboration de La Notion de Hauteur de Son Dans La Conscience Musicale Occidentale," Acta Musicologica 51, no. 1 (January 1979): 54-73, p. 54.

of as points in a geometric space and by doing so, pitch space could be transformed, resized, divided, shrunken or expanded. Against this background, Pierre Boulez introduced the concepts of *smooth* and *striated* pitch spaces.[50] *Striated space* describes a space that is marked by different partitions. A striated space is subdivided in *curved space*, which depends on a regular or irregular variable module. *Regular space* has a fixed defined partition while *irregular space* is characterized by a variable partition. Western equal temperament and other systems that use variable or fixed partitions belong to the category of *striated space*. On the contrary, *smooth space* is a continuum of distributed frequencies. According to Boulez, smooth space is not achievable with ordinary instruments. Yet, the relevance of Boulez's dichotomy is that it creates a connection between the two categories. The smaller the partition of striated space becomes, the closer it approaches the smooth space.[51] Although this opposition refers to pitch-space, it can be translated to other musical parameters or to the form of the musical work. In his own work, Boulez was limited to explore the *striated* category in pitch space. However, he used *smooth* and *striated* spaces to articulate form and the related temporal categories of *pulse* and *un-pulse time* for rhythm, for example in his work *Répons* (1981-84) for chamber orchestra, six soloists and live electronics.[52] In this sense, structure is also conceived of in spatial terms and geometrical space becomes a tool for composition. The conception of pitch space for Boulez but also for other composers like Iannis Xenakis opens the possibility of organizing pitch but also duration, dynamics, and timbre in new ways, beyond the restrictions of the diatonic partition and hierarchical rhythmic division of the traditional Western systems.

3.1.2. Space as Structure

The same goal of finding new ways of arranging the musical material is the motivation behind the representation of form as geometrical space; as a tool to organize form.

Along these lines, György Ligeti describes his conception of form as space by referring to a dream from his childhood:

50 Pierre Boulez, *Boulez on Music Today* (Cambridge, Mass: Harvard University Press, 1971).
51 Edward Campbell, *Music after Deleuze*, Deleuze Encounters (New York: Bloomsbury Academic, 2013). p. 73.
52 Campbell, *Music after Deleuze*, p. 73 and 102.

> […] denn das ganze Zimmer war von einem dünnfaserigen, aber dichten und äußerst verwickelten Gewebe ausgefüllt, ähnlich dem Sekret von Seidenwürmern, die bei ihrem Einpuppen das ganze Innere der Schachtel, in der sie gezüchtet werden, bespinnen. Außer mir blieben auch andere Wesen und Gegenstände in dem riesigen Netzwerk hängen, Nachtfalter und Käfer aller Art, die den Lichtraum einiger spärlich leuchtender Kerzen erreichen wollten, große, feuchtschmutzige Kissen, deren faule Füllung durch Risse im Oberzug herausquoll. Jede Regung der steckengebliebenen Lebewesen verursachte ein Beben, das sich dem gesamten System mitteilte, so daß die schweren Kissen fortdauernd hin und her wackelten und ihrerseits wieder ein Wogen des Ganzen bewirkten. [...]
>
> Diese hier und da eintretenden plötzlichen Ereignisse veränderten allmählich die Struktur des Gewebes, das immer verschlungener wurde:[53]

In the composition of *Apparitions* (1958-1959), Ligeti imaged a form like his dreamed net, a space whose contour and interior is shaped and continuously transformed by a inner network of events. *In Apparitions*, Ligeti organizes the material in a static texture of clusters interrupted by impulses of loud events. With each of these irruptions the entire texture shifts its register or changes its timbre and by doing so the contour of the network is reshaped. Movements and changes of the network triggered by the events organize the form without direct causation, because „Dieses Kausalverhältnis ist allerdings nur scheinbar: es ist Element einer bloß fingierten musikalischen Syntax.“[54] This relation between form and space opens the possibility of new non-hierarchical forms, in which form is re-imaged as a succession of textures (*Klangfarbenkomposition*) in time without direct cause-effect relations. In this way, time and space are related. Space becomes the Utopia oriented towards the opening of form and Ligeti imaged this form as an open space constituted by a network of multiple and multidimensional polyphonic layers. The musical work is structured by a myriad of interior micro movements that shape a mass of sound moving and developing as a living organism.[55]

Another approach to a non-hierarchical form is the idea of *Momentform* employed, among others, by Karlheinz Stockhausen. *Momentform* is a compositional technique consisting in a collage of different instances.

53 György Ligeti, „Zustände, Ereignisse, Wandlungen. Über »Apparitions«“, *Melos* 5 (1967): 165–169, p. 165.

54 György Ligeti, „Zustände, Ereignisse, Wandlungen. Über »Apparitions«“, p. 169.

55 Andreas Holzer, *Zur Kategorie Der Form in Neuer Musik*, ed. Manfred Permoser, Reihe Musikkontext 5 (Wien: Mille Tre Verlag, 2011). p. 161.

> Ich will also den Begriff so fassen, daß ich jede durch eine persönliche und unverwechselbare Charakteristik erkennbare Formeinheit − ich könnte auch sagen: jeden selbständigen Gedanken − in einer bestimmten Komposition als Moment bezeichne; [...][56]
>
> Ein Moment kann − formal gesehen − eine Gestalt (individuell), eine Struktur (dividuell) oder eine Mischung von beiden sein; und zeitlich gesehen kann er ein Zustand (statisch) oder ein Prozeß (dynamisch) oder eine Kombination von beiden sein.[57]

According to Stockhausen's use of the concept, moments can have different lengths, they are individual entities, and they can have different types of inner motions, static or procedural. These different moments are connected among each other not by relations of cause and effect but by quantifiable proportions. In its mathematical representation, space is, again, used as the tool for the composition of an open form, in which the different moments relate to each other in a non-hierarchical way.

Beside the use of mathematical proportions to organize structure, at least three other approaches to space can be mentioned with regard to Stockhausen's work. Before the composition of *Kontakte* (1958–1960) and in relation with his article "Musik im Raum," Stockhausen understood space as a fifth musical parameter in addition to the parameters of pitch, duration, dynamics and timbre, and it is as such susceptible to being serialized like the other four parameters. In the tape piece *Gesang der Jünglinge* (1955-1956), Stockhausen tried to serialize space by relating the perceptual distance between source and listener according to the degree of intelligibility of the voices.[58] On the other hand, in *Gruppen* (1955-57) for three orchestras the spatialization of sound sources was used to clarify different structural layers.

> So wurde es zunächst möglich, längere punktuelle Strukturen zu artikulieren, indem man sie im Raum wandern ließ, sie von einem Ort zum andern bewegte. Es ergab sich sogar eine Lösung des Problems, gleichzeitig

56 Karlheinz Stockhausen, "Momentform", *Texte zur elektronischen und instrumentalen Musik*. Bd. 1. (Köln: DuMont Schauberg, 1963): 189-210. p. 200.
57 Karlheinz Stockhausen, "Momentform", p. 201.
58 Enda Bates, "Before and After Kontakte Developments and Changes in Stockhausen's Approach to Spatial Music in the 1960s and 1970s," in *Kompositionen Für Hörbaren Raum*, ed. Martha Brech and Ralph Paland, (Bielefeld: transcript Verlag, 2015): 177-192, p. 180.

> Überlagerungen von solchen punktuellen Strukturschichten durch räumliche Aufteilung verständlich zu machen;[59]

However, after the composition of *Kontakte,* Stockhausen abandoned the serialization of space for another approach that attends to the perception of space. He used movements of sound sources and filters to emulate sound at different distances and in motion.[60] This use is much closer to what later became acousmatic practices in the spatialization and diffusion of sound.

Ultimately, the use of space by Stockhausen is aimed to facilitate an experience for the listener that is different from the classical concert situation. Describing the experience of the audience in the Pavilion for the 1970 World Fair in Osaka, a geodesic construction for concerts with different levels for musicians, public and loudspeakers, Stockhausen reports;

> … what is important is that they went out imitating [tracing with pointing fingers] the movements they had heard, and I was very happy. If you discover something really new, which affects human experience, I mean, there's no discussion, that's just the way it is. All the rest is minor talk about little details. But that was important, it was a new experience.[61]

For the aforementioned composers, form described in terms of space is a strategy to open form while still retaining the identity of the musical work. The use of proportions to organize musical form, as in *Momentform*, allows post-serial composers to systematize the sound material in intelligible ways that go beyond the *Formenlehre*. On the other hand, structure conceived of as a spatial sound mass, as is the case in example by Ligeti, provides an intelligible overall shape to an inner multifaceted movement of voices. In addition, the localization of sound sources in space becomes a means to clarify musical layers and the different sound morphologies of the post-serial music that otherwise would have been impenetrable, as discussed with regard to Stockhausen's

59 Karlheinz Stockhausen, "Musik im Raum", *Texte zur elektronischen und instrumentalen Musik.* Bd. 1. (Köln: DuMont Schauberg, 1963): 152-175, p. 155.

60 Bates, "Before and After Kontakte Developments and Changes in Stockhausen's Approach to Spatial Music in the 1960s and 1970s." p. 184.

61 Karlheinz Stockhausen, "Four Criteria of Electronic Music," 1971, in *Stockhausen on Music: Lectures and Interviews*, Robin Maconie ed. (London: Marion Boyars, 2000): 88-111, p. 104.

work. In both cases, space is intended to organize sound material beyond relations of causation, and by doing so provide a new experience to the listener.

3.1.3. From Spatialization to Openness

Iannis Xenakis's approach to space is multilayered: there is the use of space in the microstructure and in the macrostructure and space is understood as the particular experience of a concrete place.[62]

As an architect and composer, Xenakis represents a unique case with regard to the use of graphical and visual sketches. A level of organization in Xenakis' work is the transformation of graphical spaces into musical experiences. Space is understood in its mathematical dimensions and is as such used as a tool for composition. The dimensions are subsequently translated into the musical space, and organize the microlevel of sound and at the same time the structure of the musical work. The use of diagrams and geometrical space in Xenakis's work render possible the discovery of new sound morphologies like the massive glissandi of *Metastasis* (1953-1954) for orchestra.[63]

In addition, Xenakis enlarged pitch space to a multidimensional musical space by including the four parameters pitch, dynamics, duration and timbre, in which sonic entities are described as points in four dimensions. These parameters are later visualized along another axis, time. The separation of sonic parameters from time allows Xenakis to conceive of sonic structures outside time and opens the possibilities of a stochastic perspective on mass events. This enables the composition of sound masses on the microlevel that later move and develop in this musical space, that is the inner musical organization.[64] This conception, which is particular to Xenakis, constitutes an alternative to the pitch-class centered, post-serial organization of pitches. Furthermore, this virtual multidimensionality of the musical space, although independent and coexistent with the

62 Makis Solomos, "The Complexity of Xenakis's Notion of Space," in *Kompositionen Für Hörbaren Raum*, Martha Brech and Ralph Paland, eds. (Bielefeld: transcript Verlag, 2015): 323-338, p. 323-324.

63 Makis Solomos, "The Complexity of Xenakis's Notion of Space," p. 328.

64 Musical space "Musikalischer Raum" or "Tonraum" refers to the inner musical organization or structure of sound, it is different to the auditory space of sound localization "phänomenaler Raum", Siegfrid F. Nadel, "Zum Begriff des musikalischen Raumes." *Zeitschrift für Musikwissenschaft*, Leipzig 1931, p. 329-331. See also Harley, "SPACE AND SPATIALIZATION IN CONTEMPORARY MUSIC." p. 57.

performance space, opens the possibility of interacting with the physical space. In some of Xenakis's works, the movements in and organization of the musical space serves as the basis for organizing the spatialization of sound sources and the diffusion of sounds in the performance space.

However, space in Xenakis' compositions is not only conceived as geometrical space but also as experience and as place. With the help of the spatialization of sound sources, sound entities are diffused and moved in the performance space. This treatment of space immerses the audience in sound masses and their movements. These masses are perceived differently depending on the position of the listener in relation with the spatialization of sound in the performance space. In the piece *Terretektorh* (1966) for orchestra, the musicians are positioned in concentric circles around the conductor and the listeners are seated among them.

> *Terretektorh* is thus a 'Sonotron': an accelerator of sonorous particles, a disintegrator of sonorous masses, a synthesizer. It puts the sound and the music all around the listener and close up to him. It tears down the psychological and auditive curtain that separates him from the players when positioned far off the pedestal, itself frequently enough placed inside a box. The orchestral musician rediscovers his responsibility as an artist, as an individual.[65]

Depending on their position in relation to each individual instrument, each listener has their own unique experience of the work. Spatialization and the movements of sound among the instrument and in the musical space open the experience of *Terretektorh* for the listener.

Moreover, Xenakis further enhanced the potential for perceptual diversity of the pieces with the *polytopes*, an architectural construction that hosts, but is also part of the musical event. As its name suggested a *polytope* offers numerous (*poly*) places (*topos*). It is a construction structured by multiple shapes that creates different spaces in its interior. The polytope is open for the audience to wander in it, and due to it's structure it allows for the emergence of a multiplicity of experiences for the listener. This is, for example, the case with regard to the *Diatope*, a construction at the Pompidou Center in

65 Iannis Xenakis, *Formalized Music: Thought and Mathematics in Composition*, ed. Sharon Kanach, Rev. ed, Harmonologia Series 6 (Hillsdale, NY: Pendragon Press, 1992), p. 237

Paris built for the performance of the composition *La Légende d'Eer* (1977-1978). In the program notes, Xenakis explained the kaleidoscopic experience of the piece:

> Music is not a language. Every musical piece is like a complex rock formed with ridges and designs engraved within and without, that can be interpreted in a thousand different ways without a single one being the best or the most true. By virtue of this multiple exegesis, music inspires all sorts of fantastic imaginings, like a crystal catalyst. I, myself, wanted to deal with the abysses that surround us and among which we live. The most formidable are those of our own destiny, of life and death, of visible and invisible universes. The signs that convey these abysses to us are made up of lights and sounds that provoke our two predominant senses. This is why I have conceived the *Diatope* as a place for the condensation of these signs and signals from our various worlds. Rational knowledge blends with intuitive knowledge, or revelation. It is impossible to dissociate them. These abysses are unknowable; that is to say, knowledge of them is an eternal and desperate search, composed of milestones or hypotheses that have marked our various epochs.[66]

La Légende d'Eer does not try to evoke a univocal understanding, it is rather an event of sound and light open to interpretation. All the spatial strategies in *La Légende d'Eer* – the construction of the musical space, the spatialization of sound sources, the diffusion and movements of sound masses in the *Diatope* and the free circulation of listeners in the construction – enable the multiplicity of meanings. For me, the work also reveals a new form of knowledge, different from "rational" knowledge. Rather than a proclamation of fixed certainties, I understand this new form of knowledge as an open search by the listener and the composer.

Similarly, Luigi Nono explored the idea of opening the meaning of the musical event. However, while the implications of an open understanding through the use of space are similar in Xenakis and Nono, the strategies were significantly different since Nono emphasized the theatrical and dramatic use and function of spatialization.

Nono used space as a compositional tool in order to fragment the musical event. In his early pieces employing spatialization, such as *Intolleranza* (1960), *La Fabbrica Illuminata* (1964) or *A floresta é jovem e cheja de vida* (1966), but to some degree also in his creative output from the 1980s when he often worked at the Experimentalstudio

66 Iannis Xenakis, *Music and Architecture: Architectural Projects, Texts, and Realizations*, ed. Sharon E. Kanach, The Iannis Xenakis Series, no. 1 (Hillsdale, NY: Pendragon Press, 2008), p. 261

in Freiburg, loudspeakers are used as individual sound sources.[67] In contrast to common diffusion techniques of acousmatic music, the loudspeakers in Nono's works are understood as singular sound sources, as individual actors. The sound sources surround the listeners and immerse them in the sound material. By doing so, the listener is not confronted with all sounds at the same level or with the same clarity, but rather hears fragments. This fragmentation created by the spatialization reinforces the compositional structure of montage and, in the case of the production with voices, also the decomposition of texts into phonemes. The listener is then asked to collect these fragments in an active listening experience and create their own meaning of the sound event.[68] In this sense, the act of communication is also democratized. Communication is not a unilateral stream from composer to listener, but it is rather a co-participation and co-agency shared by composer and listener in the production of a whole from selected fragments.

In this way, space creates meaning, and is as such used as a dramatic means, as an expressive tool. Nono was influenced by Meyerhold's and Piscator's concepts of space of "total theater",[69] in which there is no separation between stage and audience.[70] The audience in Nono's work is immersed in sound and in its movements. By doing so, the musical work breaks the linearity of perspective of the listener which implies a democratization of the musical experience in step with an equality in social structures.

Moreover, sounds are not static, they rather move due to the movements of singers and the movements between speakers, and during the live-performance of *Prometeo* with the use of the *Halaphon*[71] developed by the SWR Experimentalstudio. The experience of the piece changes as well with these wandering sounds in space.

67 See Andrea Santini, "Multiplicity – Fragmentation – Simultaneity: Sound-Space as a Conveyor of Meaning, and Theatrical Roots in Luigi Nono's Early Spatial Practice," *Journal of the Royal Musical Association* 137, no. 1 (May 2012): 71–106.

68 Santini, "Multiplicity – Fragmentation – Simultaneity." p. 94.

69 References of Meyerhold and Piscator in Luigi Nono, "Notizen zum Musiktheater Heute" 1961, 61-67, p. 66 or in "Spiel und Wahrheit im Neuen Musiktheater", 1963, 82-86, p. 85 in: *Luigi Nono: Texte, Studien Zu Seiner Musik*, ed. Jürg Stenzl (Zürich: Atlantis, 1975).

70 Christina Dollinger, "Raum in Luigi Nonos 1° Caminantes ... Ayacucho (1987)," in *Kompositionen Für Hörbaren Raum*, ed. Martha Brech and Ralph Paland (Bielefeld: transcript Verlag, 2015): 282-302, p. 289. Also Santini, "Multiplicity – Fragmentation – Simultaneity," p. 74-75.

71 The *Halaphon* is an analogue device for the live performance of sound in space developed in the SWR Experimentalstudio by Peter Lawo und Hans-Peter Haller during the 70s and 80s.

Sound movements are not trajectories to follow but rather open fields in which the listener creates their own paths.[72] Nono described it in the following terms:

> Diese Ping-Pong-Auffassung, bei der die Musik von rechts nach links und von links nach rechts wechselt, wie der Ball beim Ping-Pong-Spiel, und alles sich im Effekt auflöst, ist meiner Musik fremd. Ich setze den Klang räumlich zusammen durch die Benutzung verschiedener, im Raum getrennter Ausgangspunkte. Diese Vorstellung wird mir auch als Grundlage für die Verwirklichung eines neuen Musiktheaters dienen, das ich plane[73]

The listener does not follow the movements of the sound traced by the composer. They rather actively explore the sound from within and in this exploration create their own paths, as in the Machado poem that inspired Nono's serie of *caminantes* – "*caminante no hay camino, se hace el camino al andar.*"[74]

Loudspeakers are not only used as single sources or as a means to diffuse sound, but also they are positioned in unorthodox ways, on the stage as actors – like in *A floresta é jovem e cheja de vida* – or facing the wall or the ceiling and away from the audience for dramatic purposes. In *Die Ermittlung* (1965) one of the speakers distributed in the hall is placed under the floor on which the audience is located. It diffuses loud, low tones to create a violent earthy sound that emphasizes the texts used in the piece, an account of the Holocaust.[75] An extensive dramatic use of the positioning of speakers can also be found in *Prometeo* (1984). Different speakers are facing the walls and are even located under and behind the *arca* – the construction created by Renzo Piano for the premiere of the piece – to create an effect of sounds without a clear source and from a great distance – *lontanissimo*.[76] Space thus creates a dramaturgy and becomes a provider of an inherently musical meaning especially in pieces for voice in which texts are fragmented.

72 Christina Dollinger, "Raum in Luigi Nonos 1° Caminantes ... Ayacucho (1987)." p 299-300.

73 Luigi Nono, "Diario Polaco '58" (1958) in: *Luigi Nono: Texte, Studien Zu Seiner Musik*, ed. Jürg Stenzl (Zürich: Atlantis, 1975): 123-125, p. 124.

74 "traveler, there is no path, you make the path as you walk," Antonio Machado, "Proverbios y cantares" XXIX in *Campos de Castilla*, 1912 (my translation).

75 Santini, "Multiplicity – Fragmentation – Simultaneity." p. 88 – 90.

76 Martha Brech and Henrik von Coler, "Aspects of Space in Luigi Nono's Prometeo and the Use of the Halaphon," in *Kompositionen Für Hörbaren Raum*, ed. Martha Brech and Ralph Paland (Bielefeld: transcript Verlag, 2015): 193-204, p. 202-203.

Another important dimension of space in Nono's work are the specific acoustics of places. Nono was very particular with regard to the performance spaces and preferred spaces with no division between audience and stage and with unusual acoustics. However, the semantic dimension of the specific places, their history, are also taken into consideration. Factories – *La Fabbrica Illuminata* – stadiums – *Ricorda cosa ti hanno fatto in Auschwitz* – or churches – *Prometeo* – with their distinctive acoustics and history are preferred over conventional music theaters. In the diffusion of electronics, vocal and instrumental sounds, Nono adapted the interpretation of the piece to the hall. The acoustics, size and characteristics of the place were considered and, as a result, the dynamics of singers and musicians and the capacity of loudspeakers were adjusted to the place. The unique acoustics of the place are emphasized in the interpretation of the musical work and sound diffusion instead of trying to neutralize them. As a result, the pieces are context and space dependent and in a way site-specific.[77]

3.1.4. Sound Phenomena in Place

Although the European avant-garde was aware of the site-specificity of spaces and in the cases of Xenakis and Nono integrated it into their works, most composers of *Raummusik* – Pierre Boulez, György Ligeti, Karlheinz Stockhausen – limited their explorations of space to using geometrical space as a tool for composition and the generation of structure. In contrast, during the late 1960s and 1970s composers in the USA – due to the influence of performance art and environment and land art – explored the concept of space as place. Important for the development of this idea was also John Cage's collaboration with Merce Cunningham, – *Theater Piece No.1*, (1960) or *Variations V* (1965) – in which the musical performance was decentralized by creating multiple foci of attention for the listener. As a result of all these influences and experimental practices, the concept of site-specificity gained importance among experimental composers.[78] Through sounds composers explored the acoustics and characteristics of concrete performance spaces and in many of these experiments place became a co-author of the musical work.

77 Santini, "Multiplicity – Fragmentation – Simultaneity." p. 105.
78 Harley, "SPACE AND SPATIALIZATION IN CONTEMPORARY MUSIC." p. 169.

In her earliest activity as a performer, Pauline Oliveros became aware of the influence of spaces on sound and of the ways in which the performer modifies their interpretation accordingly.[79] Later, as performer-composer Oliveros developed her awareness of the influence of acoustics of the performance space by means of her practice of "Deep Listening."[80] The qualities of the hall and its characteristics of reverberation and dryness were explored by listening and playing. During the 1960s, Oliveros started experimenting with the idea of real places in combination with the creation of virtual spaces via electronics, first with tapes and then by modifying instruments in live-performance with MIDI-controlled delay processors. In Oliveros' practice, space in relation with sound is conceived of as reverberation, that is, as the different reflections of sound in space. By means of using different delays and feedback, like in *The Bath* (1966) for Dancers Workshop, or *Bye, bye Butterfly* (1965) for fixed media, Oliveros recreates the reflections of sound in a virtual space.[81] By creating virtual spaces with delays Oliveros connected the two dimensions of time and space in her practice.

A different exploration of the phenomenon of sound in space is the work *Dream House* (1969), a sound and light installation by La Monte Young and Marian Zazeela.[82] La Monte Young arranged 32 sine waves in different intervals and chords that are continuously played without changes. When they are in harmonic relation with the room modes of a specific space, sine waves are allowed to vibrate with very little energy loss – they are standing waves. As a result, the nodes – moments of the cycle when the amplitude is zero – and antinodes – those moments of the cycle in which the amplitude is at its maximum – of the standing waves are distributed spatially in the room. In the spots in the room which coincide with the wave antinodes, the sound becomes louder, in

79 Pauline Oliveros, "Acoustic and Virtual Space as a Dynamic Element of Music," *Leonardo Music Journal* 5 (1995): 19 -22, p. 19.

80 Julia H. Schröder, "»Compare to Other Spaces, Real or Imagined« (Pauline Oliveros 1969) Acoustic Space in North American Experimental Music of the Late 1960s," in *Kompositionen Für Hörbaren Raum*, ed. Martha Brech and Ralph Paland (Bielefeld: transcript Verlag, 2015): 221-233, p. 228-229.

81 Pauline Oliveros, "Acoustic and Virtual Space as a Dynamic Element of Music." p. 20.

82 See Jeremy Neal Grimshaw, *Draw a Straight Line and Follow It: The Music and Mysticism of La Monte Young* (Oxford: Oxford University Press, 2011) and William Duckworth and Richard Fleming, eds., *Sound and Light: LaMonte Young, Marian Zazeela*, Bucknell Review, 40,1 (Lewisburg, Pa: Bucknell Univ. Press [u.a.], 1996).

resonance with the space, while at the spots corresponding to the nodes the sine wave is almost imperceptible. As La Monte Young writes:

> When a continuous frequency is sounded in an enclosed space such as a room, the air in the room is arranged into high and low pressure areas. In the high pressure areas the sound is louder, and in the low pressure areas the sound is softer. Since a sine wave has only one frequency component, the pattern of high and low pressure areas is easy to locate in space. Further, concurrently sounding sine waves of different frequencies will provide an environment in which the loudness of each frequency will vary audibly at different points in the room, given sufficient amplification. This phenomenon can rarely be appreciated in most musical situations and makes the listener's position and movement in the space an integral part of the sound composition.[83]

In contrast to Oliveros' work, space is here not the result of delays, but rather the result of a static time. Since the sine waves always remain unchanged, time is erased from the sound work. The entire temporal development and structure of the installation is therefore left to the listener's exploration of the "house". The musician Ed Howard writes about the experience in the Dream House:

> … though the music itself stays constant no matter how long is spent inside the House, the sound's relationship to its listeners can change drastically with the slightest movements.
>
> The only time the music remains stable is when the listener is completely still: the low drones culminate in a dense jackhammer cloud as they cross over each other, forming complex rhythms. However, just slight changes in posture completely alter the sound field. Different higher pitches appear as you move your head; by rocking slowly back and forth, you can create a hypnotic two-note melody as the high tones shift and spin dizzyingly. Towards the center of the main room, the drones are thickest and lowest, while around the perimeter of the room the sound tends to be airier, dominated by chattery high-end whine.[84]

The different wavelengths and their relations are distributed in space and open to the listener to be explored. With their movements, the listener encounters the different patterns of diffraction between the different sound waves – and the light waves of

83 La Monte Young and Marian Zazeela, *Selected Writings* (ubu classics, 2004). p. 11.
84 "Mela Foundation," accessed November 20, 2020, https://www.melafoundation.org/Howard_03.htm

Zazeela's part of the installation. By searching the space, the listener becomes the co-author of the aesthetic experience that is the *Dream House*.

A famous example of an artistic exploration of room modes is the work *I am sitting in a room* (1969) by Alvin Lucier in which the sound material and the musical development are derived from the reinforced room modes of a concrete space.[85] The score of *I am Sitting in a Room* is a text, a recording of which is at the same time its sound material, instructions and a description of the compositional process. The text is read in a room and recorded, the record is played back in the same room and recorded again. By repeating this process sixteen times, the frequency components of the voice that are in harmonic relation with the room are reinforced in every iteration of the process, while the sound of the speech is smoothed out and disappears. Incidentally the artifacts produced by the recording technology used in the piece, the microphones and the tape recorders are also reinforced in the process. Nevertheless, what is uncovered in the process are the room modes of the concrete place. Lucier describes the process in the following way:

> All the components of my speech that related to the physical dimensions of the room are reinforced; those that don't, disappear. Think of yourself singing in the shower. You instinctively find the resonant frequency(-ies) of the small space you are in. Your voice sounds rich because it reinforces itself.
>
> While the procedure of the work was repetitive, the rate of change of the resonance went at its own speed. I was careful not to influence the results in any way. I didn't raise or lower volume levels on purpose to make the process go faster or slower. I did have to carefully monitor the levels, however, in order to keep the recording from distorting or getting too soft. I did this minimally. I wanted the room to do the work.[86]

The concrete place of the room and its room modes are not only the material of the piece but also the co-author of the sound work. The speech triggers the place's agency

85 Relevant to Alvin Lucier's piece are the original Polaroid image sequence by Mary Lucier based on Alvin Lucier's recording process. The images are a series of augmentations and transformations of a shoot of the room and chair Alvin Lucier used while recording his text, 1969. accessed 14 April, 2021 https://vimeo.com/392524425.

86 Alvin Lucier, *Music 109: Notes on Experimental Music* (Middletown, Connecticut: Wesleyan University Press, 2012). p. 90.

and the emergence of the sound material. The musical work is the revealing of what is normally hidden, the influence of space on sound.

Many of Lucier's works are concerned with the phenomenon of sound in space and with the singularity of places.[87] A year before *I am sitting in a room*, Lucier composed *Vespers* (1968), a sound work for players with echolocation devices. The players are in a darkened room, which they explore by means of the pulses emitted by the devices. The shape of the room, the furniture and objects in the room, the movements of the players in their navigation of the space trigger the sound of the devices and together create a polyphony in space that gives the audience "an acoustic signature of the room, as if one were taking a slow sound photograph over a long period of time."[88]

Chambers (1968) also explores the phenomenon of sound being shaped by the concrete place in which it is produced. The score of *Chambers* consists of two lists, one of resonant objects and a second one of different ways to make the objects sound. The objects can be played, but recordings can also be played within them. Sounds that are recorded in a specific environment are detached and played in an entirely different and smaller resonant space. The recordings are shaped and transformed by the acoustic characteristics of the objects. Depending on these objects some frequencies are reinforced while others are filtered, thus shaping the sound in different ways.[89]

Space and site-specificity have also been central topics of Maryanne Amacher's work. In the different iterations of *City-Links* – beginning in 1967 – live recordings of different cities or of several places in the same city were broadcast and mixed live in another location. By doing so, the sounds of different places were played and mixed in an entirely different environment. Amacher deeply explored the idea of site-specificity in the *Sound-joined Rooms* series. In the first piece of this series, *Living Sound: Patent Pending* (1980), an entire house – an old Victorian house on a hill in Minneapolis –

87 See Alvin Lucier, *Reflections: Interviews, Scores, Writings = Reflexionen: Interviews, Notationen, Texte*, ed. Gisela Gronemeyer and Reinhard Oehlschlägel, trans. Gisela Gronemeyer, 1. Aufl, Edition MusikTexte 003 (Köln: MusikTexte, 1995).

88 Alvin Lucier, *Music 109: Notes on Experimental Music*. p. 87.

89 Alvin Lucier and Douglas Simon, *Chambers: Scores by Alvin Lucier. Interviews with the Composer by Douglas Simon* (Middletown, Conn: Wesleyan Univ. Pr, 1980), p. 1-14.

becomes the resonator of the musical work and in this way, the building shapes the timbre and nature of the sounds. For *Living Sound*, Amacher used unconventional placements for the loudspeakers – directly facing the walls or floor – in order to send sound through the solid medium of the building before it could circulate in the air. Sound thus becomes structure-borne instead of airborne, the architecture of the installation itself, the physical medium of the work. The structure and materials of the building shape and color the sounds as they propagate through them, creating multiple overlapping acoustics. As a result, the sound is not distributed in the room, but rather the entire room itself resonates.[90] The listener is immersed in the sound instead of viewing it from a "safe" distance. The room is not an abstract place in which the sound event takes place in a controlled environment, but the specific place, the isolated house on the hill is the sound event itself.

3.1.5. Response to the Music Experiences of the 1960's and 1970's

My approach resonates with the work of composers of *Raummusik* and experimental music from the 1960's and 1970's. Konrad Bohemer wrote about the openness of form through space:

> Die Komposition komplexer, vieldeutiger Formen, in denen ein Netz von Beziehungen alle Elemente miteinander in Verbindung bringt [...] Den mobilen Werken müssen mobile Formen der Wahrnehmung entsprechen, und dazu sind neue *Hör*bedingungen und neue *Raum*bedingungen erforderlich.[91]

90 "The Maryanne Amacher Foundation – Blank Forms," accessed November 30, 2020, https://blankforms.org/the-maryanne-amacher-foundation/. See also Maryanne Amacher, "Psychoacoustic Phenomena in Musical Composition: Some Features of a 'Perceptual Geography,'" *FO(A)RM* 3 (2004), accessed November 30, 2020, http://www.sonami.net/Articles/Amacher-OAE.pdf, the interview Maryanne Amacher, "Extremities: Maryanne Amacher," interview by Frank J. Oterion, May 1, 2004, accessed November 30, 2020, https://nmbx.newmusicusa.org/extremities-maryanne-amacher-in-conversation-with-frank-j-oteri/. Unfortunately, little is published on or by Amacher except for the work of Amy Cimini "Telematic Tape: Notes on Maryanne Amacher's City-Links (1967–1980)," *Twentieth-Century Music* 14, no. 1 (February 2017): 93–108. "In Your Head: Notes on Maryanne Amacher's Intelligent Life," *The Opera Quarterly* 33, no. 3–4 (December 31, 2017): 269–302, and a biased article by Paul Kaiser, "The Encircling Self: In Memory of Maryanne Amacher," *PAJ: A Journal of Performance and Art* 36, no. 1 (January 2014): 10–34. In 2020 has been published *Maryanne Amacher: Selected Writings and Interviews*, in which Amy Cimini and Bill Dietz selected a compilation of Amacher's unpublished texts and interviews.

91 Konrad Boehmer, *Das Böse Ohr: Texte Zur Musik* 1961-1991, ed. Burkhardt Söll, DuMont Dokumente (Köln: DuMont, 1993). p. 83.

However, my approach differs from the one of *Raummusik* with regard to the compositional strategies and nature of the sound material. More than half a century later, the questions and problems of today differ from those of post-serial composers and American experimentalism. Questions of identity, feminism, ecology, and the object's agency, although present in the 1960s and 1970s, were not relevant to the reality and compositional practice of some of the composers mentioned above. Hence, my approach is influenced and informed by these topics, but it also diverges from post-serial and American experimental composers in the conception of form and space, and with regard to the role of the composer, material, and the listener.

Regarding the description of my compositional strategies and concepts, they will occupy the next chapter of this dissertation. However, it is important to mention two main points in which my approach differs from the avant-garde positions presented in this section.

During the 1960s and the 1970s openness was achieved in addition to the aforementioned uses of space through the use of open scores or improvisation. The musical work offers multiple experiences in different moments, through its different reiterations in time. On the contrary, my approach provides multiple simultaneous experiences through a localized network of materials and relations.

In the tradition of experimental music, and influenced by John Cage, there was an implicit critique of the ideological figure of the composer and of their relation with the sound material. This is a discussion that is not yet exhausted and in light of questions of identity and feminism it needs to be rethought. In addition, in their compositional practice most of the composers of this period do not put in question the figure of the composer. The subject-composer still acts on a passive sound material-object.

3.2. Contemporary Music

Musical composition and sound art have been influenced by different understandings of space from other disciplines, such as theater studies, dance, visual arts, and design.

Since the 1960s new spatialization techniques have been developed as well as new ways of sound diffusion by electronic and digital means and new understandings of space as social spaces, public spaces, spaces of embodiment, and virtual spaces have been formulated. In addition, the popularization and development of virtual spaces and social media have influenced the way we socialize and understand ourselves. All these experiences, technologies and understandings stemming from composition, electronic music and sound art have shaped current practices and conceptions of work, form, space and performance.

In this section, I will describe, exemplify, and review what I think are the most important uses and understandings of spatialization in contemporary more recent compositions. Later on, I will relate them to my own approach. I am aware that there are more uses and understandings of space in contemporary music, which are not considered in this description. Instead of providing an extensive survey of approaches, I decided to focus only on the approaches that directly influence or are relevant to my compositional work and this project. Since the goal of ambisonics is to render a unique perception of the sound experience – which is opposite to the goal of this project – I limited my discussion of this technology to a few pertinent aspects. In the same way, in the section on Sound Art, I limit the discussion to examples that resonate with my practice instead of summarizing the well-known practice of artists like Brandon LaBelle or Christina Kubisch. These examples subscribe to concepts and topics of sound art regardless of the classification by their makers as composition or as sound art and regardless of the artist's identification as sound artist or as composer.[92]

The different uses of space that I regard as currently most prevalent in contemporary music can be described as:

3.2.1. The use of space as a resonant instrument – prevalent in the instrumental music for ensemble or orchestra of the last twenty years (e.g. Rebecca Saunders, Beat Furrer, Mark André, Chaya Czernowin)

92 For a discussion of the fissure and relation of music and sound art see Thomas Gardner and Salomé Voegelin, eds., *Colloquium: Sound Art and Music*, (Winchester: Zero Books, 2016).

3.2.2. The staging of space of *Musiktheater* (e.g. Carola Bauckholt, Manos Tsangaris, Elena Mendoza, Daniel Ott)

3.2.3. Musical works that aim to render visible social spaces (e.g. Cornelius Cardew, Mathias Spahlinger, Jennifer Walshe)

3.2.4. The recreation of virtual spaces in electronic music through convolution or ambisonics techniques (e.g. Denis Smalley, Natasha Barret)

3.2.5. The concepts of place and site-specificity from sound art and sound installations (e.g. Agostino di Scipio, Cathy van Eck)

3.2.1. Space as Resonant Instrument

In the last twenty years, there have been several experiences in composition that use the localization or movements of sound sources beyond the stage, having in common the use of the performance space as a resonance space and the understanding of a concrete hall as a resonant instrument. Space is used as a possible means to shape timbre. This approach can be traced back to the work of Luigi Nono in the 1980s at the SWR Experimentalstudio and to his excitation of space with sound. Recent pieces that follow this premise are for example Isabel Mundry's *Penelopes Atem* (2003) for mezzo-soprano, accordion and orchestra groups or *Fama* (2005), *Hörtheater* for big ensemble, eight voices, actor and acoustic construction[93] by Beat Furrer, but also works by Chaya Czernowin, Marco Stroppa, Mark André, Rebecca Saunders, or from a younger generation Turgut Erçetin[94] just to mention a few.

Turning space into a resonant instrument is achieved through different compositional strategies, which include the localization of musicians or sound sources to excite the performance hall, the partial or total immersion of the audience into sound, and the recreation of specific spaces through modifications of the spatial structure or

93 Beat Furrer, *FAMA* Interview with Bear Furrer, interview by Arthur Schnitzler, accessed November 13, 2020, https://www.swr.de/swrclassic/donaueschinger-musiktage/article-swr-2510.html.

94 However, the case of Turgut Erçetin is a bit more complex, since he also uses space as structure and as a means to generate material. For example, in *Resonances* (2014) for five wind instruments, Erçetin plotted the data of the acoustic characteristics of the instruments and their projection in space into several matrices to generate both the material and structure of the piece. Accessed November 13, 2020, https://www.youtube.com/watch?v=wb4n_zgpTaU.

through electronic means. These strategies achieve the modification of the resonances of instruments in real-time and with it their timbre. Hence, space in these musical works colors timbre and becomes an expressive tool. On the other hand,this approach stimulates the audience's perception of space in unexpected ways. Different experiences of the work arise depending on the position of the listener in relation to the instruments and the sound sources.

In Furrer's *Fama*, in addition to using different positionings and movements of sound sources, a structure of different panels was created to modify the performance space. A reflecting material covers one side of each panel of the structure while a damping one covers the other side. The whole construction separates the ensemble and the audience. By manipulating the panels of the structure, the sound of the musicians and the singers is filtered and reflected and its resonances are modified. Space becomes a big resonant instrument whose timbre can be transformed by moving the panels and musicians. Furrer describes the structure:

> Ja, das Gebäude ist eigentlich nichts anderes als ein Instrument, und seine Resonanz funktioniert im Prinzip ganz ähnlich wie das Mundstück eines Blasinstruments oder der Korpus eines Streichinstruments. Es ist ein einziger großer Transformator des Klanges, ein Resonator, ein Meta-Instrument. Wir haben die beiden Seiten der Klappen, die sich öffnen und schließen lassen wie beim Schwellwerk einer Orgel, die man aber auch um 180° drehen kann, unterschiedlich beschichtet, die eine Seite mit einer Metallschicht – wie das Erz beim "Haus der Fama" –, die den Klang ganz direkt reflektiert, die andere Seite mit einem speziellen Kunststoff, der den Klang trocken, aber gleichzeitig ganz präsent macht. Überhaupt wichtig war mir die klangliche Präsenz, die Plastizität.[95]

The structure enables Furrer to shape timbre during the performance of the piece. The structure becomes a meta-instrument and space, an expressive tool that creates different spatial perceptions. The structure, visually but also sonically enables or hinders, enhances or muffles the listeners' perception of the sonic event and of the performance space – during its premiere in the *Baar-Sporthalle* in Donaueschingen.

95 Beat Furrer, *FAMA* Interview with Bear Furrer.

Another example of this approach is … *auf III* … (2007) by Mark André for orchestra and electronics.[96] In this piece, André engages with the acoustic phenomena of impulse and resonance. The orchestra is situated on the stage while six percussionists and eight loudspeakers are placed around the audience. The live electronics created by the SWR Experimentalstudio mainly use convolution, combining two audio signals into a new one in which common frequencies are reinforced. This is similar to the way in which an acoustic space affects a sound impulse. André uses the orchestra instruments as impulses while the electronics recreate different resonances, thus creating different virtual spaces. In his program notes, Mark André writes:

> Die Raumdisposition der Schlagzeuger um das Publikum herum und die konsequente Entwicklung einer Typologie von Impulsen und Antworten machen die Musik transparent. Es geht um die Entwicklung eines gesamten Klangkörpers,[97]

Together the real – the performance space – and the virtual spaces – recreated by the electronics – constitute an interstice, "die Entwicklung von Zwischenräumen,"[98] a resonant instrument that changes during the course of the piece. The compositional idea of attack and resonance is supported and emphasized by the instrumental gestures and by the use of convolution in the electronics.

In her opera *Infinite Now* (2015-2016), Chaya Czernowin also uses electronics and the localization of sound sources as a way to recreate different spaces. However, in the case of her work, and especially in the opera *Infinite Now*, her use of spatialization has a strongly dramatic component. Czernowin creates expressive sensations of proximity or distance through the spatialization and diffusion of sound by means of loudspeakers and the use of different dynamic levels.[99] Several loudspeakers surround the audience in the opera hall, while the singers and the orchestra remain in their usual places on the stage and in the orchestra pit. The speakers amplify the sound of the

96 Mark André, "Program notes '...auf... III,'" swr.online, accessed May 3, 2019, https://www.swr.de/swrclassic/donaueschinger-musiktage/Werke-des-Jahres-2007,article-swr-3884.html.
97 Mark André, "Program notes '...auf... III.'"
98 André, "Program notes '...auf... III.'"
99 Eva van Daele, "ABOUT THE MUSIC IN INFINITE NOW Over de muziek in Infinite Now," in *Programmaboek Infinite Now*, ed. Luc Joosten (Antwerpen: Opera Vlaanderen, 2017), 39–42.

singers and the musicians but also diffuse electronically produced sounds and recordings. With these means, Czernowin builds sound landscapes that move, expand and shrink, and by doing so create a claustrophobic atmosphere for the audience.[100] Sound landscapes immerse the audience in a static surface without development or clear direction, which creates a sensation of atemporality, an abolition of time. Space appears in this context as what remains after the abolition of time reinforcing the idea of an infinite moment, the *Infinite Now*. Exactly this infinite tense waiting is one of the themes of the opera. The libretto uses texts from different sources: the short story *Homecoming* by the writer Can Xue, and the play *Front* by Luk Perceval based on *All Quiet on the Western Front* by Erich Maria Remarque, and on letters by soldiers from the First World War. These texts describe a state of desperation and an uncanny state of suspension, which the use of space and electronics re-creates and reinforces. Czernowin explains this dramatic effect of space in her program notes:

> Imagine that the hall, the whole space of the hall, is the inside of a head/heart/body. The audience is immersed in the working of the head/heart/body of a person who finds themselves in a difficult or hopeless situation, a person who is struggling to find their footing. The hall becomes an acoustic space where the outside is reacted upon, digested, dreamt, in an attempt to figure it out, and to survive.[101]

Instead of a Cartesian space, or an acoustically recreated physical space as in André's piece, the space in *Infinite Now* is clearly a perceived space. It is the re-creation of the perception of a space in a stressful situation. Space in *Infinite Now* is an oppressive *unheimlicher éspace vécu*.

3.2.1.1. Response to "Space as a Resonant Instrument"

In this approach, there is little margin for ambiguity in the understanding of the pieces. Spatialization is primarily used to modify timbre and not to offer different meanings to the listener. The recreation of spaces via convolution, as in the example by Mark André, or with spatialization of sound sources and modification of the actual space, as in the piece by Beat Furrer, change the timbre during the performance but not the meaning.

100 Van Daele, "ABOUT THE MUSIC IN INFINITE NOW Over de muziek in Infinite Now."
101 Chaya Czernowin, "Infinite Now," Chaya Czernowin, accessed November 13, 2020, http://chayaczernowin.com/infinite-now.

The spatialization of the percussionists in Mark André's piece reinforces a single unequivocal meaning, after the attack a resonance is expected. While the expressive content and dramaturgy provided by the use of diffusion and spatialization in the works by Chaya Czernowin or Beat Furrer, although susceptible to be interpreted by the listener, is intended to be understood in an unequivocal way. The listener will have different acoustic experiences during the course of the piece depending on their position, but a single possible understanding of it is presented, the one intended by the composer. This is not problematic in itself, but it is contrary to the aim of my investigation. Although in my practice I use the performance space as a resonant instrument, I aim to open the perception of the work and its understanding.

3.2.2. Staging Space ("Rauminszenierung")

The dramatic use of spatialization in Czernowin's opera connects with the second use of space that I see in contemporary music, that is the use and understanding of space in *Musiktheater*. Musical composition and sound art have been influenced by notions and uses of space developed by other disciplines, such as theater studies, dance, visual arts, and design. *Musiktheater* reflects this interdisciplinary influence. The work of Dieter Schnebel, *Maulwerker*, Mauricio Kagel, George Aperghis, Carola Bauckholt, or Manos Tsangaris explore the connection between visual elements, semantics, physical movements and sounds in non-hierarchical ways. In all these experiences there is an implicit idea of space as bodily presence. Space is understood as the place created by the physicality and movements of actors, musicians and performers. This conception goes beyond and criticizes the abstract concept of Euclidean space.[102] The work of the composer Elena Mendoza and the stage director Matthias Rebstock is an example of this approach. They propose a phenomenology of listening and a staging of listening that can be described as a spatialization of sound sources and movements of actors and musicians that emphasizes dramatic action and semantic content. Their last collaboration has been the *Musiktheater Der Fall Babel* (2016-2019) for choir of twelve

102 Matthias Rebstock, "Im Fluchtpunkt der Sinne : Musiktheater als Arbeit an einer Phänomenologie des Hörens" in *Macht Ohnmacht Zufall: Aufführungspraxis, Interpretation Und Rezeption Im Musiktheater*, Christa Brüstle, Clemens Risi, and Stephanie Schwarz, eds., Recherchen 87 (Berlin: Theater der Zeit, 2011): 172-182.

singers, two actors and three percussionists. *Der Fall Babel* uses texts from Yoko Tawada's novel *Biskoop der Nacht*, Cécile Wajsbrot's text "W wie ihr Name / Avec un double V" and Fabio Morábito's "Los Vetriccioli" and "Por qué traducimos". All these texts engage with language in one way or another, still they share the idea of the richness of the different languages. The texts explore the polysemic and abstract nature of language and how the structure of each language refers to a different specific reality, a different form of knowledge.[103] The plot of *Der Fall Babel* is based on an image from Fabio Morábito's essay "Por qué traducimos", Fabio Morábito describes a monolingual, culturally completely impoverished human society that exists in the distant future and that looks back to our culturally diverse present. Elena Mendoza and Matthias Rebstock employ this idea of reversing the myth of the Tower of Babel in defense of cultural diversity. The texts of this *Musiktheater* piece are in different languages. The use of space and music reinforces the idea of plurality and ambiguity. The stage is an open structure without walls and with several asymmetric levels and platforms. The stage thus forms an open structure, the performative space is thereby formed by the position and movements of the singers, actors and percussionists. In addition, the stage rotates on its own axis. The result is an open kaleidoscopic space that in its movements shows its different facets.[104] In *Der Fall Babel*, there is a spatialization of musicians and singers, but also a musicalization of their actions and movements. There is a staging of space, movements of musicians and even of the stage itself. The spatialization thus reinforces plurality as the theme of the work and adds another semantic layer to the already multilayered experience.

The composer Daniel Ott transports the aesthetic experience outside the music hall. Ott activates industrial spaces or landscapes with the movements and positioning of musicians and the audience. In Ott's work, space is a found place, which is not only constituted by its dimensions but rather by its historical and cultural characteristics and the people that interact with it. This is clearly the case of the piece *Hafenbecken I & II:*

103 Suzanne Benda, „Schwetzinger Festspiele: Uraufführung: Musiktheater *Der Fall Babel*", *stuttgarter-zeitung.de*, April 29, 2019, sec. Kultur, https://www.stuttgarter-zeitung.de/inhalt.schwetzinger-festspiele-urauffuehrung-musiktheater-der-fall-babel.fee76eaa-2fde-4f8f-8f66-78c1e281fc4b.html.

104 Preview of *Der Fall Babel* (2016/2019), Musiktheater, Elena Mendoza, accessed December 1, 2020, https://www.swr.de/swrclassic/schwetzinger-festspiele/Preview-Der-Fall-Babel-Neu,av-o1114336-100.html

Umschlagplatz Klang (2005-2006) co-composed with the director Enrico Stolzenburg, the costume designer Angela Zimmermann and light designer Michael Göock for the industrial harbor in Basel and 68 musicians from the Basel Sinfonietta.[105] The concrete space of the harbor is full of history – it is a frontier point between Switzerland, France and Germany – and relevant for the city of Basel. The compositional process for the piece started with the listening of the sound of the harbor itself. These found materials were later used, imitated, improvised and rearranged by the composer and the musicians together and with references to the harbor's history. Wagons, cranes, containers, halls, platforms, ships, and vessels are occupied, played and activated by the musicians of the Sinfonietta during the performance.[106] The listeners participate in a multifaceted, multidimensional and multi-referential aesthetic experience with their own movements and relative position in the harbor. The compositional process of the piece can be described as open due to the use of improvisation, experimentation and collaboration, in which Ott acts not as the only creator but rather, and close to the notion of Relational Aesthetics,[107] a catalyst of a social and aesthetic event.[108] The result is an acoustic, but also a semantic and social exploration of the space and the specific place of Basel's harbor.[109]

3.2.2.1. Response to "Staging Space"

Theatrical aspects are not a main focus in my work and I do not intend to emphasize semantic meanings through performative and scenic means like in *Musiktheater*. However, I find it important to be aware of how the visual and physical perception of musicians and their actions in the performance space contribute to enhancing, contradicting, or correlating aural perception. Important for my work is also how the

105 Video by Reinhard Manz of *Hafenbecken I & II: Umschlagplatz Klang*, accessed December 1, 2020, https://vimeo.com/138020286

106 Daniel Ott, "Am Umschlagplatz Klang," in *Sound Studies: Traditionen - Methoden - Desiderate*, ed. Holger Schulze (transcript-Verlag, 2008): 269–80, p. 272.

107 Nicolas Bourriaud, *Relational Aesthetics*, trans. Simon Pleasance and Fonza Woods, Nachdr., Documents Sur l'art (Dijon: Presses du réel, 2002).

108 Christa Brüstle, "Composing with Raw Materials: Daniel Ott's Music-Theatre Portraits and Landscapes," in *Composed Theatre: Aesthetics, Practices, Processes*, ed. Matthias Rebstock and David Roesner (Bristol: Intellect, 2012), 257–78, p. 256.

109 A new version of Hafenbecken for Berlin Westhafen is planned to be premiered in 2022, accessed May 5, 2021 https://umschlagplatzklang.wordpress.com/

position and physical presence of musicians and sound sources activate and create different spaces. Performative spaces are not limited by the geometrical dimensions of the hall, but places rather emerge from gatherings and actions of musicians and listeners – like in Daniel Ott's *Hafenbecken I & II* – or places are re-signified and transformed by movements of performers, as in Elena Mendoza's *Der Fall Babel*.

3.2.3. Social Space

Many approaches to *Musiktheater*, like the work by Daniel Ott described above, or in the work of Dieter Schnebel and George Aperghis, exhibit an interest in the construction of a social space. We can find this goal also in non-theatrical approaches, like in the work of Cornelius Cardew, or more recently in projects that employ virtual spaces of the internet like in "Net music." The work then is the result of, and in some cases identical to, the construction of a social space, between musicians and/or listeners, sharing the agency of the work.

An orchestral example of this approach is Mathias Spahlinger's *doppelt bejaht, Etüden für Orchester ohne Dirigent* (2009).[110] The piece is conceived as an installation with a duration of about four hours in which the musicians are seated in a row above the audience, forming a square with an aperture. The audience can access the interior through the open side at any time and walk around freely. The musicians play without a conductor and decide what to play in each moment, selecting from material proposed by the composer. A set of rules was formulated to allow the agency of the musicians of the orchestra, which Spahlinger describes as rules of the game: "und spielregeln mussten formuliert werden, die das geschehen für die einflussnahme jedes einzelnen offen halten."[111] The result is an open work that displays an organic form in continuous transformation, in which the musicians have a strong agency in deciding its

110 Spahlinger, Mathias, "Program notes *doppelt bejaht*," accessed December 1, 2020, https://www.swr.de/swrclassic/donaueschinger-musiktage/Werke-des-Jahres-2009-doppelt-bejaht,article-swr-2156.html

111 Spahlinger, Mathias, "Program notes *doppelt bejaht*" (lowcases from the original)

development.[112] By doing so, the work criticizes power structures in music production and in musical institutions. In his program notes Spahlinger writes:

> diesem text von marx ist der titel entnommen. künstlerische arbeit kann gelegentlich eine ahnung davon geben, was nicht entfremdete arbeit wäre. aber man täusche sich nicht. auch kunstwerke werden unter bedingungen des marktes erzeugt und verbreitet; mehr noch: ihre innerste zusammensetzung selbst ist von der produktionsweise abhängig, von den denkmustern der machtverhältnisse durchwirkt. so scheinbar für jeden klar wie täuschend, wirken hierarchien, wo, um die ideen eines komponisten durchzusetzen, ein dirigent vor das orchester tritt – und am ende bleibt dem publikum nichts zu tun, als zuzustimmen oder abzulehnen.[113]

In addition, the audience makes decisions with their movements and thus influences the perception of the form by deciding when to arrive and when to leave the installation. The work is the result of the construction of a social space, between composer, musicians, and listeners sharing agency.

While Spahlinger subverts the social situation that emerges in the classical orchestra concert, Jennifer Walshe centers her attention on the social situation that emerges in social media. In recent years, the emergence of virtual spaces on the internet, the boom of social media and the popularization of smart phones have profoundly transformed our ways of socializing. At the same time, social media have influenced the way that we present ourselves to others. How we understand and perceive ourselves, the construction of our identity has been increasingly shaped by the image and performance of our "best-selves" that we project to others in the media. In her piece *The Total Mountain*,[114] Jennifer Walshe has commented and researched the topics of performativity, self-identity, and social spaces. In *The Total Mountain* for voice and film, Walshe performs different roles and personas, sings quotes from *Twitter* and embodies different characters from the media. All these materials overlap and interweave in a collage that serves as a comment on the speed of the social space on the internet and the solipsism and constructions of identity of famous and private people.

112 Rainer Nonnenmann, "Wider den Utopieverlust: Mathias Spahlingers „doppelt bejaht" auf neuen Bahnen," *MusikTexte* 124 (February 2010): 57–63. accesed December 5, 2020 https://texte.musiktexte.de/mt-124/17/mathias-spahlingers-doppelt-bejaht-beschreitet-neue-bahnen

113 Spahlinger, Mathias, "Program notes *doppelt bejaht"* (lowcases from the original)

114 Excerpt of *The Total Mountain*, accessed December 1, 2020, https://www.youtube.com/watch?v=OkTmuPEZPko

3. Context

This dissertation has been partly written during the COVID-19 health crisis. As a reaction to this crisis and as an answer to the problem of making and consuming music in the time of social distancing, concerts in streaming and online performances have been populating the space of the internet. A deeper investigation of the virtual space that goes beyond mere documentation or streaming of a live-performance is the approach of *KLANGRAUM* – a series of online sound works curated by DUMPF EDITION.[115] The works presented in the online platform *KLANGRAUM* explore the idea of remotely being together while being in different places. In its first edition, published in November 2020, *KLANGRAUM* presented installations, compositions and live performances by Teresa Carrasco, Luc Döbereiner and David Pirrò, Cathy van Eck, Davide Gagliardi, Ji Youn Kang, Veronika Klaus and Luk Poncet, Casper Schipper, and Lara Stanic. The works are launched in the web browser and the listeners may choose just to listen to the pieces or to participate through the microphones of their devices. Not only the sounds that the listeners produce but also the specific acoustics of the spaces that the listeners occupy are recorded and then used as sound material in different ways depending on each piece. In most of the works of this edition, the sound recorded is used as sound material to fill a precomposed process or a fixed structure. An interesting exception is the case of the work *Contingency and Synchronization - Iteration 3a* by Luc Döbereiner and David Pirrò.[116] In this third iteration of their project, Döbereiner and Pirrò create a network of sixteen dynamical systems that analyze, transform and react to the sound input of the listeners. Each listener is represented as a node in a meshwork. The systems organize and transform the different recordings according to the similarities of their content. These recordings and their transformation are then spatialized in the meshwork depending on their similarities. Similar nodes are close to each other. Closeness is represented aurally through delays and is displayed in a graphical visualization. As a result of this organization of nodes, each listener hears only their closest three nodes instead of the whole network. By doing so, the piece creates

115 For more information of *KLANGRAUM* see, accessed May 5, 2021, https://klangraum-dumpf.com/

116 For more information about the *Contingency and Synchronization project* and about its previous iterations see David Pirrò, Hanns Holger Rutz, Luc Döbereiner, Daniele Pozzi, ‘ALMAT - Iteration LD‘, Research Catalogue (2020), accessed December 1, 2020, https://www.researchcatalogue.net/view/552571/552572/0/0

and transforms its own musical space and offers each listener a unique experience of the piece depending on their position in this virtual space. The structure in time of the work is not pre-established but rather emerges from the spatialization and microphone input and is different for each listener. In this sense, the listener's position and the sounds they produce affect the piece. The listener's agency is exercised by doing – recording – but also by listening from their position. In addition, the virtual space of the work is the result of the simultaneous individual spaces in which the different listeners are.[117]

3.2.3.1. Response to "Social Space"

The creation of a social space raises interesting questions about agency, authorship and subjectivity that are part of this investigation. Still, the creation of a social space is not the main objective of my project. An important aspect of Spahlinger's approach is that the piece not only proposes an open form in the line of open scores from the 1960's, that is, a different version each time it is performed, but also a singular experience and understanding for each listener at the moment of the performance. The understanding of the work, its form, emerges from the position of the sound sources, the organic development of the material, but more importantly, from the listeners' movements and decisions. This aspect connects with my project which proposes a piece that offers different understandings of itself at the same time through spatialization.

The multiplicity of meanings that emerge from a multiplicity of references in the work of Jennifer Walshe poses an interesting critical comment to the topics of identity. Still, in my approach this critique is centered on the compositional practice rather than on the semantic material. In this sense, my practice is closer to that of Döbereiner and Pirrò in which the piece emerges from a process, and by doing so raises questions of sharing agency, communication and subjectivity.

3.2.4. Electroacoustic Music – Acousmatic, Diffusion and Ambisonics

Since the 1950s, electronic music has been concerned with space and spatialization of sounds. Since then, electronic studios have developed systems that enable sound

117 After its first edition the platform *KLANGRAUM* will continue as an online exposition gallery of sound works.

diffusion. The *Acousmonium* at the *INA/GRM*, the *BEAST* (Birmingham ElectroAcoustic Sound Theatre) at the *University of Birmingham's Electroacoustic Music Studios*, the *ZKM Sound Dome* in Karlsruhe or the *Wave Field System* at the *TU* Berlin are a few examples of such systems. They make possible diverse usages of space, such as the immersion of the listener in sound, the distribution and movements of sounds, the separation of spatial sonic layers or objects, or the modification of the acoustics of a hall. Acousmatic music has made extensive use of these facilities and of the distribution of sound in space. Representative of these aesthetics are the construction of spatial images, spatial morphologies, and sound trajectories in space and a work at taxonomies of the perception of space in music.[118]

In the last years, there have been interesting technological developments in the diffusion of sound in space. Virtual spaces are emulated through convolution and sound diffusion, as I have discussed in the work of Mark André and the SWR Experimentalstudio. With the development of ambisonic techniques, the location and movements of sound has become more realistic and precise. These techniques allow composers to create sound images and to "sculpt" sound in space. The development of the ambisonic techniques has also ensured that the impression of space is accurate with regard to the composer's intention and deviates as little as possible from it regardless of the actual performance space. In this sense, inherent to ambisonic techniques is the conception of space as an ideal abstract space that does not change. For the piece to function according to the sound image of the composer, the "space" in which the piece is played should remain the same no matter what the real acoustic environment is like. The practice of Natasha Barret is exemplary of this type of work with ambisonics. In her pieces, Barrett translates sound gestures and objects into sound movements through space by using ambisonics. Spatialization does not only have a dramatic use in her work, but also structures the pieces. The central musical idea of *Part II: Optical Tubes,*[119] for example, is the acoustic emulation of how objects are in focus when we

118 Examples of these taxonomies are Denis Smalley, "Space-Form and the Acousmatic Image," *Organised Sound* 12, no. 1 (April 2007): 35–58. Also, Bertrand Merlier, *Vocabulaire de l'espace En Musiques Électroacoustiques: Collecte Des Mots En Usage, Mise En Forme et Propositions, Terminologie En Usage Essai de Classification, Musique-Pédagogie* (Sampzon: Delatour, 2006).

119 From the cycle *Hidden Values* (2012) composed at the IRCAM. Binaural version of Optical Tubes (2012), accessed December 1, 2020, ttps://soundcloud.com/natashabarrett/albums

move towards or away from them. Barrett structures the piece in spatial terms by projecting far or close and relating sound morphologies, points, and objects in space.[120] In relation with the use of ambisonics Barrett states:

> However, with ambisonics, because you can accurately compose the spatial information, you gain tighter control over the spatial musical structure and therefore allow it to play a more important role. With sound diffusion performance, you really have to accept some chance.[121]

Diffusion and ambisonic techniques facilitate the identical rendition of the same acoustic experience of the piece that is the same for each listener regardless of their position and the characteristics of the performance space.

3.2.4.1. Response to “Electroacoustic Music - Acousmatic, Diffusion and Ambisonics”

The use of ambisonics is an important technical achievement that provides a unique ideal sound in space that is experienced equally by each member of the audience regardless of their relative position to the sound sources. In addition, ambisonics is a powerful tool for modeling spaces for purposes of experimentation – as in the case of the spatialization model developed in this project. However, ambisonics implies an abstract conception of space, it thus proposes only one possible ideal acoustic experience of the piece. Moreover, ambisonics and uses of sound diffusion in which the same experience of the piece is optimized, erase the idiosyncrasy of the performance place in order to render the ideal sound conceived by the composer. An equal rendition of sound regardless of real spaces and listener positions implies a single perception and understanding of the piece. This uniformity is the goal of this aesthetical approach, which is thus the opposite of my own approach, which searches for a multiplicity of perceptions and meanings of the musical event.

On the other hand, taxonomies of spatial categories and spatial perception from acousmatic music, such as the ones developed by Smalley, imply a reduction of the multiplicity of experiences to a few meanings that can be objectivized. Moreover, such

120 Natasha Barrett’s web page, accessed December 1, 2020, http://www.natashabarrett.org/Hidden_values.html.

121 Natasha Barrett, “Creating Sonic Spaces: An Interview with Natasha Barrett, interview by Felipe Otondo,” *Computer Music Journal* 31(2), September 8, 2005. p. 12.

categorizations means a universalization and objectivization of the subjective experiences of the author. In addition, by categorizing techniques and effects, the compositional process risks to be reduced to the following of a formula to influence the audience's reaction.

3.2.5. Sound Art, Live Electronics and Sound Installation

While ambisonics proposes an ideal abstract space, site-specific sound art has artistically explored concrete places and by doing so it has criticized the conception of Euclidean space. Sound materials and their development are derived from the concrete spaces, and in turn the concrete place becomes an agent in the work. The idea of the specificity of space is considering not only places with respect to their acoustics but also as lived spaces, inhabited places, which are the result of activities and gatherings. Agostino di Scipio has explored this later understanding of place in his series of installations and works called *Audible Ecosystems.*[122] Di Scipio considers sound as an event rather than an object. Thus, as an event, sound in its perceived manifestation is always in the concrete space and time, it is the product of the here and now. To research this spatial-temporal nature of sound, di Scipio uses feedback systems, in which the sound emerges and is continuously transformed by its own manifestation in the specific place and time. In this way, sound and place become agents of the piece. Listeners as well transform the sound, not only with unintended or intended sounds, like stepping or coughing, but also with their mere presence and movements. The system thus reacts to the changing of the space and its acoustics due to the actions and presence of listeners or other elements, such as objects or furniture.[123] By doing so, di Scipio reveals to the listener how the space, but also their actions modify sounds in a reactive environment, and uncover their own agency inside the ecosystem.

122 *Audible EcoSystemics n.1 (Impulse Response Study)*, (2002) solo live electronics, *Audible EcoSystemics n.2a (Feedback Study)*, (2003) solo live electronics, *Audible EcoSystemics n.2b (Feedback Study, Sound Installation)*, (2004) live electronics, optional vocal performers, *Audible EcoSystemics n.3a (Background Noise Study)*, (2005) solo live electronics, accessed December 1, 2020, https://vimeo.com/11696443, *Audible EcoSystemics n.3b (Background Noise Study, in the Vocal Tract)* , (2005) performer handling miniature microphone in the mouth, and live electronics, accessed December 1, 2020, https://vimeo.com/11706263, *Audible EcoSystemics n.3c (Background Noise Study, with own silent actions)*, (2014) solo live electronics.

123 Makis Solomos, ed., “Agostino Di Scipio: Audible Ecosystems,” *Journal Contemporary Music Review*, vol. 33, 2014.

On the other hand, Cathy van Eck takes another approach to feedback and to the idea of space as place in her work *Wings* (2007-2008), for big white shields, three microphones, one loudspeaker and three performers. Instead of unveiling what is not directly perceptible, like in the work of di Scipio, van Eck uses technology as a tool for experimentation, for researching a sound phenomenon. In *Wings*[124] a loudspeaker faces three microphones. Between speakers and microphones there are three performers each holding a large plate. The volume of the loudspeaker is increased and a feedback is generated between speakers and microphones. The three players manipulate the space between microphones and speakers and with it the feedback by moving the plates. The actions of the performers with the plates allow for the emergence of the sounds and render visible their search, as well as add a visual component often recurrent in van Eck's work. A computer program analyzes the feedback with pitch detection and according to this analysis it processes the sound of the feedback differently.[125] There is no prior material, the sound material rather emerges from the technological circumstances and from the specific acoustic of the spaces created by the performers with the plates. At the same time this emergent material modifies itself through the analyses and transformations of the computer program. The actions of the players, the performance room, the volume of the loudspeaker and the sensitivity of the microphones influence the sound result. In this way, the agency of the work is shared by all elements involved in it. Furthermore, the use of technological means in *Wings* is not a way to control, but a tool for experimentation to allow an aesthetic experience to emerge.

Another aspect of the conception of space as place is the question of the listener's perception. This question concerns the relation between listener and place and how the listener's relative position to the sound sources affect their perception of the sound phenomenon. Gerhard Eckel explored this relation between time and space and the listener's perception in the sound environment *Zeitraum.*[126] In this work, several sound sources play the same percussive pattern. Following an acoustic investigation of

124 Video of a performance of Wings, accessed December 1, 2020, https://youtu.be/TY7ltnRxUgc
125 Composer's website, accessed December 1, 2020, https://www.cathyvaneck.net/wings/
126 Gerhard Eckel, '*Zeitraum* Formulations', Research Catalogue (2018), accessed December 1, 2020, https://www.researchcatalogue.net/view/94547/141743/0/0.

the concrete place, the sound sources are positioned in such a way in the hall that when the listener is located in a particular sweet spot – the spot in which all the sources arrive with the same amount of delay to the listener – the listener hears all the sources synchronized and a clear regular pattern is perceivable. When the listener moves away from the sweet spot the different sound sources arrive at different time delays to the listener and the rhythmical pattern starts to deviate. The sources then are perceived as unsynchronized, until reaching a chaotic mass in the farthest point from the sweet spot.[127] In this way, the work reveals in a clear way how the movements of the listener in space affect their perception of the sound phenomenon and enables the listeners agency in the experience. Moreover, *Zeitraum* explores the connection between space and time in the perception of sound. *Zeitraum* shows how the time of arrival to the listener, the delay, depends on the distance between listener and sound sources, ultimately on space and how space influences the sound. As I discussed in relation with Oliveros' work, space understood as delay, that is as the distance between listener and object, is in this way related to time.

3.2.5.1. Response to "Sound Art"

My work is informed by sound art, by its concepts of space as place and by the possibilities of agency for material and space. I regard the practices discussed above as remarkable investigations of subjectivity and authorship, and the possibility of non-human agents while allowing for the emergence of an aesthetic experience. Although the composers di Scipio and van Eck are not strictly sound artists, I find their practices for being clear examples of experimentation in composition and in this sense close to my own understanding of the musical experiment. Nevertheless, sound art often implies a critique of musical form and of the figure of the composer as ideological or irrelevant.[128] Although such a critique is necessary, the problem of form cannot be erased by negating its relevance or its existence. Form can be perceived if a sound event

127 Auralization of *Zeitraum* by the composer Gerhard Eckel in Research Catalogue Gerhard Eckel, '*Zeitraum* Formulations', Research Catalogue (2018), accessed December 1, 2020, https://www.researchcatalogue.net/view/94547/94914/0/0

128 Musikprotokoll and Sabine Sanio, eds., *Form - Luxus, Kalkül und Abstinenz: Fragen, Thesen und Beiträge zu Erscheinungsweisen aktueller Musik*; [anläßlich des Musikprotokoll im Steirischen Herbst 99] (Saarbrücken: Pfau, 1999).

begins and ends, regardless of the authors intention. On the other hand, to negate the agency of the composer[129] when they are a member of an excluded collective is to negate their agency once more. Therefore, it is relevant to rethink the category of form and with it to rethink a different relation between composer, material and listener, beyond the binary hierarchical relation of subject and object. My project aims to contribute to the discussion and proposes space as a possible medium for achieving a non-hierarchical relation of composer and material.

3.3. Conclusion

As we can see in this short overview, the use of spatialization is more than the mere disposition of sound sources in space or the movements of musicians, listeners, and sound through loudspeakers. It relates the localization of sound sources with concepts of space and conscious compositional techniques and strategies in order to achieve different aesthetics results. A conception of space as abstract, as social, or as place influences the strategies used in the compositional process, and in turn determines how open the perception and understanding of the aesthetic experience can be.

While sharing many aspects with the works presented in this section, my approach stands out due its use of space as a generator of multiple understandings. In Mark André's or Chaya Cwernowin's approach several experiences were activated through space but there is an unequivocal aesthetic signification. On the other hand, in Spahlinger's piece, space enhances multiple experiences while a different version of the piece is generated in each repetition of the piece. In the work of Mendoza or Ott different understandings are possible through relations with visual elements and semantic associations, to which the localization of sound sources contributes. My approach opens the aesthetic experience of the work and its agency through the use of space.

129 Agency is the capacity of acting. However, in my concept of experimentation (see 2.4.), agency also means the capaticity of acting – and intra-acting – for non-human agents. For a discussion of agency also for non-living organisms see Xabier Barandiaran, Ezequiel Di Paolo & Marieke Rohde (2009) "Defining Agency. individuality, normativity, asymmetry and spatio-temporality in action." *Journal of Adaptive Behavior*, Vol 17, Issue 5, 2009. 10-19.

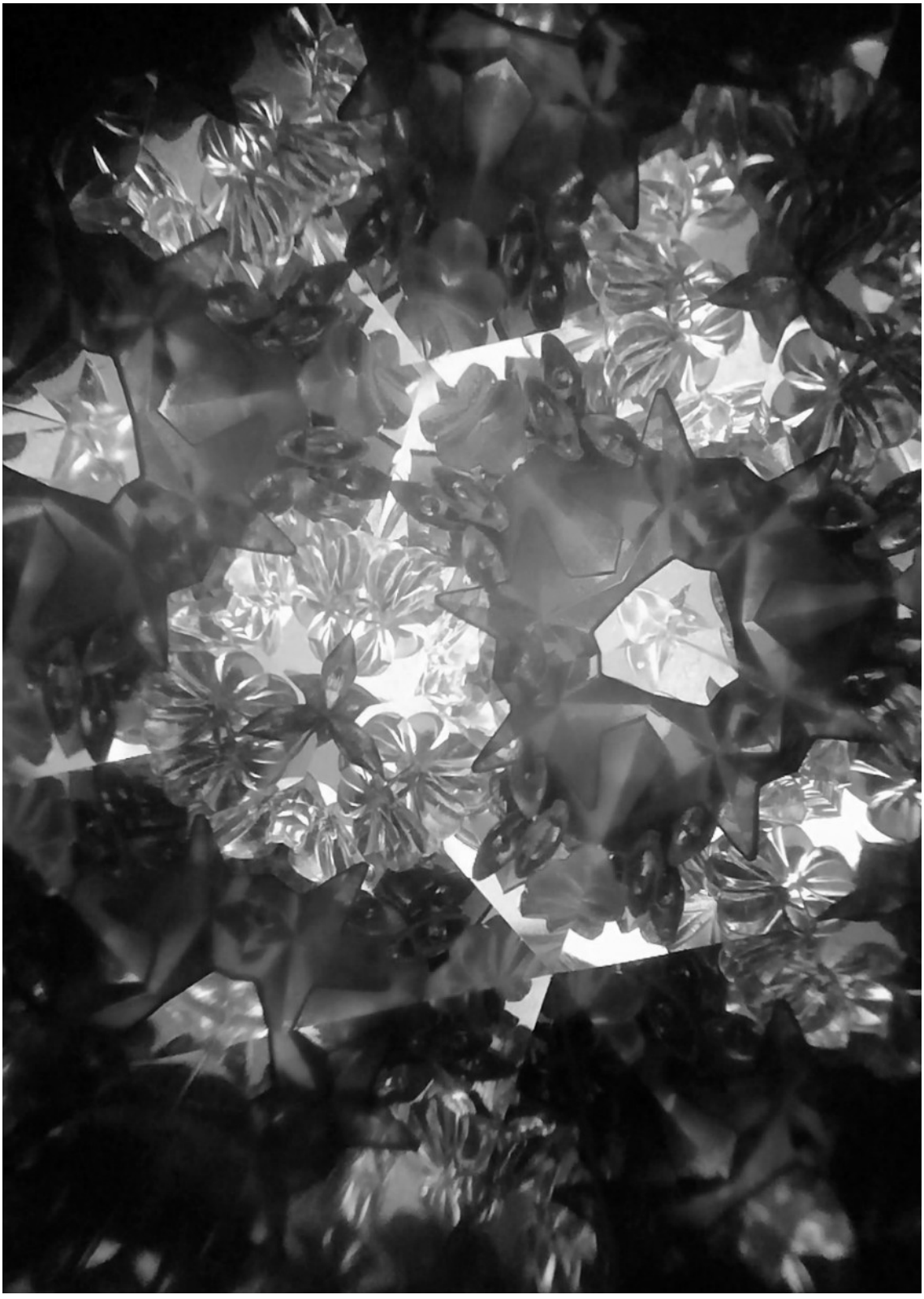
3. Context

My work is influenced by practices and concepts of sound art. Still, in sound art the development of the temporality of space is not always fully taken into account. In light of new developments and questions of identity, feminism and ecology, I want to re-think the relation of form and subjectivity with space by adding my own practice to the current context.

Context	**Influence on my practice**	**Difference to my approach**
Space as Resonant Instrument	→ space as timbral color	→ only one aesthetic signification
Staging Space	→ dramatic potential	→ semantic emphasis
Social Space	→ questions of agency, authorship, subject	→ multiplicity through iteration →critique on the semantic level
Ambisonics	→ technical achievements	→ one ideal spatial experience and understanding
Sound Art	→ space as place and agent	→ questions of form and agency of the composer

Figure 3.1: Summary of the context in relation with my approach

Illustration 3: Kaleidoscope



4. Concepts – Compositional Strategies – Case Studies

> My approach is more like in science. This is not to say that music is not emotional and everything else. I sit and listen and I hear things, then I discover how I can expand them or increase them and try to understand them. I think of them as perceptual geographies actually. "Ways of Hearing"—how we hear things far away; how we hear things close. (Maryanne Amacher)[130]

4.1. Introduction

The main objective of my research project is the composition of musical works that offer multiple meanings through the use of space and that can therefore be described as both open and coherent.

However, how does openness emerge in my practice, and how its it related to space? What is the nature of the musical work? A coherent situation implies a perceived form with a certain degree of identity. What kind of assumptions do I make in my practice? How does my understanding of form and openness influence my practice? What is the relation between material and form? And what are the repercussions for the relation between composer and material, listener and the work? Does it make sense to talk about form and material in a postmodern or post-media context?

Discussions on the topic of form have been cast aside by postmodern and post-conceptual positions of sound art and experimental music. According to these positions, form is a less relevant concept if art is focused on opening up towards the agency of the material, of the performer, or of the listener. My intention is not to restore form in all its ideological glory. On the contrary, I try to surpass the opposition of subject and object in favor of an "intra-action" (Karen Barad, see chapter 2) of composer and material. However, the question of form, although avoided in the discourse, is very present in the practice of contemporary artists. While contemporary sound artists and composers have

130 Maryanne Amacher, *Extremities: Maryanne Amacher*, interview by Frank J. Oterion, May 1, 2004, https://nmbx.newmusicusa.org/extremities-maryanne-amacher-in-conversation-with-frank-j-oteri/.

engaged with the agency of the material, the contingency of the sound result and its perception in time are not always researched. In some cases, the experience of the musical work is a straightforward development or a juxtaposition of different materials, in which only the material is open but not its development.

I am aware of the historical charge of the terms material and form. Yet, to some extent I move away from their traditional roles and meanings. In my practice, form is the sounding product of the encounter between composer and material and offers multiple perspectives to the understanding of the listener in the performance. Sound material is thus the emergent sound result of the intra-actions between the composer and a network of parameters. However, for the sake of clarity, I maintain the terms of material and form in this dissertation.

Such a notion of form that offers a multiplicity of understandings through space and that allows for other agencies, can be qualified as open. Moreover this situation in its relation with material, posts a different subject-composer. Hence, in this chapter I engage with the concepts of openness, space, form, and subject. I contextualize and characterize them in relation to my own practice. As described regarding the methodology (chapter 2), my analysis relies on my own practice. Therefore, the theoretical and aesthetic frames are understood as tools to understand and explain my practice, they should not be seen as a justification of my work or as guidelines to be translated into sound.

Moreover, the different concepts are not isolated in my practice, they rather form dynamic relations among themselves. Each of the different case studies can also be understood as a distinctive approach to the same topics and questions. Openness can be described as the goal of the practice, while space can be understood as the tool, the means to achieve it. Form, together with the subject, appears in this relation as results or consequences (see figure 4.1). In this sense, what I describe in this chapter is a topography of these concepts on the basis of their dynamic relations.

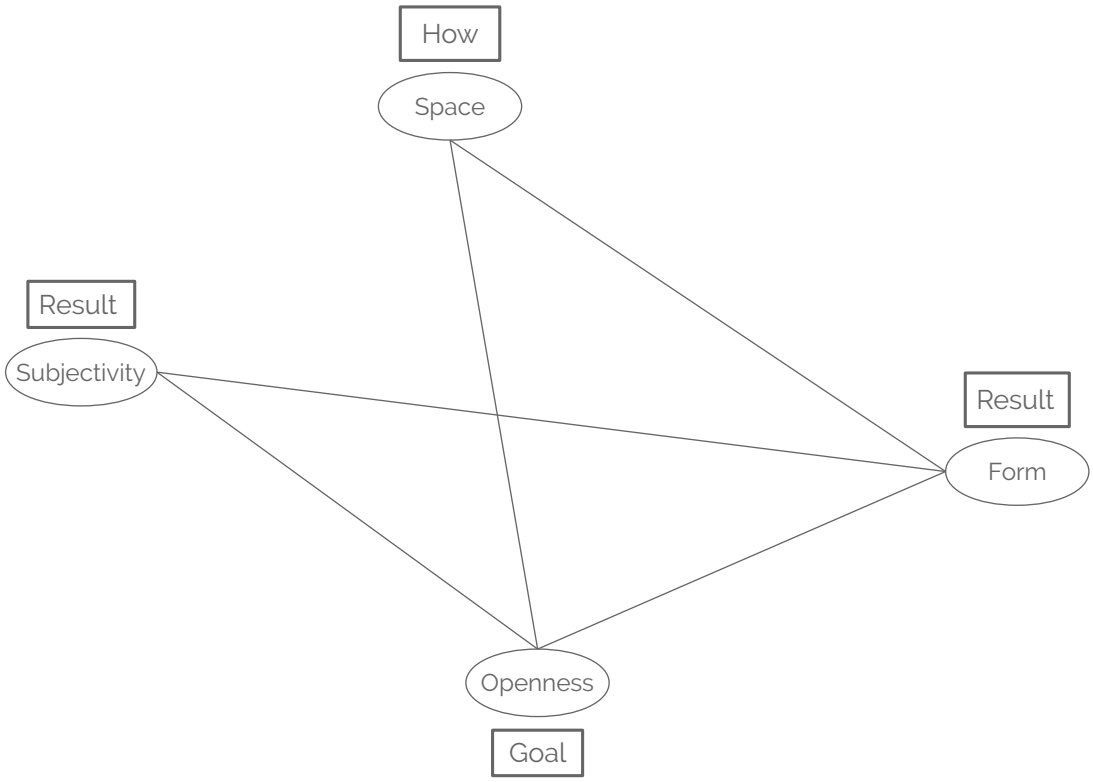


Figure 4.1: Topography of concepts.

To achieve an open musical event that offers multiple understandings it is necessary to set up a set of conditions that allow for this openness and multiplicity to appear. What I term compositional strategies are means of establishing such sets of conditions, principles, processes, and structures intended to achieve openness through the use of space and generative systems. In addition, these strategies have the potential of opening the work to other agencies, that is to allow external participation beyond the composer themselves in the creation of the piece. I intend to open the work to the agency of the material and to the influence of the listener without renouncing my own role as composer. In this chapter, I recount the main compositional strategies employed and developed as part of this project: the strategy of networks of family resemblances, localization of sound sources, spatializing sound parameters, and generative systems. All these strategies are related to each other in the practice. My description, which is divided into different sections, is thus a way to clarify the strategies, but also a way to look at the different perspectives of a multilayered phenomenon. However, this

analytical division does not imply that I employ each strategy solely in the piece used to demonstrate it in this chapter. Furthermore, the strategies can by no means be heard as isolated aspects in the musical works, they rather allow for the agency of the material and contribute to the emergence of an open sound result in time.

For the sake of clarity, each section of this chapter is structured in a way that proceeds from the most abstract to the more concrete aspects. First, I discuss how I understand a certain central concept in my practice, then I briefly describe the compositional strategy in relation with the concept, and finally engage more extensively with the ways in which the strategy and the concept are approached in one of the four case studies. This analytical structure does not reflect my compositional practice. In my practice, concepts inform the compositional process, but concepts are in turn shaped in and by the practice in a dynamic and mutually constituting relation. Still, for analytical purposes this pattern structures the four principle topics in the following way:

4.2. Concept: Openness. Strategy: form by means of “family resemblances.” Case study: *displaced*

4.3. Concept: Space. Strategy: form created by localization of sound sources. Space inherent to material. Case study: *ins Offene*

4.4. Concept: Form. Strategy: form created by spatializing sound parameters. Case study: *Parallax*

4.5. Concept: Subjectivity and identity. Strategy: form by means of the use of generative systems. Case study: *MTRAK (*מטרקא*)*

There is a strategy related to each concept. Although each strategy contributes to the whole topography of concepts, each is most closely related with one of the concepts. Figure 4.2 shows the map of relations between concepts and strategies.

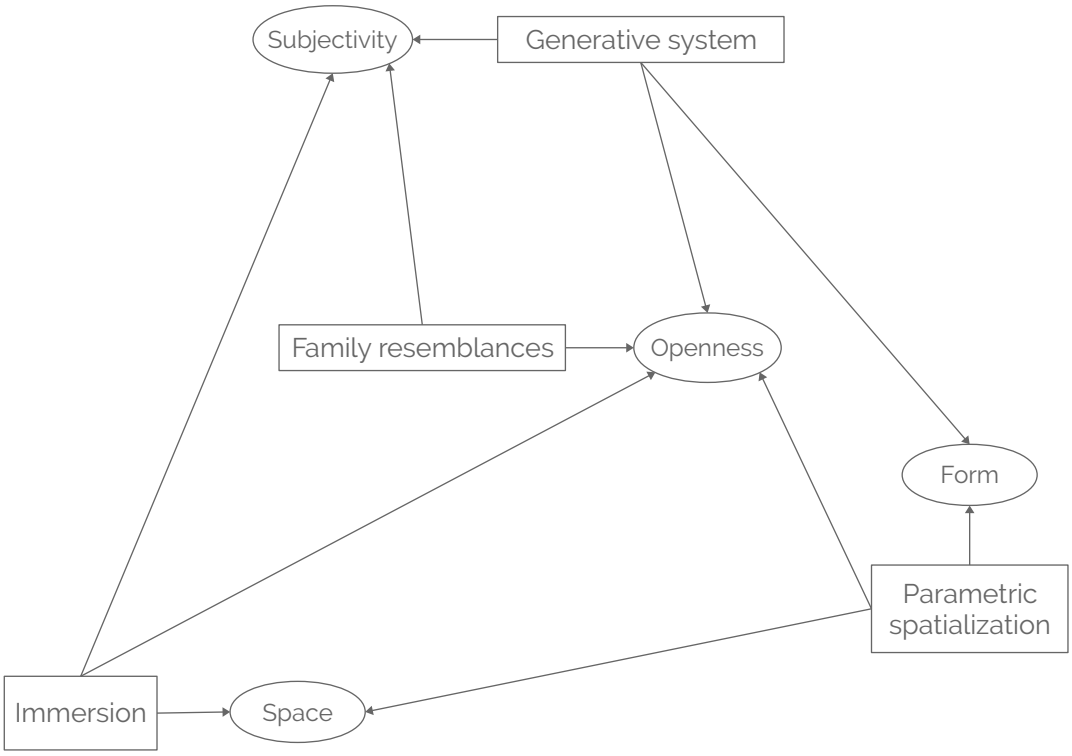


Figure 4.2: Relations between concepts and strategies.

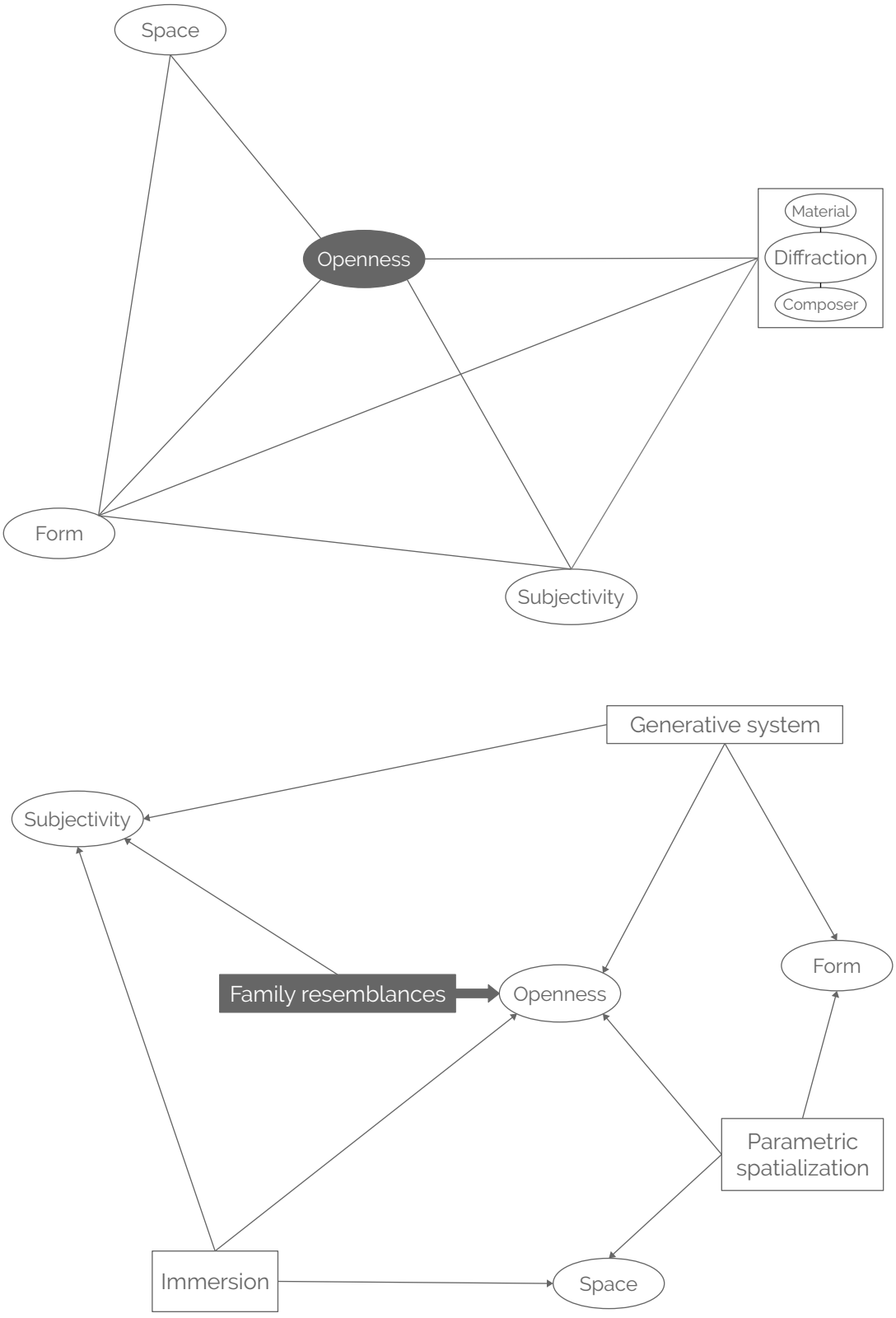
In a way, this chapter is an attempt to describe a multilayered phenomenon in which all the different elements interrelate with each other. As in a kaleidoscopic image, an analytical survey of each part will not accurately portrait the whole image. In this sense, each section, rather than being the description of one of the features of the practice, is rather another perspective of the same phenomenon. By doing so, I try to reflect in writing my practice in composition. In the same way that my compositional work offers multiple perspectives on a set of materials and its transformations and relations, this chapter revolves around a set of ideas and practice in their different elaborations and from different perspectives.

This artistic research project deals with my practice, whose main result is situated in the aesthetic realm. As already described in methodology (chapter 2), the written part of this dissertation is thus an attempt to encircle something that only fully appears in the aesthetic experience. In this chapter, I describe what I do in my compositional practice as well as my intentions. Scores and recordings are a

representation and documentation of the phenomenon but they are not the "thing itself." The knowledge of the result is only possible in the experience of the work, it "shows itself"[131] in its performance, in its knowledge through experience. Hence, there is a gap between the phenomenon and its description in this chapter, due to its very nature, which is aesthetic. Nevertheless, it is this reflection on the practice and the discussion of this gap, together with the artistic practice itself, that also constitute the results of an artistic research project.

131 Dieter Mersch, *Epistemology of Aesthetics*, trans. Laura Radosh, Think Art (Zurich-Berlin: diaphanes, 2015).

Illustration 2: Topography of concepts and strategies from the perspective of openness and family resemblances.



4.2. Openness – Form through "Family Resemblances" – Case Studies *displaced*

In the previous chapter dealing with the context of this project, I have discussed how composers in the 1960 and 1970 understood space as a way to open the musical form. These composers related openness with progressive ideas that challenged bourgeois values as well as totalitarian ideologies. In these composers' practices, openness was the result of chance or probabilities. In this way, the outcome of chance, that is the work, was different in each performance of the piece. In this sense, the terms of openness, "open form" and "open works" are historically and aesthetically shaped. However, in recent years, a renewed interest in openness emerged, reflected in the concept of contingency. Formulations of contingency and openness and their relation with material are currently discussed in new materialist and object-oriented philosophies,[132] but more importantly to this dissertation, contingency has recently become a ubiquitous key concept in practices of contemporary art and in contemporary music.

Contingency is defined as something that may or may not happen. It is related to necessity, as is opposite, and as such, contingency is something that does not proceed from rational necessity and can only be thought of as an event.[133] On the other hand, necessity subordinates events in structures of relations and hierarchies of cause and effect. While the necessity and the succession of cause and effect is known in advance, contingency subverts order and is unknown.

Contemporary concepts of contingency formulated at the beginning of the 21th century are not the same as the idea of openness as a product of possibilities or chance as it was practiced by composers of the 1960s and 1970s. Chance and probability are tools in an attempt to understand and apprehend contingency. As Robin Mackay puts it, the understanding of contingency as a product of chance or probability is ultimately a

132 See for example Diana Coole and Samantha Frost, eds., *New Materialisms: Ontology, Agency, and Politics*, (Durham [NC] ; London: Duke University Press, 2010).

133 Robin Mackay, "Introduction: Three Figures of Contingency," in *The Medium of Contingency* (London: Urbanomic : [distributor] Central Books Ltd, 2015), 1–10. p. 1.

failed attempt to control contingency by limiting it to certain parameters or to a set of controlled possibilities. As such it fails to achieve "real" openness:

> The ideologies of probability and chance, no less that of divine necessity, hallucinate a universe in which – at least – the parameters within which the events may take place can be circumscribed. But an event, a real contingency, is precisely something that overflows this compartmentalization and management.[134]

Mackay is following philosopher Quentin Meillassoux here, for whom contingency is not conceived as "evaluable risks", as an event constrained to chance and probability, but it is rather something that just happens to us. In *After Finitude,* Meillassoux writes:

> The contingent, in a word, *is something that finally happens* – something other, something which, in its irreducibility to all pre-registered possibilities, puts an end to the vanity of a game wherein everything, even the improbable, is predictable.[135]

As an unexpected event, contingency cannot be reduced to a set of possibilities. Moreover, for Meillassoux real contingency is a menacing power. Mackay describes three realizations in science that jeopardize the illusion of necessity for human beings: The realization that life on earth was the product of contingent factors, the realization that the human being is the product of contingent evolution, and the realization that our individual psyche is the result of unconscious forces. These realizations erase any illusion of necessity with regard to our collective and individual existence as well as ideologies of progress and subtracts the historical necessity of our existence as human beings.[136]

Accordingly, there is a contemporary urgency for conceiving of contingency and for art to reflect on our and the world's contingency. We can even talk of a "necessity" of thinking and practicing in terms of contingency. Therefore, for new practices of contingency it is no longer possible to conceive of the work of art as matter being shaped by a necessary form, as a "block of matter ordered and organised to present an

134 Robin Mackay, "Introduction: Three Figures of Contingency," p. 2.
135 Quentin Meillassoux, *After Finitude: An Essay on the Necessity of Contingency*, Pbk. ed (London ; New York: Continuum, 2009). p. 108.
136 Robin Mackay, "Introduction: Three Figures of Contingency," p. 2.

autonomous, intentional, controlled experience."[137] Hence, a work under the premises of contingency exceeds its limits, undermines the categories of form and material, and recognizes what is left out. In this sense, I agree with Mackay that an artistic practice directed towards openness should not repeat old practices related to openness. A new practice should not again rely on chance and probabilities, like the practices of the 1960s and 1970s, still it should not affirm the "privilege of meaning making over material contingencies"[138] either. Since attributing a meaning to material imposes a concept and necessity onto it, a practice oriented towards contingency needs to reject using material symbolically and focus on the concrete, on material and its potentiality for agency.

In my own practice, I seek openness in two moments, in the process of composition, that is, in the experiment, by creating a work which is intrinsically open (see chapter 2 and chapter 4) and in how the piece is perceived, in its experience. Although these two moments happen separately, they are codependent, since strategies oriented towards openness and experimentation in composition influence how the work is perceived. Yet, what is the open experience that a musical practice can offer? The openness in the experience of music can be understood in at least three non-conflicting ways: 1) The result of a musical experiment is not known in advance and it emerges in the process. 2) The musical experiment provides a different result in each iteration – as in the aleatory experimental music of the 1960s. 3) Openness depends on each listener's subjective interpretation, as in Umberto Eco's semiotic understanding of the open art work.[139] A multiplicity of understandings is the result of the different readings by the listeners.

I would like to propose a fourth possibility of understanding openness, which does not reject the previous ones: a multiplicity of experiences inherent to the result of the experiment rather than derived exclusively from the divergent semantic interpretations of each listener. This type of openness is what I referred to above as "openness in the composition process," or "openness in the experiment." Close to some

137 Robin Mackay, "Introduction: Three Figures of Contingency," p. 4.
138 Robin Mackay, "Introduction: Three Figures of Contingency," p. 5.
139 Umberto Eco, *The Open Work* (Cambridge, Mass: Harvard University Press, 1989).

speculative realists positions, I regard multiplicity and openness to be also inherent to the relations that objects establish among each other and independently of the subject. Along these lines, the philosopher Graham Harman rejects the privilege of the human perspective in relation to objects. Harman writes:

> The world is neither a grey matrix of objective elements, nor raw material for a sexy human drama projected onto gravel and sludge. Instead, it is filled with points of reality woven together only loosely; an archipelago of oracles or bombs that explode from concealment only to generate new sequestered temples.[140]

In this scenario of autonomous objects, things do not need human reason to relate to each other, rather they relate independently beyond human access and according to their nature. Still, these relations are not established among two real objects, but rather between a real object and an aspect of another object that the first one "needs." This kind of mediated relation between objects is similar to the way in which humans relate to objects. A person does not relate to the real tree as an object but rather to their image of the tree according to their perspective and needs. In the same way, fire does not relate with cotton in its entirety, when it burns it. For fire to react to cotton some of the cotton's qualities of softness and color are superfluous. Fire relates to cotton's inflammability rather than to the real cotton. As Harman writes, "The separature of a thing from its quality is no longer a local phenomenon of human experience, but instead is the root of all relations between real objects."[141] In this sense, materials relate to each other by creating networks of contingent relations that are independent of our intentions and expectations.

In my practice, this openness is due to the relations and family resemblances that the materials and the composer create. This network of relations remains open in the contingency of its different appearances but still retains coherence by means of these very same relations. An openness inherent to the work goes beyond the semiotic openness. In Eco's *opera aperta*, openness ultimately relies on the listener, presupposing that the work of art is an object of projection of the listener's expectations

140 Graham Harman, "On Vicarious Causation," *Collapse: Philosophical Research and Development II* (2007): 187–221. p. 211.
141 Graham Harman, "On Vicarious Causation," p. 220.

or a symbol for them to interpret. This does not mean that any form of semiotic interpretation is excluded in my practice. Still, due to its multiple nature, the work resists its reduction to a mere carrier of meaning and rejects the status of a passive object. The relations of crystals in a kaleidoscope are contingent on their shapes, weight, and rugosity – not on their colors – yet they influence the colors and image that we see, our perception of it. In the same way, the relations of the different partials of a multiphonic depend on their loudness and its changes over time. The interactions of partials creates beatings which in turn create new relations. These processes are independent of our perception of the multiphonic as an overall timbre, still they influence it. Likewise, on the macro scale of the piece, the different materials interact with each other in different ways according to their resemblances but also loudness, projection, localization, and frequency content, just to mention a few, that influence our perception of the overall event. The work is ambiguous and inherently open and influences its understanding in listening by the encounter with the listener. Therefore, the work forces the listener to actively encounter it, to intra-act with it, and to follow its continuous meandering. The experience of the piece, its knowledge,[142] is the presentation of an ever-changing network of materials and their behaviors in their encounter with the listener.

In order to create these synchronous multiple understandings, I formulate a network of relations, localized in space, that is open to be traced and retraced by the audience. Parameters and sonic qualities such as frequency, duration, density, timbre, amount of distortion or noise, are arranged according to scales and categories, which are inherently connected with a spatial dimension. These categories are generalizations that I use as tools in order to enable the production of concrete sound materials, which are conceived of as processes rather than as static objects. However, the resultant materials are not the mere summation of the different parameters,[143] they are rather the result of the intra-action and encounter of different layers of parametric organization. In this way,

142 For a discussion of artistic knowledge see chapter 2.

143 A clear sound example of a result not being equal to the sum of its parts is a multiphonic. Although a multiphonic in a clarinet is the result of the interaction of a number of partials, dividing up these partials to each be played by a different instrument will not result in a multiphonic. In this sense the clarinet can be described as a nonlinear system.

sonic identities emerge as sorts of “phenotypes” which are always more than their “genotypic” parametric description. The audible commonality of these sound materials can be described phenomenologically in terms of family resemblances. Since such family resemblances are perceptual categories, they create a connection between my imaginative listening in the composition process and the listeners’ experience of the performance. The creation of meaning is thus always distributed among perception, composition, performance and space. Semantic functioning, such as causation, contrast and continuation, remains ambiguous and is activated by the perception of a situated listener in a concrete space.

The latest formulation of a network of family resemblances is *displaced* (2020) for chamber orchestra, commissioned by the SÜDWESTRUNDFUNK for the Donaueschinger Musiktage 2020 – see score and audio in the repository.[144] *displaced* was commissioned to be played during the festival instead of my piece *Parallax* for symphonic orchestra, which due to the restrictions imposed in order to prevent the spread of COVID-19 and the number of musicians on stage has been postponed to 2022. Although *displaced* is a different piece than *Parallax*, it uses a similar network of related materials. The structure of *displaced* is based on the sonification of the paths of reflections of an imagined sound produced in four different points in space using an acoustic raytracing algorithm, a process that is also used in a section – bars 132 to 213 – of *Parallax*, with five points. The points are localized in four positions in the *Baar-Sporthalle* in Donaueschingen and connected by two trajectories (figure 4.3). The first point, from the perspective of the audience, is at the left side of the hall, the second point is at the right side of the stage, the third at the center of the stage and the fourth at the back of the audience. The points are distributed in space and time forming two trajectories: 1) From *point 1*, left to *point 2*, stage right 2) from *point 3* center of the stage to *point 3* behind the audience. There are twenty paths of reflections connecting the start and end points of each of the six trajectories. Figure 4.4 shows the paths in the first trajectory between *point 1* and a *point 2*.[145] A path is characterized by its number of

144 Link to score and audio of *displaced*: https://www.researchcatalogue.net/view/1228054/1253922

145 Calculations of the reflections in a space with the dimensions of the hall and the map of the reflections are calculated with Amray. https://amcoustics.com/tools/amray

reflections (from zero to three) and its total duration. The number of reflections of the generated paths are mapped to instrumentation and to a network of materials. Since each of the twenty paths connecting two points has a different duration, the sum of these paths creates a unique rhythmic pattern. These durations typically last a number of milliseconds. In order to use them musically, I scaled them by a factor of 840 for mapping them to processes at the macrolevel and by 15, 20 and 30 for the microlevel. Figure 4.5 shows the mapping of the two arrays at the macrolevel.

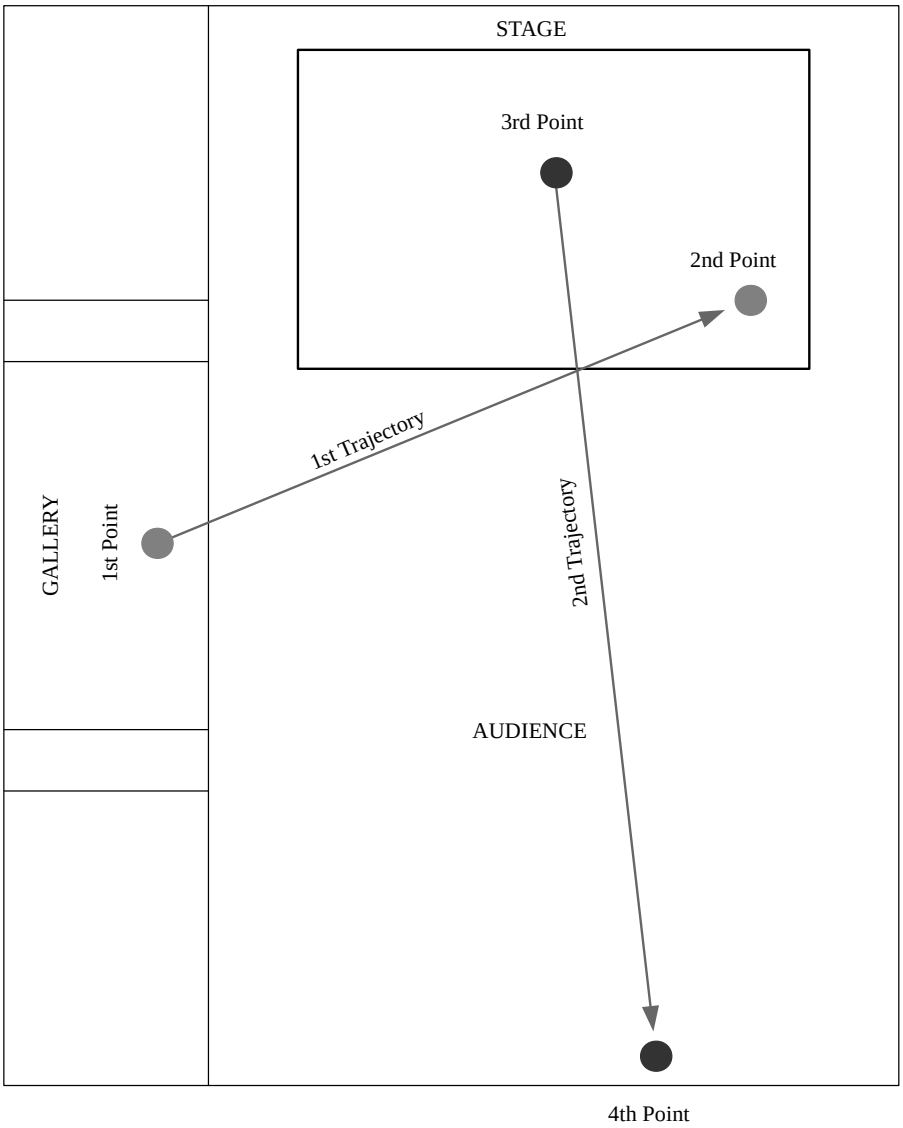


Figure 4.3: Two trajectories in space, displaced.

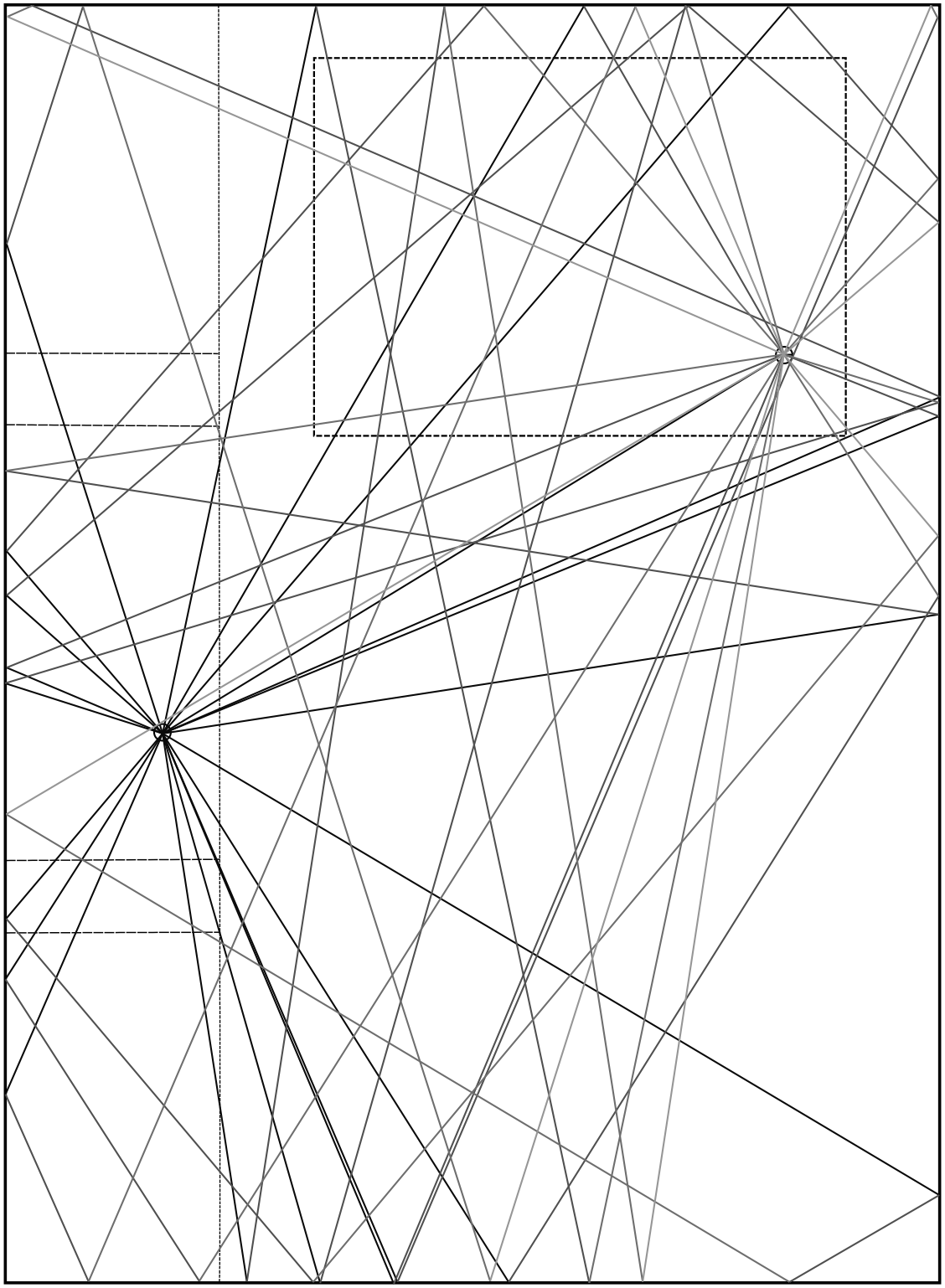
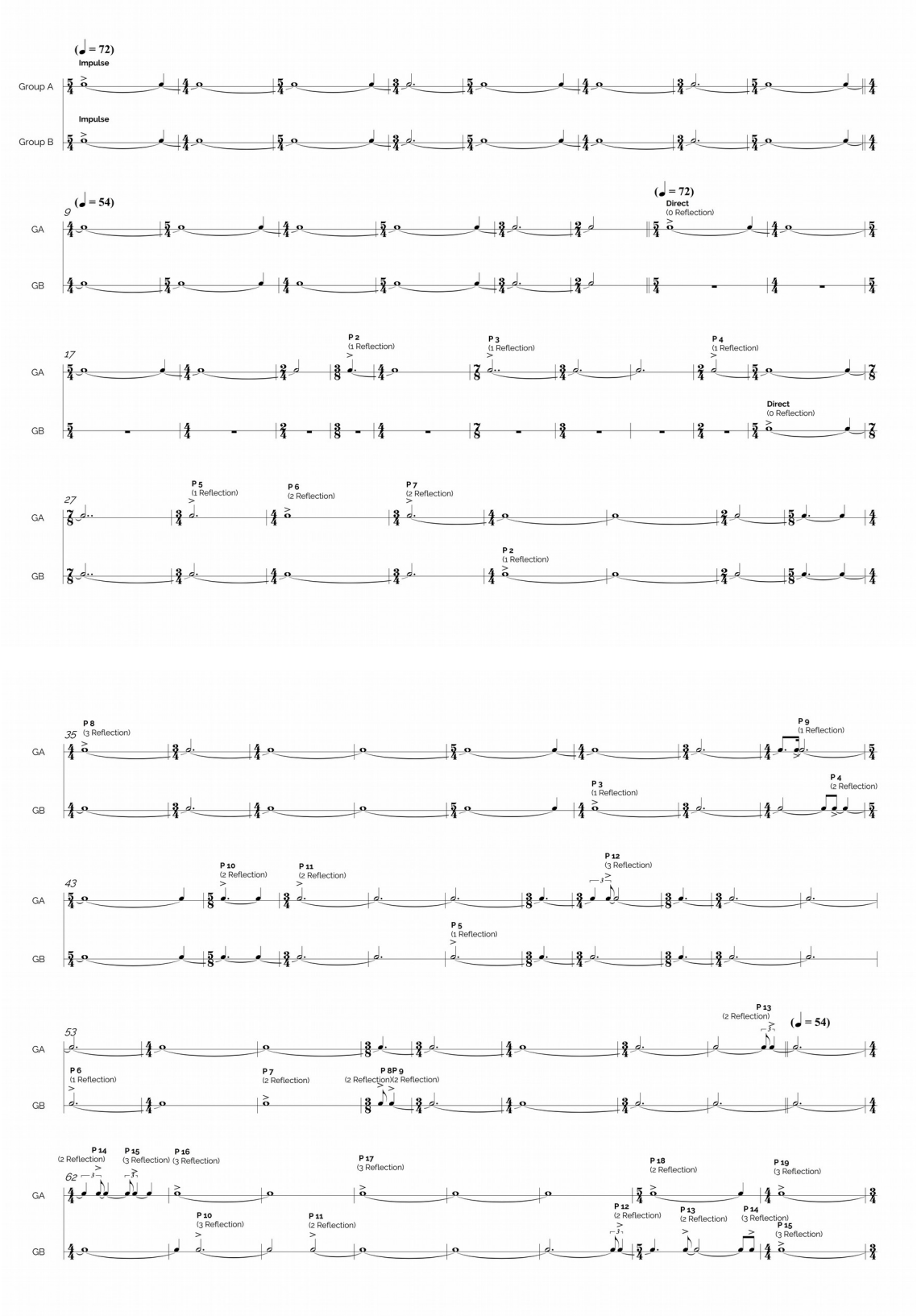


Figure 4.4: Paths of trajectory 1, displaced.

4. Concepts – Compositional Strategies – Case Studies



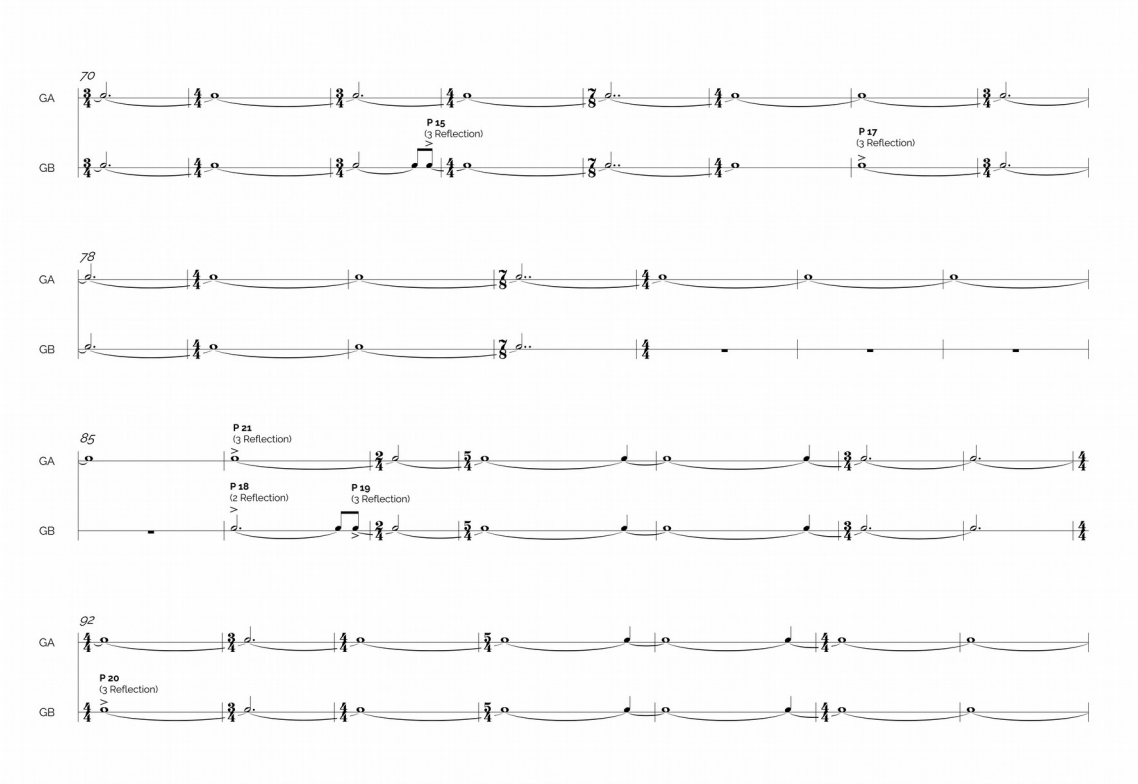


Figure 4.5: Rhythmic, instrumentation and dynamic mapping of the two arrays of paths for the macrostructure, displaced.

This resultant pattern of reflections is related to a network of materials. This network of materials is a matrix of different sound qualities. This matrix is divided into four main groups according to spectral complexity: simple, medium, complex, and noise. Each category is related with four or three different sound qualities: amount of noise, amount of oscillation, amount of distortion and amount of density, which are graduated in four degrees, none, low, medium or high. The matrix is displayed in figure 4.6. The resultant material is later grouped together according to its inherent dynamic level as represented in figure 4.7.

SPECTRUM		none	low	medium	high
SIMPLE	Noise	ord. press. SP	+ Luft T / MSP	overpressure	
	Oscillation		bisbigliando w.t.		
	Distortion			overpressure	
	Density				
MEDIUM	Noise	ord. press. SP	+ Luft T / MSP	overpressure + Luft + Luft	slap
	Oscillation		bisb.		
	Distortion		Halve valved		overpressure
	Density				

SPECTRUM		none	low	medium	high
COMPLEX	Noise	ord. press. M M	H.V.	overpressure M	Steg
	Oscillation	ord. press. M M	Halve valved	M M	BT
	Distortion	ord. press. M M	H.V.	Fltz.	overpressure Fltz. M M
	Density				
NOISE	Distortion	Luft Steg	sch		
	Density				

Figure 4.6: Network of materials, displaced.

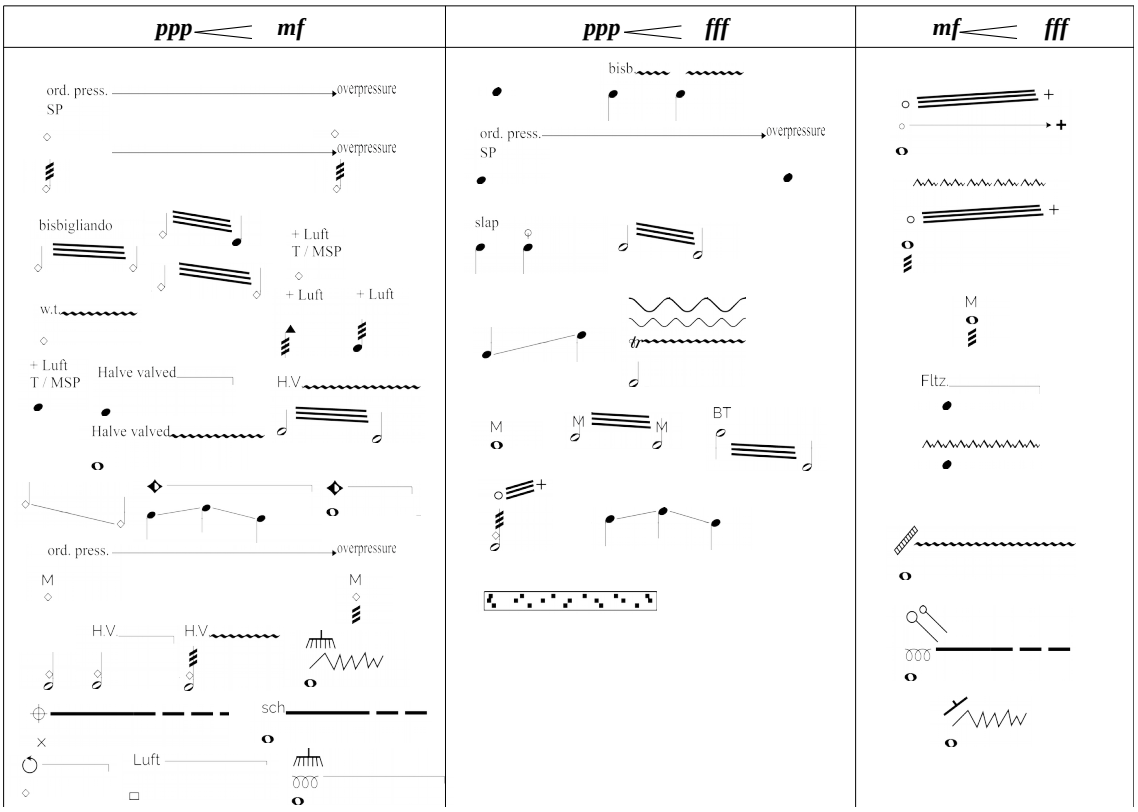


Figure 4.7: Materials grouped according to inherent dynamic level, displaced.

The number of reflections of the paths (see figure 4.5) are then mapped to the resultant materials of the network of relations (figure 4.6) in the following way:

- 0 reflections; to the materials on the categories of medium and complex spectrum with medium and high amount of noise and medium and high amount of distortion in *forte*.
- 1 reflection; “Noise” and “complex” spectrum in *mf*.
- 2 reflections; Noise and simple spectrum the last one also with medium amount of noise and distortion, with medium and high oscillation in *mp*.
- 3 reflections; complex but mostly simple spectrum with low and medium oscillation in *pp*.

Each of the components and categorizations of the matrix are general and simple abstractions, that is generalizations. Still, the results of the interrelation of the different parameters of the matrix are concrete materials. These raw categories manifest

differently in the different instruments and are further concretized with different amounts of distortion and density. A noise and complex spectrum may result in a loud unstable multiphonic on the clarinet while on the trumpet it becomes a soft halve-valved unfocused tone. Consequently, the sound results are not mere sound objects resultant of the summation of the different parameters but rather different manifestations of their relations.

In order to illustrate this concretization of the matrix, I highlight some examples from the score (see online repository):

- Example of the genotypic categorization for 0 reflection can be found in bar 15 to 19 in one half of the orchestra – group A: flute, oboe, bassoon, French-horn, trumpet, percussion 1 and 2, violin I and celli, but also in bar 26 to 30 in Bb in the other half – group B: clarinet, bass clarinet, trombones 1-2, percussion 2, violin II, viola and contrabass.
- Example for the genotype for 1 reflection: bars 20-28 in group A or in bars 31-42, group B.
- Example for the genotype for 2 reflections: bar 29-35 in group A.
- Example for the genotype for 3 reflections: instruments bar 35-41 in group A.

The concrete materials emerging from the matrix are open due to the multiple relations that they establish with each other. These relations are neither causal nor grouped in hierarchies of importance, such as background and foreground, but the materials are rather connected by relations of resemblances. There are several layers of resemblances, starting with my compositional categorizations, which give rise to new resemblances through their material interactions, and ending with the multitude of possible perceptions. In the performance, this multitude is made possible by the ambiguity of these relations. The sound result thus goes beyond my initial categorization and depends both on how the different categories interact – the object itself – and on their posterior understanding by the listener.

In time, the whole work can be described as follows: After an initial impulse by the whole orchestra in which the entire matrix of materials is displayed, half of the

orchestra, the aforementioned group A, creates differently delayed acoustic responses. These responses correspond to the rhythmic pattern, materials, instrumentation and dynamic level generated by the mapping of the paths of the first trajectory (see figure 4.5). At the same time the instruments of group B play the delayed responses according to the mapping of the second trajectory. While one array of paths is sounding, the other array starts, which results in a simultaneity and interrelation of different activities. In addition, within each response “inner reflections", a sort of feedback inside each group, can take place. By doing so, a chain of reactions and feedback loops is produced. Furthermore, each orchestral group uses a different aggregate of frequencies derived from the room modes.[146] From the initial impulse in bar 1 each group play a different aggregate. From bar 69 until the end both groups contribute to the same aggregate (see figure 4.8).

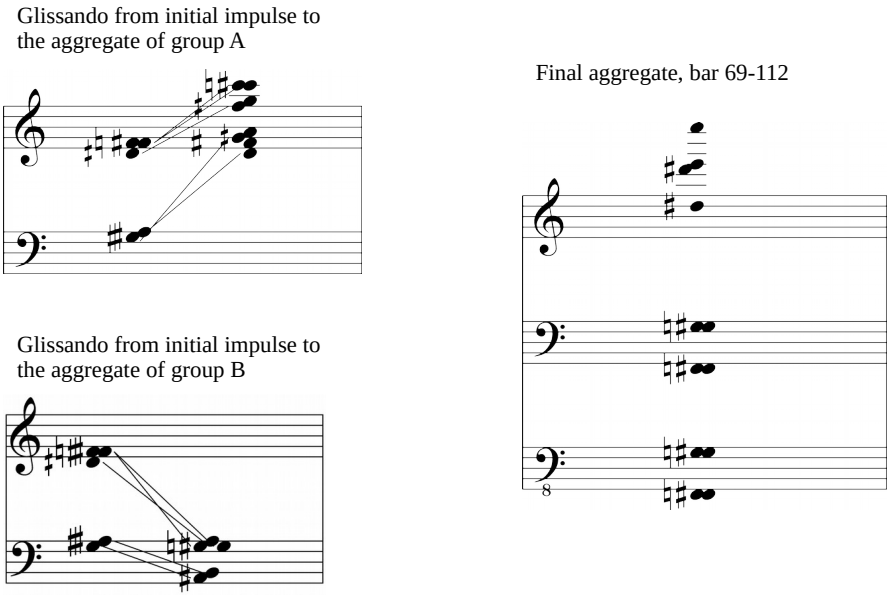


Figure 4.8: Aggregates, displaced

There is no special localization of sound sources in *displaced*. During the composition of the piece, it was clear that no spatialization of musicians was possible

146 The different room modes for this piece have been calculated with *Amroc* https://amcoustics.com/tools/amroc

due to the security measures against the spread of COVID-19 regarding the position of musicians on stage. Therefore, the composition of the piece was created for the usual orchestra disposition. Nevertheless, I choose *displaced* as an example to describe how the strategy of "family resemblances" can provide an open result in the experience of the piece even when there is no special localization of sound sources involved.

Nevertheless, the instrumentation grouping in *group A* and *group B* creates two areas in the usual orchestra disposition on stage. Still, the musicians keep a distance to each other of 1.5 meters, to avoid the spread of COVID-19. This creates a spatial impression that benefits the piece, since the unusual separation of a small number of musicians of the chamber orchestra contributes to diffuse and decenter the sound. Besides, there is another spatial dimension in *displaced*, that is the aesthetic perception of a lived concrete space. The structure of *displaced* is based on the mapping and time-stretching of the reflections of an imagined sound from two different points in the space of the *Baar-Sporthalle* in Donaueschingen. From the infinite number of possible positions of sound emissions and their vast number of reflection patterns in the hall, I selected a few based on an acoustic model to use them compositionally in the piece. This selection is a conscious compositional gesture to aesthetically explore a concrete aspect of a place rather than to represent this place. Rather than recreate a place, the piece makes the listener aware of this place. "This place" is also "displaced" to the stage. That is, the place that we are experiencing at the moment of the performance is being explored and made audible by displacing its entirety to the area of the stage.[147] In this way, *displaced* revisits the Utopian topos of space as openness. Utopia is here not an ideal unreachable place, but it is rather the place that we experience, which is rethought and redistributed according to different values and through another lens.

Due to the strategy of "family resemblances" and a structure provided by the mapping of reflections, the sound materials in *displaced* are not related by imposed relations of contrast, continuation, or causation. Instead, these relations remain

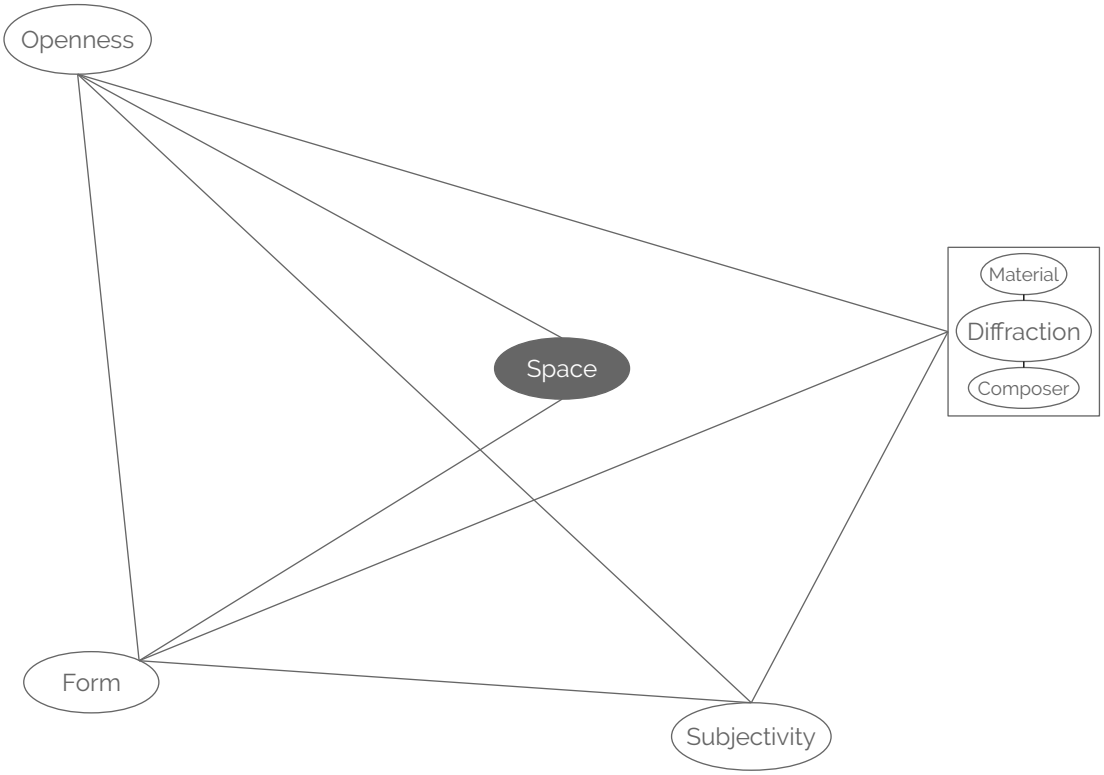
147 With the second wave of the COVID19 crisis the *Festival of Donaueschingen 2020* and its opening concert with the performance of *displaced* were sadly canceled. A recording of the piece was still broadcast on *SWR2* in October 2020. For a second time, *displaced* was thus displaced from a live performance on stage to the listener's place.

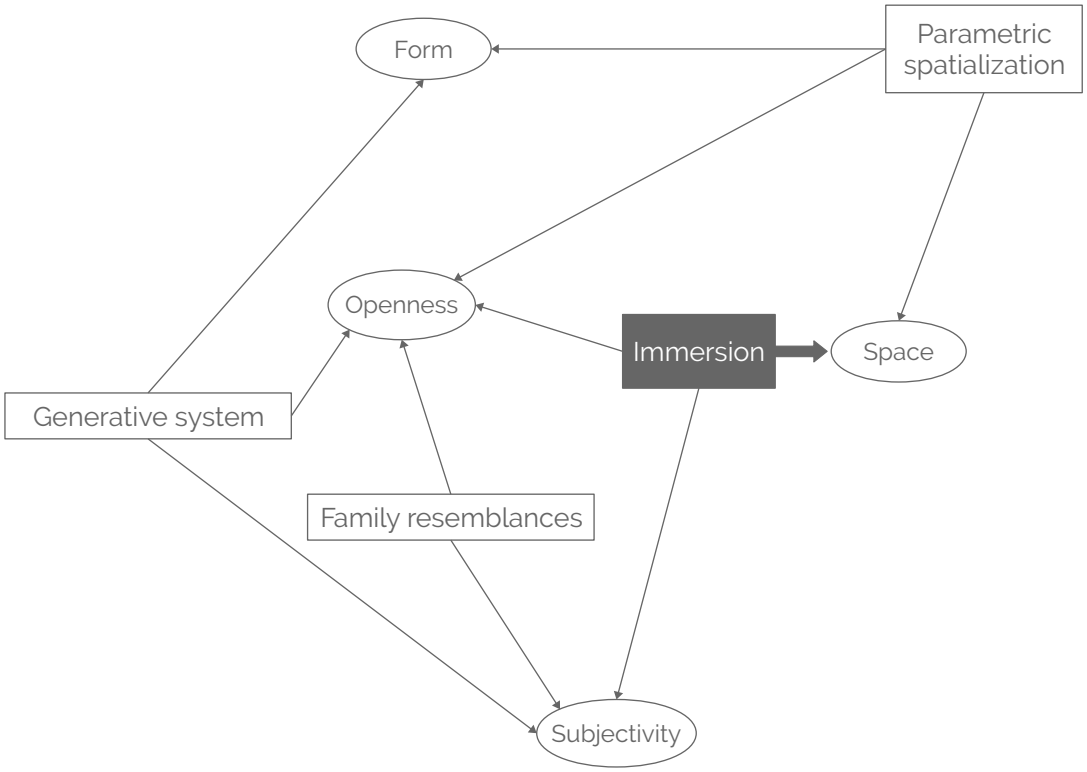
ambiguous, sometimes irrelevant or can emerge in an active listening. However, *displaced* does not merely display a juxtaposition of elements or a sound texture. On the contrary, materials emerge – and disappear – as entities that are related to each other by their multiple relations of resemblances, and by doing so, the materials' identities remain in continuous transformation. The piece is open but retains identity. This openness is not the product of chance or probability, like in the 1960s, neither by favoring meaning making – like in the case of *Musiktheater* or conceptual music – but rather due to the inner ambiguity and potential openness of the material itself in its intra-action with an active listener.[148]

Openness is twofold in my practice. On the one hand, contingency is intrinsic to the sound result and its development in time. This contingency is the product of the agency of the materials and their interactions. These relations are facilitated by me as a composer employing certain compositional strategies, like the network of family resemblances used in *displaced*. The network in the relations of the different parameters sets the conditions for the emergence of a multilayered sound. Yet, the sound results of the relations of the different parameters are more complex than their mere addition. On the other hand, openness results from the multiplicity of possible understandings that this multifaceted ambiguous sound result offers. The next section is devoted to the role of the localization of sound sources in the creation and enhancement of this multiplicity of understandings.

148 A recording of *displaced* (2020) for chamber orchestra. https://www.youtube.com/watch?v=79obWo0WFJg

Illustration 3: Topography of concepts and strategies from the perspective of space and immersion strategy





4.3. Space – Form created by Localization of Sound Sources. Space Inherent to the Material – Case Study *ins Offene*

In chapter 3, I described how the different conceptions of space involved in compositional practices influence the aesthetic result of the musical work. Post-serial space as structure has different aesthetic results than the concept of space as place, as it has been conceived of in sound art, or space as bodily presence, as it appears in *Musiktheater*. In what follows, I describe the concept of space inherent to my own practice, how it is concretized in my compositional work and the compositional strategies in which it is grounded. Finally, I discuss the aesthetic consequences of my concept of space in relation to form and openness in the case study *ins Offene* (2012-2013) for ten instruments and live electronics.

In my practice, space plays an important role in creating a multiplicity of experiences. Parameters and networks of relations have a spatial dimension and materials are the results of combinations of spatial processes instead of merely being distributed in space. This implies a relativist and relational conception of space similar to the concept of space described by the sociologist Martina Löw in *The Sociology of Space: Materiality, Social Structures, and Action.*[149]

The different understandings of space in sociology but also in the sciences[150] and philosophy can be roughly divided into two main models, an absolute understanding and a relativist conception of space.[151] In general, an absolute position understands space as something given that exists independently of the actions, bodies and objects that take place in it. Space is the basis and establishes the conditions for actions and is as such fixed and unmoved. On the other hand, a relativist position conceives of space as an arrangement of things, bodies and their actions, and is therefore in continuous motion. According to a relativist understanding, space – as a product of actions and

149 Martina Löw, *The Sociology of Space: Materiality, Social Structures, and Action*, trans. Donald Goodwin, Cultural Sociology (New York: Palgrave Macmillan, 2016).
150 Jan C. Schmidt, "Physik," in *Texte zur Theorie des Raums*, ed. Stephan Günzel, Reclams Universal-Bibliothek 18953 (Stuttgart: Reclam, 2013): 290–307. p. 290-291.
151 Martina Löw, *The Sociology of Space: Materiality, Social Structures, and Action*, p. 9-10.

arrangements of bodies – is in a continuous process of change and does not exist prior to the bodies that form it.

Absolute conceptions of space are the basis for the conception of three dimensional Euclidean space and have been predominant in physics since antiquity. Aristoteles conceived of space as a finite container in which things are localized and actions happen. Space for Issac Newton is an absolute reality separated from the bodies that inhabit it, and remains immobile and without changes. The absolutist position of space is also endorsed by our everyday notion of space, in which we conceive ourselves and our actions against a background of immobile space.[152]

However, since Albert Einstein's theory of relativity, the Newtonian absolute concept of space has been debunked. New conceptions of space from quantum physics, fractal geometry, or chaos theory have questioned and replaced absolute conceptions of space in physics and the privilege of Euclidean space as a model to explain the world.[153] Einstein mathematically demonstrated that space and time are relative to the observer and their frame of reference. Space is a relational structure between bodies and in continuous change in time. In this sense, time and space constitute a continuum.[154] Conceptions of space from 20th century physics align with relativist conceptions of space, which conceive space as resultant of arrangements of bodies and their actions, and are as such interrelated with the observer. Relativist conceptions have also been influenced by phenomenology regarding the ways in which the subject perceives space. In the *Phenomenology of Perception* (1945),[155] Maurice Merleau-Ponty described space as the perception of things and their arrangement in everyday action. From a phenomenological perspective, Gaston Bachelard, in his book *The Poetics of Space* (1958),[156] analyzed architectural spaces from the perspective of their lived experience and how the places are experienced and imaged in daily life. A seminal work for the

152 Martina Löw, *The Sociology of Space: Materiality, Social Structures, and Action*, p. 10.
153 Jan C. Schmidt, "Physik," in *Texte zur Theorie des Raums*. p. 290.
154 Martina Löw, *The Sociology of Space: Materiality, Social Structures, and Action*. p. 15.
155 Maurice Merleau-Ponty, *Phenomenology of Perception*, trans. Colin Smith (London: Routledge, 2005).
156 Gaston Bachelard, *The Poetics of Space*, trans. M. Jolas (Boston: Beacon Press, 1994).

relativist understanding of space is Henri Lefebvre's *The Production of Space*.[157] Lefebvre investigated the social influence on the construction of space and proposed a concept of space that goes beyond the description of absolute space as a container, which he relates with objectivization and commodification of space by capitalism. Lefebvre distinguished three concepts concerning space: *perceived space*, related to everyday spatial practice, the bodily experience of space, the c*onceived space* constituted by representations of space, such as mathematical or physical models, and *lived spaces*, which describes spaces of representation and the way in which spaces are communicated. It is the space of artistic expression. It is this last category of space the only one that has the potentiality to subvert the prevalent order and the capacity to imagine other spaces.[158] Michel Foucault also proposed a different idea of space from the absolute one. In "Of Other Spaces" (1967),[159] Focault analyzed how space in his time is conceived as a form of placements and storage relations. Space is thus formed by the particular relations established for the concrete placement.[160] In this sense, for Foucault, space is not only a structure but a network of relations that refers to the placing of things, and by doing so space is always in movement, not static.

Against this background, Martina Löw proposes a relational concept of space. Löw describes space as a relational arrangement (*An-Ordnung*) of social goods and bodies that are in constant motion, so that the arrangement itself is always changing. Beings have an agency to shape and create spaces but also social goods, such as sounds or odors influence the creation of space and the arrangement of beings. Space is not fixed or prior to the actions and bodies but is rather created by linking bodies and things.[161] In a current society, in which the organization of proximities is changing, in which great distances are surpassed with airplanes, and in which communication between remote areas happens in milliseconds via email, there is a process of insularization connected via dynamic links. In Löw's conception, space is not

157 Henri Lefebvre, *The Production of Space* (Oxford, OX, UK ; Cambridge, Mass., USA: Blackwell, 1991).
158 Martina Löw, *The Sociology of Space: Materiality, Social Structures, and Action*, p. 111-112.
159 Foucault, Michel, "Des Espace Autres," trans. Jay Miskowiec, *Architecture, Mouvement, Continuité*, no. 5 (October 1984): 46–49.
160 Foucault, Michel, "Of Other Spaces," p. 47.
161 Martina Löw, *The Sociology of Space: Materiality, Social Structures, and Action*, p. 129.

preexistent but rather emerges by virtue of elements and their relational connections: "Space is never only a substance and never only the relationship; rather, space emerges from the arrangement, that is, from placement in relation to other placements."[162] Nevertheless, space is not a mere disposition of people and things, the arrangements in turn affect the placements of beings and social goods.

> Social goods and living beings are combined to yield spaces through processes of imagination, perception, and memory. This operation of linking is socially pre-structured by virtue of ideas of space, institutionalized space constructions, and class-, gender-, and culture-specific habitus.[163]

The perception of spaces, how they are imagined, regulated and institutionalized, plays an important role in its constitution and continuous transformation. Space is not only a placement of bodies and their actions but also its perception, conception and institutionalization. All these aspects influence the constitution of space, its characteristics and its transformations.

In my compositions, I understand space similarly to Löw's relational concept. I understand space as a dynamic system of interactions between objects, structures, social relations, and actions. Therefore, material but also space itself emerge like in the Baradian conception of the experiment (see chapter 2) in the diffractive encounter between the network of relations, listeners, performers and the acoustics and dimensions that constitute the performance space. Space is also in continuous transformation during the compositional work. There is no a prior space that remains the same throughout the course of the whole piece, rather the different relations of family resemblances – discussed in section 4.2 – established by instruments and the materials among themselves, create and transform space. The listener, due to their position in relation to the performers, establishes their own links and relations with the sound material. In turn, the listener's perception, expectations, and understanding of sound events modifies their experience of subsequent sounds events of the musical work. My conception of space, by being conceived of as a relativist and as a relational phenomenon, embraces the differences in perception and experience by each being involved in it. Although I

162 Martina Löw, *The Sociology of Space: Materiality, Social Structures, and Action*, p. 189.
163 Martina Löw, *The Sociology of Space: Materiality, Social Structures, and Action*, p. 189.

use geometrical space as a tool to represent reality, and for the construction of models (see chapter 2) and systems, it emerges in performance and it is not equal to its geometrical representation. Due to the compositional strategies described in this chapter, space is the interaction between sound material, performers and listener position, position of walls, objects and their acoustics properties, and the listener's perception and understanding. This understanding and perception of the listener is also influenced by their position, the position of sound sources and things, and the listener's interaction with the material. With the use of the localization of sound sources and the emergence of a relational space in the performance, my compositional practice seeks to open the experience and understanding of the compositional work.

It can be argued that pieces that use localization of sound sources and even any piece played in a concrete space is differently perceived depending on one's spatial position. However, this is not always compositionally explored. As I discussed in the chapter on the context of this project (chapter 3), pieces that make use of ambisonics but also instrumental works that create a specific area or "sweet spot" in which an ideal sound image would be experienced equally by every member of the audience, do not favor a multiplicity of experiences. On the other hand, there are pieces that do offer multiple experiences but do not promote multiple understandings. These musical works display teleological forms in which ambiguity in the understanding is not fully taken into account. Spatialization in these pieces is used to communicate a single unequivocal meaning and is understood as the imposition of a spatial position onto an otherwise non-spatial sound object. The listener will have different acoustic perceptions depending on their position, even different semantic interpretations of the piece. Still, beside semantic interpretations, the sound image conceived by the composer is the one that prevails as an ideal. While this is not to be rejected as such, it is contrary to the open understanding investigated in my practice.

To achieve openness through localization of sound sources and the emergence of a relational space I use four strategies that are related to each other and can be used simultaneously:

1. Asymmetry in the localization of sound sources.

2. Immersion of the listener in sound rejecting the frontal perspective.
3. Space as inherent to material, space as material.
4. Movements and areas of activity instead of sound trajectories.

What follows is a description of these strategies in my practice and their aesthetic consequences. These strategies are not without antecedents. In chapter 3, we saw how Luigi Nono and Iannis Xenakis opened the perception of their works by immersing the audience in sound masses, or how Maryanne Amacher disrupted frontal perspective in *Living Sound, Patent Pending.* Nevertheless, the use of the strategy of localization of sound sources, together and interrelated with the other strategies described in this chapter – the network of family resemblances, parametric spatialization, and generative systems – and its aesthetic results are unique to my compositional work.

The use of an asymmetrical disposition of sound sources avoids the creation of an ideal position or sweet spot. In my practice there is no unique ideal image of the piece, but there are rather multiple possibilities to understand it. This multiplicity of understanding as discussed in relation to openness is not only due to the particular semantic impression of the listener, but rather, and most importantly, due to the ambiguous and open nature of the material and the musical event itself. Openness and ambiguity is reinforced by using an asymmetrical localization of sound sources and by strengthening the appearance of different partitions and relations in space, and with them the increase of possible multiple perspectives on the same sound.

A frontal perspective of a musical event prioritizes one experience of it, while an immersive arrangement of sound sources allows for multiple perceptions of the event. Gender studies have discussed how the social construction of the “male gaze” posits an unequal power relation between the subject-male who sees, and the person-female who is seen. The male gaze is frontal and objectifies and commodifies what it sees and by doing so it controls it.[164] Along these lines, sound studies have confronted visual frontality with the idea of immersive sound. While vision implies a separation between

164 See Laura Mulvey, “Visual Pleasure and Narrative Cinema,” *Screen* 16, no. 3 (September 1, 1975): 6–18.

subject and object, hearing is related to immersion of the subject into a medium and to the blurring of the separation between inside and outside.[165]

However, in authors like Frances Dyson and Douglas Kahn there is what Will Schrimshaw[166] has called and ideology of immersion. This ideology presupposes that hearing in opposition to seeing is pre-critical. Moreover, they describe sounds as inherently immersive, vague, and imprecise. In addition, these authors propose a re-mystification of the sound experience that supposes to merge inside and outside. I agree with Schrimshaw that immersion in these terms reduces the scope of art. Furthermore, an analysis of hearing as pre-critical and the nature of sound as vague and imprecise presupposes that listening cannot be active and disregards acoustic and psychoacoustic studies of sound and the analytic capacities of the trained ear.[167] In addition, in my understanding, hearing is not necessarily immersive. While sound phenomena indeed surround us while hearing, this does not necessarily cancel frontality in a concert situation in which the sound is distributed from the stage. Moreover, we perceive the position of sound sources localized in space and our position in space in relation. Therefore, sound does not guarantee immersion.

Immersion in my practice is created by the localization of sounds sources. However, the immersion that I propose is not a passive and un-critical listening, but rather an active listening of an event that manifests itself differently in their relations when heard in different positions. In this sense, I understand immersion as Brandon Labelle understands sound: “sound may create a relational space, a meeting point, diffuse and yet pointed”.[168] In my understanding, an immersive localization of sound sources breaks the frontal perspective and immerses the listener in the sound event. Instead of controlling the event from afar, the listener is part of it. By interacting with their active listening, the listener creates relations with the sound material. Immersion is not an attempt of merging inside and outside, or to mystically reconnect the inside with

165 See Frances Dyson, *Sounding New Media: Immersion and Embodiment in the Arts and Culture* (Berkeley: University of California Press, 2009); Douglas Kahn, *Noise, Water, Meat: A History of Sound in the Arts* (Cambridge, Mass: MIT Press, 1999).

166 Will Schrimshaw, “Exit Immersion,” *Sound Studies* 1, no. 1 (January 2015): 155–70.

167 Will Schrimshaw, “Exit Immersion,” p. 8.

168 Brandon LaBelle, *Acoustic Territories: Sound Culture and Everyday Life* (New York: Continuum, 2010). p. XVI.

the outside. On the contrary, there are no prior categories of inside and outside.[169] In contrast, immersion allows for the emergence of a relational space between sound material and listeners, in which the listeners and the materials both have agency in the result due to the relations that they establish with each other. By doing, so the hierarchical binary division of subject and object is subverted, in the relation between listener and musical work.

In recent years, immersion has been a ubiquitous topic not only in sound art, but also in visual arts.[170] With the current health crisis in which being present and together is dangerous, questions of immersion, sharing and creating a space seem Utopian. Although at the moment the end of the crisis appears on the horizon as a possibility, its economical, social, psychological, and cultural consequences are not easy to envisage. Nonetheless, we can foresee that musical events, the conditions in which we will listen to music, and the cultural politics that support musical events will change in the immediate future and after the crisis. In this sense, immersion regains a new meaning in this current situation, since immersive experiences become a singularity, a unique aesthetic event and Utopia.

In most of my pieces, the starting point is the disposition of the sound sources, that is the representation of the localization of musicians, speakers, and audience in the geometrical space based on the place of the performance. Based on this, I develop a matrix of parameters and family resemblances of materials that are localized in space, due to the position of sound sources. In this way, the resultant materials of this matrix are not spatialized in a later step, but they rather have a spatial character from the outset and in their relations. Although I construct a system in which a geometrical space is involved and materials are conceptualized by me based on a matrix, neither space nor sound material are prior objects to the piece. They rather emerge in the performance in

169 Sound can play a role in creating borders and marking spaces. For example, in an assemblage of people in conversation, the categories of inside and outside of the group are not marked only by the physicalities of their bodies, but more importantly by the reception of the sounds that they emit.

170 See Fabienne Liptay and Burcu Dogramaci, eds., *Immersion in the Visual Arts and Media, Studies in Intermediality*, volume 9 (Leiden ; Boston: Brill Rodopi, 2016). Just to mention an example in Berlin, the annual program series of events and expositions *Immersion* by the Berliner Festspiele, in which among other events the exposition *Welt ohne Außen*. *Immersive Spaces since the 1960s* in the Gropius Bau, Berlin 2018 has been shown.

their relations and in the relations established by the listeners. This emergence is not a concretization of an idea into practice, because there is not a preexistent idea or form, there is rather a system, the matrix of relations and localizations, that in their encounters allows for an open event.

The spatial effect of creating clear sound trajectories between sound sources that the listener can follow is well known. Although movements of sound are present in my work, I do not create sound trajectories that force the listener's attention in a certain direction. Trajectories imply an unambiguous gesture with a clear interpretation. In contrast, in my practice, sound material and its movements activate and create different spatial areas that expand, transform, and change themselves. The different sound sources create different areas of activity in space that interact and relate to each other. In addition, sound processes and morphologies as well are divided according to different parameters that are localized in space.[171]

These different strategies of dealing with space can be better illustrated on the basis of the concrete case study of *ins Offene* (2012-2013) for ten instruments and live electronics. The starting point of the composition *ins Offene* was the localization of sound sources and listeners in a hypothetical performance space without separation between stage and audience. The percussionist is located in the center of the performance space, while the audience is seated around the percussionist. The other nine instruments are placed around the audience at regular intervals, forming a circle. Around the musicians there are four speakers forming a square, each speaker is situated in one of the corners of the square (figure 4.9). The electronics amplify and transform the sound of the instruments in real-time. For each instrument – except for the percussion – there is a microphone that picks up its sound and sends it to the computer in order to amplify it or to transform it by means of a granular synthesis processor.

171 The spatialization of parameters is discussed in more depth in the next point 4.4. Form – Form created by spatialization of sound parameters – case study *Parallax*.

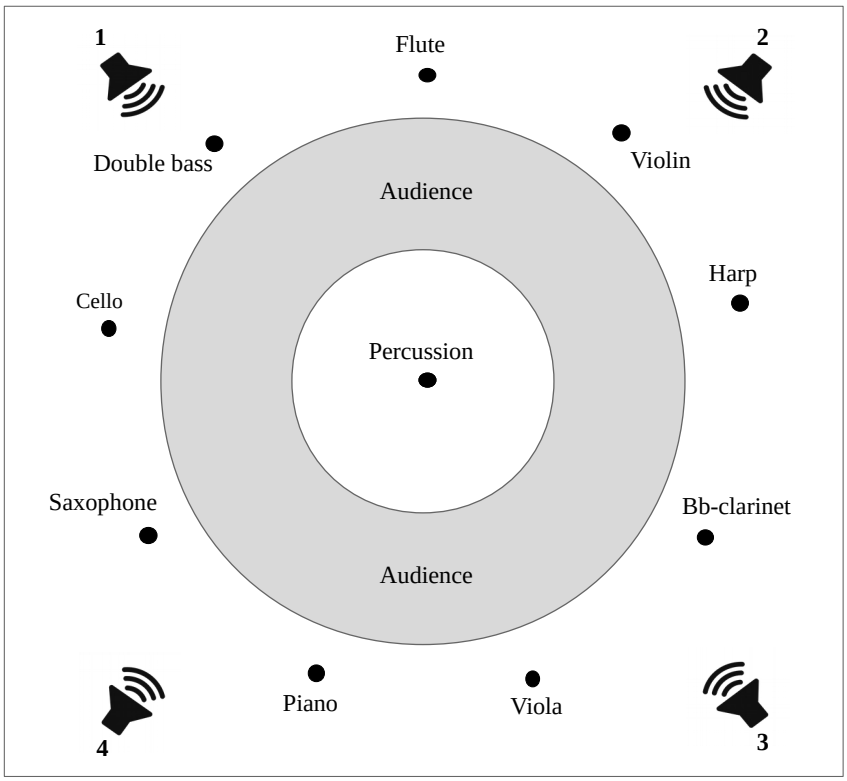


Figure 4.9: Disposition of instruments, speakers and audience in ins Offene.

Based on this map of sound sources I can build different areas of activities in the composition of the piece by relating the different instruments and their sound materials. For example, I can build areas that have a triangular shape between the instruments belonging to the same family. The result of this grouping is a triangle between woodwinds – flute, clarinet and saxophone –, a triangle between strings – violin, viola and cello –, and a triangle comprising instruments that can reach a lower register – piano, harp, and contrabass. I can also create an area between instruments that are close to each other or situated in front of each other. I can use the space of the entire ensemble or the space created among the speakers (figure 4.10). These different areas can be sounding simultaneously or in succession. Each loudspeaker can amplify and process the sound of the instruments that are closest to it, but it can also transform the sound of the instruments on the opposite side, and by doing so create a mirror effect.

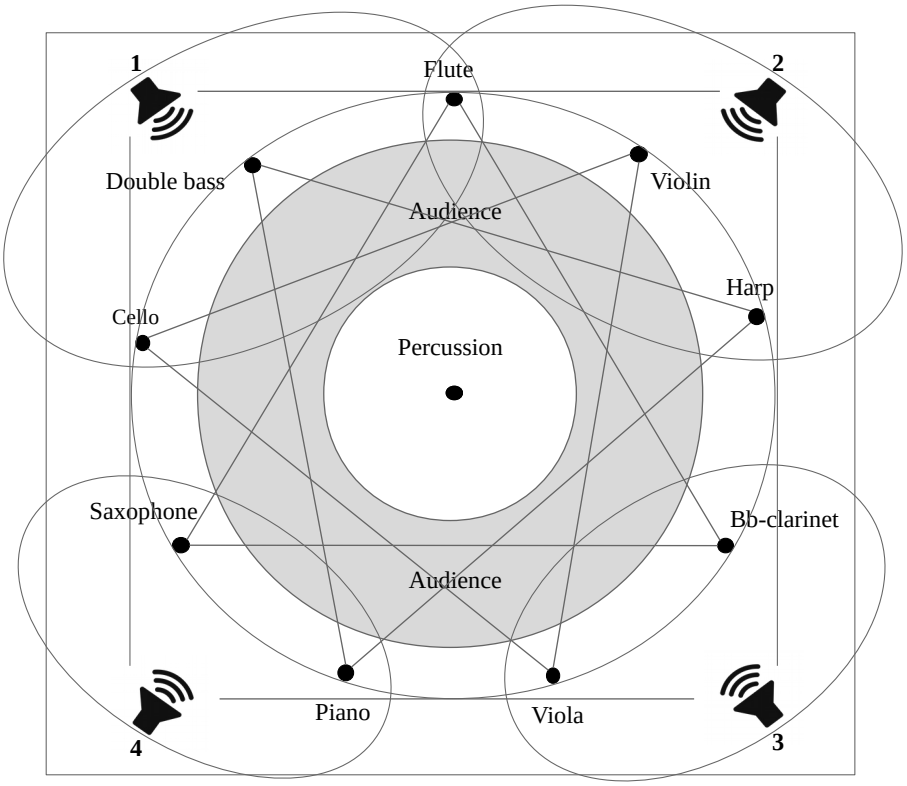


Figure 4.10: Different possible areas, ins Offene

A network of materials was created based on this map, the instruments, and their position. In this way, the localization is already involved in the conception of the material. Material, therefore has an inherent spatial dimension. The network for the first part of the piece – bars 1-130 – contains three categories of materials for the percussion – A, B, C. Each of these categories can trigger three different possible materials for each of the other instruments (figure 4.11).

I use the matrix to relate the different categories of materials tot each other. The use of the matrix can be described as follows: For each category of percussion material, there are certain constraints for the other instruments. For example, if I use category A for the percussion, I can alternate between the options A1, A2 or A3 for the other instruments (see figure 4.11). I can use each of these options of materials in different combinations and instrumentation.

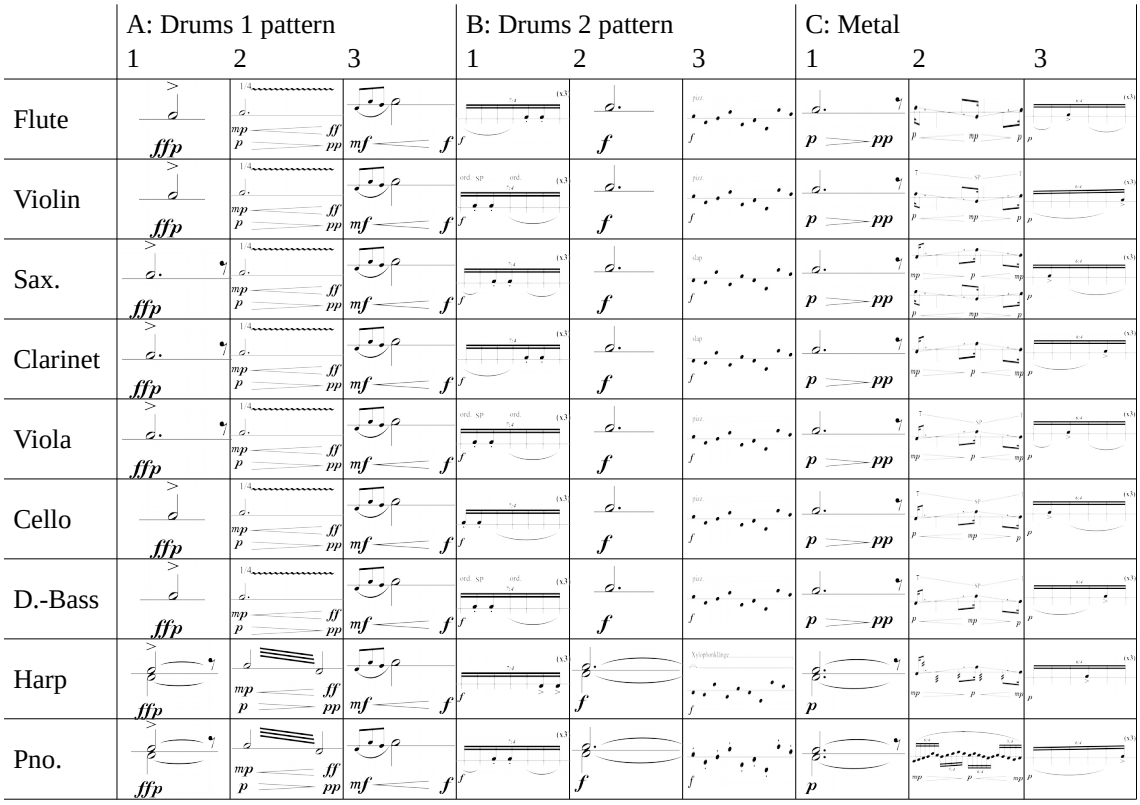


Figure 4.11: Set of materials, ins Offene.

For example, for material A in the percussion: a dense rhythmical drum pattern – example bar 1-2 percussion – the matrix offers three possible materials to chose from in each of the other instruments:

A1) A sustained note with a quarter tone vibrato in crescendo – example bar 1 first half note in flute, second half note in clarinet.

A2) A group of grace notes that follows a sustained note also in crescendo – bar 2 clarinet.

A3) A *ffp* sustained note – bar 1, first half note in the clarinet.

This set appears in the score at bar numbers: 1-2, 5-11, 15-17, 28, 33-34, 43-44, 46-47, 49-51, 68-75, 78-80, 83-84, 103-104, 123-130.[172]

172 See complete score in the online repository: https://www.researchcatalogue.net/view/1228054/1253914.

For the material B in the percussion, a rhythmical pattern that is less dense than the material A also played in the drums – example bar 3-4 –, there is the following set of three materials for the rest of the instruments:

B1) A group of pizzicato notes or slaps with the same level of dynamics – example bar 3-4 flute.

B2) An irregular grouping of sixteenth notes in a sustained dynamic – bar 3-4 viola.

B3) A sustained note in decrescendo – example bars 18-19 in the contrabass.

This set B appears in the score at bars 12, 18-19, 29-31, 36-37, 45, 52-63, 76-78, 85-98, 102, 121-122.

The last material in the percussion C is a tremolo in the cymbals or tam-tam in crescendo and decrescendo – bar 13-14. This can trigger the following materials in the other instruments:

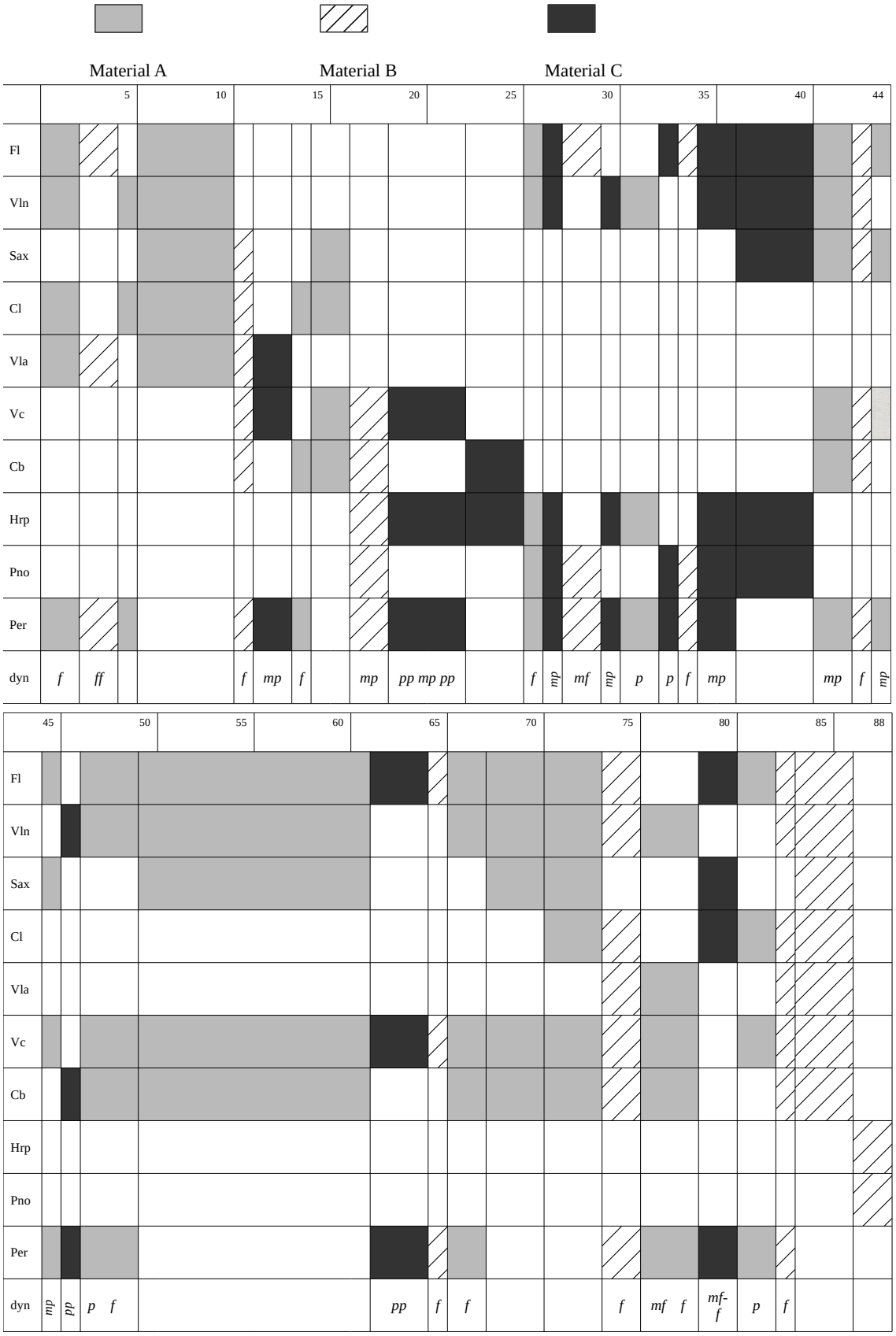
C1) A glissando in crescendo and decrescendo – bar 13-14 in cello.

C2) An irregular group of sixteenth notes in melodic movements made up of close intervals also in decrescendo and crescendo – bar 13-14 in viola.

C3) A trill or sustained note or chord that decreases in dynamics – bar 20, piano, and cello, bar 21 harp.

Set C appears in bars 13-14, 20-27, 32, 35, 37-42, 48, 64-67, 81-82, 99-101, 105-120.

Figure 4.12 shows the alternation in time between the different categories of materials of the matrix and their instrumentation.


Material A
Material B
Material C
5
10
15
20
25
30
35
40
44
Fl
Vln
Sax
Cl
Vla
Vc
Cb
Hrp
Pno
Per
dyn
f
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f
mp
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mp
pp mp pp
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60
65
70
75
80
85
88
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Vln
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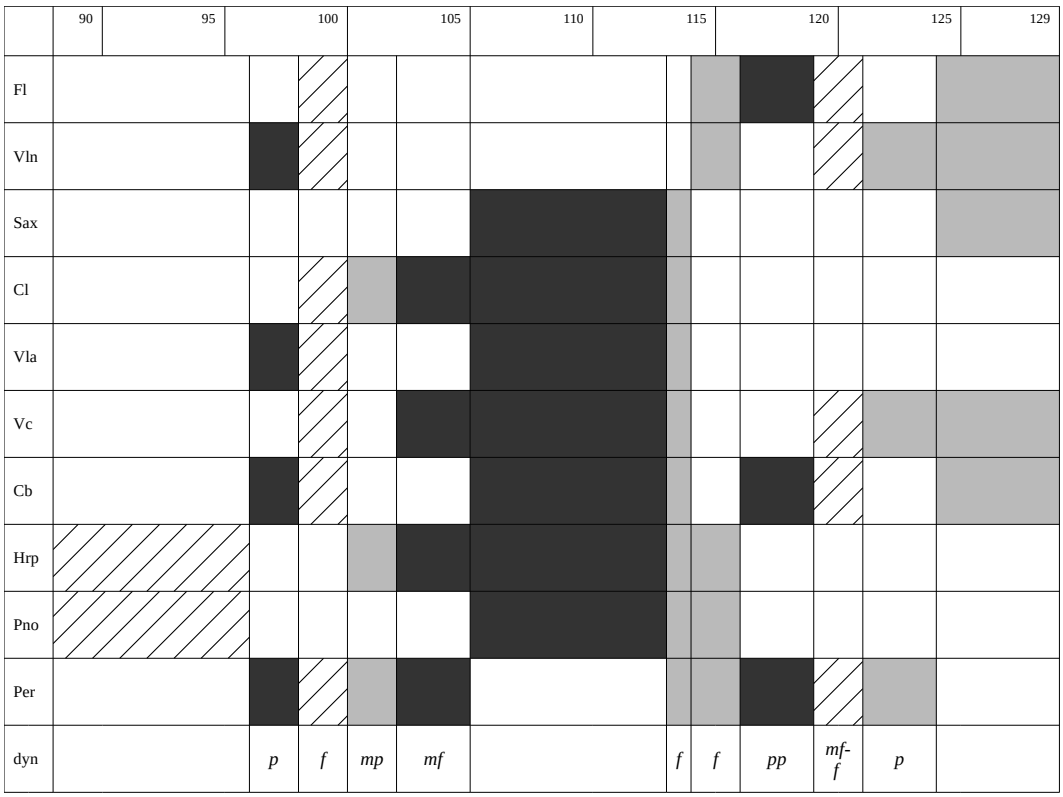


Figure 4.12: Network of materials, ins Offene

These material categories, which are abstract types in the matrix (see figure 4.11), are later concretized in each instrument in a slightly different way. In each iteration, the instrumentation and constellation and with it the localization in space is different. The reduced set of coordinates that the matrix provides gives rise to numerous combinations. In *ins Offene*, my conception of the "network of materials" was not fully developed: The material is not fully conceived as emergent from a matrix of family resemblances, the materials are rather conceived of as categories. Nevertheless, the categories are very similar or conceived as variation which allow the materials themselves to form relations of family resemblances. The aesthetic experience of the piece is open due to the spatial dimension of the materials, their different appearances in the instruments and in time, and due to the relations between the resultant materials in space and in the different areas of activity that these relations create. An example of the influence of localization in the understanding of the material and its relations can be seen in bar 3 and 4. A listener who is close to the viola will perceive its material as the

main gesture, while a listener who is close to the flute will perceive the material of the flutist as foreground and the material of the viola as secondary. That, in turn, will affect how the different subsequent transformations of these materials by the other instruments will be understood, such as for example in bar 12, 18-19 and so on. Still, this first impression and understanding of these materials is modified in the course of the piece due to the transformations and localization in space. The example of viola and flute shows how an asymmetric disposition of sound sources reinforces the differences in possible understandings of the material by the listener. (See the online repository for score of *ins Offene*).

ins Offene avoids the creation of trajectories, instead the materials create areas of activity, for example in bar 85 to 98 there are two elements, the irregular groups and *pizzicati* or slaps (figure 4.13). These elements move freely between the duo of flute and clarinet – inside the triangle of woodwinds –, between the trio of violin, viola and cello – the triangle of strings – but also between the two areas front-left and rear-right. These spaces later collapse in bar 89 into the two points of harp and piano (see figure 4.10). The movements and localization of the material do not describe trajectories to be followed. Instead of sequentially following each other to describe a path, the materials overlap. These movements and positions circumscribe an area of activity and create a space as a product of their relations. This space is transformed and later on moved to the space between piano and harp.

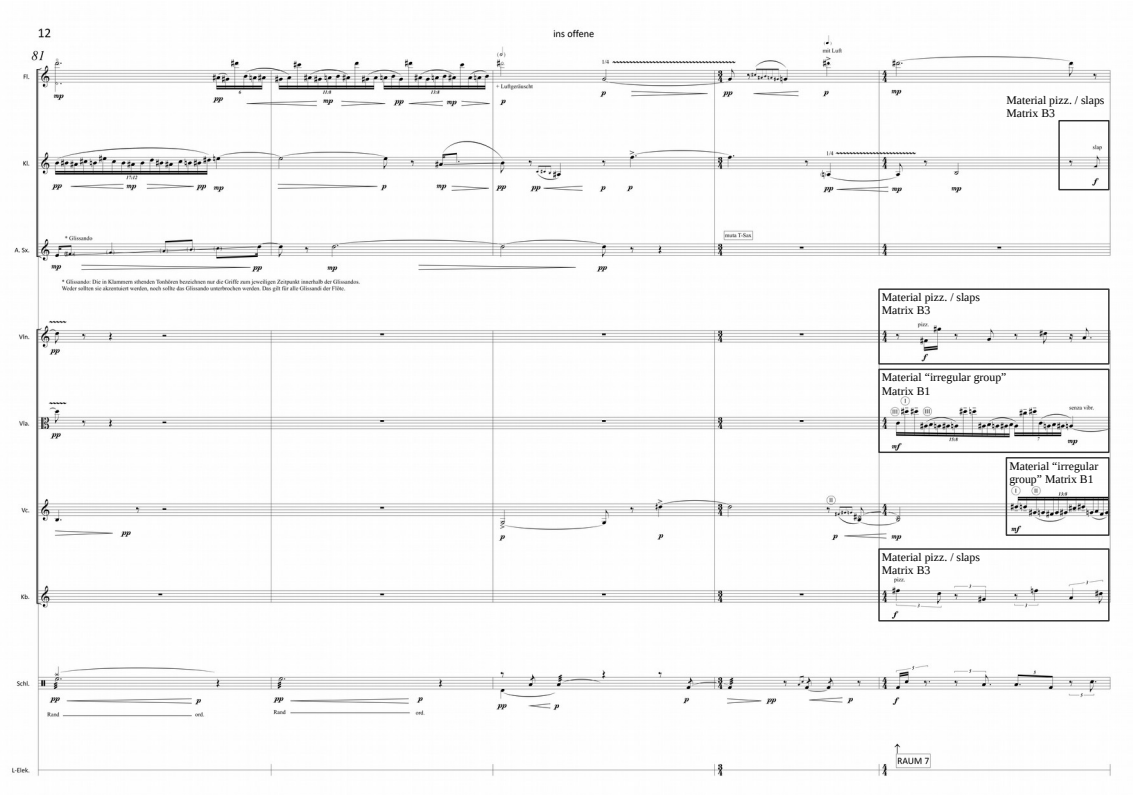


Figure 4.13: example of "irregular group" and "pizzicati", ins Offene.

The localization of sound sources in *ins Offene* is immersive. The listeners are surrounded by sound sources and in this way they are part of and immersed in sound. Still, the listeners are not immersed in a drone that sinks them into an interior introspection. On the contrary, the different areas of activities invite them to trace and retrace the material in its movements by actively listening. This can be experienced in the whole piece, however, an example of this can be found in bars 243-259, which is the first tutti passage in the work. The whole ensemble is playing at the same time, yet each instrument plays a different layer. The result is therefore perceived differently depending on the position of the listener. Another example of immersive sound can be found starting in bar 280 and continuing until the end of the piece. In this section, tutti passages – bars 280-284, 287-293, 299-301, 302-312, 320-330, 341-348, 351-354, 359-365 – alternate with silences and very short interventions of two or three instruments – bars 285-286, 293-298, 313-319, 331-341, 348-351, 355-357. The whole ensemble plays a sound aggregate, that is a harmonic organization, formed by different gestures

and reminiscences of the first set of materials from bars 1-130. This aggregate is conceived as a timbre that has been transformed in time, since the different gestures contribute to synthesize a timbre. The timbre and its details are experienced differently depending on the position of the listener. The aggregate in its morphology and instrumentation does not always appear in the same way, therefore this experience also changes over time and space. The short duo interventions happen in different instruments, and therefore in different locations, its experienced meaning and relation to the interventions of the tutti passages also depend on the position of the listener.

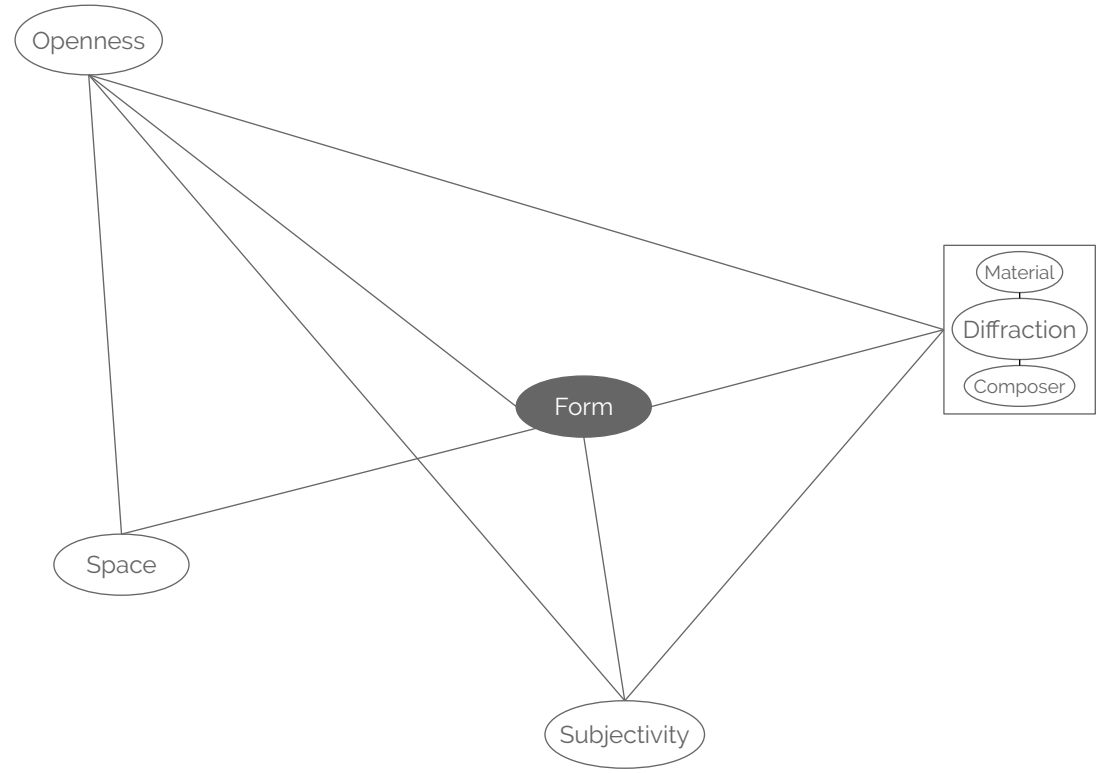
In the repository of additional media, there are three recordings created with the spatial model (described in chapter 2) programmed in *SuperCollider,* which render the piece *ins Offene* from four different listening positions.[173] Through these recreations, it becomes apparent how the localization of sound sources, materials, and listeners provides multiple understandings and experiences of the same musical event and how the piece's intrinsic openness is enhanced by the disposition of sources and listeners.

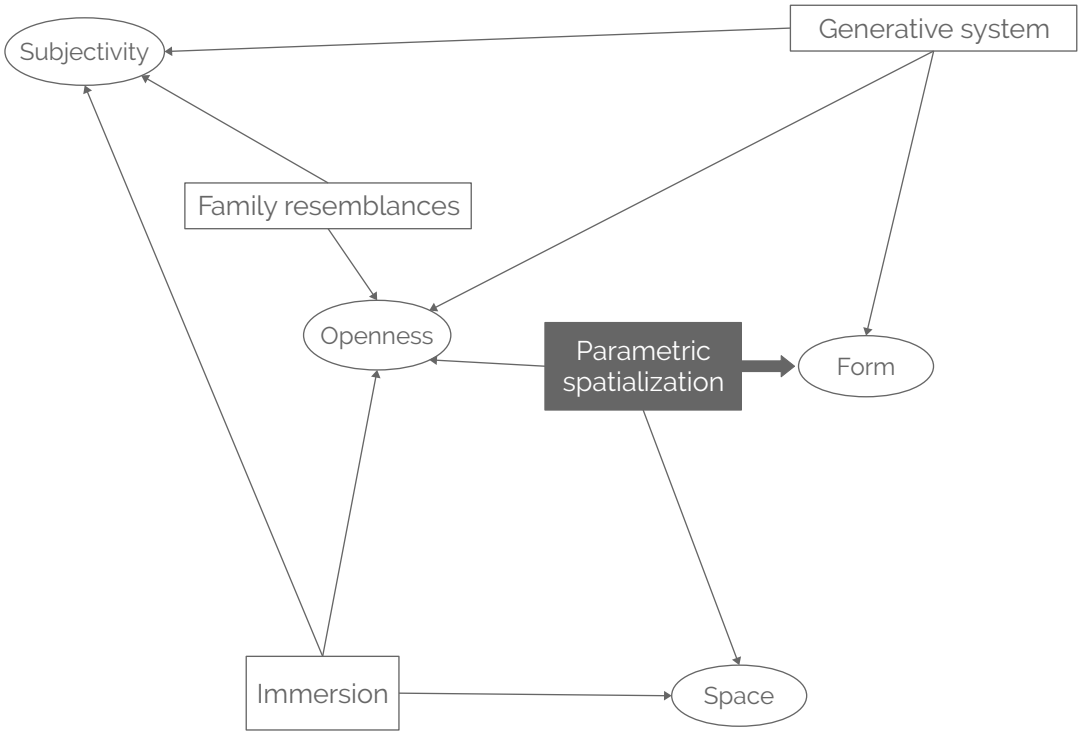
Unlike my most recent works – *MTRAK*, *Parallax* or *displaced* – some parts of *ins Offene* display a manifest direction to an evident goal. The work, which has a duration of twenty two minutes, is divided into four sections and in the central part – bars 203-267 – there is a clear and unambiguous progression to a climactic point. Nevertheless, the first and second sections – bars 1-203 – and the last section of the piece – from bar 280 to the end – do not have a teleological direction. Instead, each of these sections remains ambiguous and open by displaying different appearances of a set of materials in space. More importantly, *ins Offene* is open by proposing an active form of listening and due to the concept of space as a network of relations established by a localized network of materials. Openness as a multiplicity of understandings of the same event is produced by the inherent spatial quality of the materials and their relations, and reinforced by the use of an asymmetric position of sound sources. Due to this asymmetric disposition of instruments different spaces and material relations

173 The spatialization model renders binaural recordings. Therefore, for an accurate spatial representation of the recreation of the different listener positions, it is necessary to hear them with headphones. The piece were recorded by *Zafraan Ensemble* in the Teldex Studio Berlin for my Portrait CD *ins Offene* WERGO, Edition Zeitgenössische Musik (WER 6429 2) Link to the binaural recordings of *ins Offene:* https://www.researchcatalogue.net/view/1228054/1253914

emerge. Moreover, the listener, who is seated inside the performance space, is immersed in sound, rather than controlling and objectifying a musical event by hearing it from a safe distance. Immersion in *ins Offene* asks the listener for an active form of listening in order to follow the materials, their relations, changes and movements. In this interaction with the material, the listener has agency in the result. Moreover, by disrupting the frontal perspective this interaction subverts the binary hierarchical division between subject and object from the perspective of the listener and the work.

Illustration 4: Topography of concepts and strategies from the perspective of form and the strategy of spatializing sound parameters





4.4. Form – Form created by Spatializing Sound Parameters – Case Study *Parallax*

Up to this point, I have described my concept of openness and space and how the localization of sound sources and the concept of relational space influence an open the experience of the musical form. In this section, I delineate how I understand form and openness, which is different from the historical term of "open form" of the 1960s and 1970s. While all strategies described in chapter 4 contribute to the development of a form that can be described as open, in this section I focus specifically on the strategy of the spatialization of sound parameters and how it contributes to the emergence of an intrinsically open form that provides multiple understandings. Afterwards, this strategy is analyzed in my practice and specifically in the case study *Parallax* (2019-2020) for symphonic orchestra.

The concept of form is inseparable from the concept of material. Traditional concepts of form define it as the shape, idea, or logic that arranges the musical material. Along these lines, the New Grove Dictionary defines form as "The constructive or organizing element in music."[174] In his article on form in the *Musik in Geschichte und Gegenwart* Clemens Kühn wrote:

> Der Begriff Form im eigentlichen Sinne allerdings meint nicht derartige naturhafte Gegebenheiten, sondern ein Ergebnis bewußten künstlerischen Gestaltens und dessen schöne, sinnvolle, bezwingende Ordnung.[175]

Form is traditionally conceived of as what orders, organizes, and makes sense of otherwise passive musical material. In this way, material is associated with the objectivity or the objective aspects of a composition, while form is regarded as the manifestation of the composer-subject or as the result of a subjective form-giving. This relation of passivity and agency is a traditional conception dating back to the Aristotelian concept of *hylomorphism*.

174 Arnold Whittall, "Form," *Grove Music Online*, 2001, https://www.oxfordmusiconline.com/.
175 Clemens Kühn, "Form," *Musik in Geschichte und Gegenwart (MGG)*, 1995, https://www.mgg-online.com/.

4. Concepts – Compositional Strategies – Case Studies

After the 1950s, there was a new interest in discussing the question of form by serial and post-serial composers. New conceptions of form stemming from compositional practice appeared in the discourse on new music. Definitions of form arose in a range of specific concepts that equate form with structure, and, more abstractly, that understand form as the course of things in time.[176] On the other hand, practices of "open form" have sought to evoke events that are unexpected and open. In the practices of post-serial composers, form is either open in the composition process by using chance or probabilities, or by means of open scores and relying on the performer's decision in the moment of the performance.

Against this background, but with the first generation of serial composers in mind, Theodor W. Adorno in "Vers une musique informelle" (1961)[177] proposed a music with an "informal form". Adorno described the overall effects of the identity principle inherent to the universalism of Western rationality as an imposition of an identity over difference, i.e. an exclusion of difference by reducing everything to an abstract sameness. For Adorno, form (in art and in music) is an imposition of the principle of identity, an imposition of sameness, of the One onto the material, the concrete, difference, and the other. Adorno understood this imposition of the principle of identity onto difference, onto what is not the same, as an act of violence, because it reduces everything to the same, which is understood as a homogenization and standardization rather than as a form of political equality. Hence, the new music envisaged in *musique informelle* has to compensate for the violence applied to difference and has to be based on difference; it has to be able to think (form) the non-thought (difference). In music this idea of thinking the unthinkable materializes itself in giving space to difference, to the material, to open space for the constellation (opposed to configuration or organization and taking its place), to dispersive fragmentation in which the identitarian dominance of form (such as in historical musical forms) never determines the way music is either composed or heard. The form of the musical work should be, according to Adorno, developed from the material. Form (the new conception of form, not

176 Andreas Holzer, *Zur Kategorie Der Form in Neuer Musik*, ed. Manfred Permoser, Reihe Musikkontext 5 (Wien: Mille Tre Verlag, 2011). p. 40.

177 Theodor W. Adorno, "Vers une musique informelle", in *Quasi una Fantasia*, trans. Rodney Livingstone (London: Verso, 1998).

historical form) is now, on this second level of thinking, understood by Adorno as material as well. In this sense, there is openness in form by allowing concreteness and the agency of the material.

Another approach to material is that developed by the philosopher Gilles Deleuze. Deleuze was aware of the problem of ideology intrinsic to form. He advocates an understanding of form that is derived from material forces. Hence, in a musical work the sound material is ruled by natural forces, instead of imposed ideas.[178] The problematic aspect of this approach is that the concept of material forces in the Deleuzian network of concepts is elevated into a quasi metaphysical entity. Instead of rehabilitating the material (the difference, the other) this rather results in establishing a new idealization (identity). Translated into music, we have another external form, the natural "law" imposed on the sound material.

A seminal understanding of form in relation to openness is that of Umberto Eco developed in his *Opera Aperta* (1962). Eco based his argumentation on the openness of our perception proposed by Maurice Merleau-Ponty in his *Phenomenology of Perception*.[179] According to Merleau-Ponty, the natural world as *it is* is impossible to grasp completely by our senses. We can only grasp a part of it at any moment. Our individual understanding is therefore always partial and different from one subject to another. Accordingly, Eco argued that the work of art as reality is also impossible to grasp in its totality, it is thus open for interpretation:

> We have, therefore, seen that (1) "open" works, insofar as they arc *in movement*, are characterized by the invitation to make the work with the author and that (2) on a wider level (as a *subgenus in* the *species* "work in movement") there exist works which, though organically completed, are "open" to a continuous generation of internal relations which the addressee must uncover and select in his act of perceiving the totality of incoming stimuli. (3) *Every* work of art, even though it is produced by following an explicit or implicit poetics of necessity, is effectively open to a virtually unlimited range of possible readings, each of which causes the work to

178 Gilles Deleuze, *Francis Bacon: The Logic of Sensation*, trans. Daniel W. Smith (London; New York: Continuum, 2004).

179 Maurice Merleau-Ponty, *Phenomenology of Perception*, trans. Colin Smith (London: Routledge, 2005).

> acquire new vitality in terms of one particular taste, or perspective, or personal *performance*.[180]

"Uncompleted" works are open by virtue of some parameters left to be completed by the performers or listener. A clear example of such a conception of openness can be found in open scores. Although the second type of open works mentioned by Eco do not need to be completed by other agents, they are open, due to the field of aesthetic stimuli open to be interpreted by the listener. In this sense, every sound work, even if it has a clear form and interpretation – "an explicit or implicit poetics of necessity" –, is open to be interpreted by the listener. The openness of the work relies on the addressee and on their semantic interpretation at the moment. As Eco writes:

> In an aesthetic stimulus, it is not possible to isolate a particular sign and connect it univocally to its denotative meaning: what matters is the global denotatum. Each sign, depending as it does on all the other signs of the proposition for its complete physiognomy, can signify only vaguely, just as each denotatum, being inextricably connected to other denotata, can only appear as ambiguous when taken singly.
>
> In the field of aesthetic stimuli, signs are bound by a necessity that is rooted in the perceptual habits of the addressee (otherwise known as his taste): rhyme, meter, a more or less conventional sense of proportion, the need for verisimilitude, other stylistic concerns.[181]

Signs in their relations create a field of aesthetic stimuli to be interpreted by the addressee depending on their previous knowledge. Eco defined form as the addressee's organization of the field of stimuli into an object that makes sense. Open form is therefore the never ending process of decoding the stimuli:

> This is just the beginning of the chain reaction that characterizes every conscious organization of stimuli, commonly known as "form." Theoretically, this reaction is endless, ceasing only when the form ceases to stimulate the aesthetic sensibility of the addressee; but this is generally the result of a slackening in attention.[182]

However, as I discussed in relation to openness in experience (see section 4.2. Openness – Form through "Family resemblances") there is also a type of openness that does not

180 Umberto Eco, *The Open Work* (Cambridge, Mass: Harvard University Press, 1989). p. 21.
181 Umberto Eco, *The Open Work*. p. 36.
182 Umberto Eco, *The Open Work*. p. 37.

stem primarily from the listener's interpretations but is intrinsic to the "thing itself." This type of intrinsic openness does not cancel the interpretation of the addressee, or substitute it. It rather establishes its own relations and contingencies, that, in a second step, are open to be interpreted by the listener.

To illustrate the openness inherent to the object itself, I use the *mobiles* of the sculptor Alexander Calder, the same example that Eco used to describe the category of *works in movemen*t.[183] However, I will argue that we can see a type of openness in Calder's mobiles that goes beyond the addressee's interpretation. *Mobiles* are sculptures formed by different abstract shapes suspended in the air that are moved by natural air current. On a first level, the organization of the whole sculpture depends on the movements and the relations that the shapes form in space, that in turn are contingent on the form of the shapes, their points of suspension, the force of the air. Calder established a set of conditions that are contingent with regard to their relations and behaviors. On a second level, the viewer's position in relation to the shapes in space influences their perception and their conception of the form of the sculpture. Still, on the first level the relations are independent from the viewer's position and from any semantic interpretation. The relations that the elements create among each other are independent of the viewer and inherently open, since these relations stem from material forces and their interactions. In his practice, Calder allows these contingencies to emerge, which are not the result of chance or probabilities, but rather stem from the system itself. In their relations, the materials of the work of art allow for the emergence of an inherently open result. In this sense, they behave similarly to the crystals in a kaleidoscope, whose relations create images that are open and more than the sum of the different crystals. In addition, this autonomous contingent work is open in its relation with the viewers with regard to its understanding depending on their position in space and it is also open to their semantic interpretation. Like the natural world[184] in Merleau-Ponty, the open work is impossible to be apprehended in its totality. The viewer has only a perspective from a certain point in space and time, embedded in a certain set of conditions. On this second level of openness, that is in the relation between work and addressee, I also see the work

183 Umberto Eco, *The Open Work*. p. 12.
184 Maurice Merleau-Ponty, *Phenomenology of Perception.* p. 385

of Calder as an example of Karen Barad's concept of intra-action between material and subject discussed in Chapter 2. The mobiles create a diffraction between the movements, the environment including temperature and airflow, the shapes, and their relations in space with the position and movement of the viewer. In addition, the space of the mobile can be described as relational (see 4.3.), since it is not a predetermined space, but it is rather the result of the relations of things, bodies, and their actions in time.[185]

In my practice, form is conceived of as the relations that the materials and the composer establish in their encounter and their coherent comprehension by the listener. Through the use of the composition strategies described in this chapter, I aim to achieve a autonomous open form by means of a shared agency, an intra-action between composer and material, which is later open in the performance, by offering multiple meanings and understandings to the listener. Form – like the experiment described in chapter 2 – is open in the composition, due to the strategies that allow for the material's agency and in the experience, due to the multiplicity of relations of the material and interpretations in an active listening process. Hence an open form emerges from the encounter of material, composer, and listener. Although related to structure, form is different from it. Structure consists of the conditions and constraints out of time and the compositional strategies that the composer establishes in order to compose the piece.

This understanding of form stands against conceptions that describe form as a provider of meaning or order. It also rejects form as an idea, plan or logic which hierarchically organizes and gives functions to raw materials. It opposes the conception of forms as language but also of form as mere juxtaposition of successive events. In my understanding, there is a logic in the appearances of the sound material, which is not imposed by the composer but inherent to the material, due to the relations established by the material themselves, with the composer and later with the listener. This logic stems from the encounter, from the diffraction pattern (Karen Barad) between material and composer, and in the performance between work and the listener.

185 It is not a coincidence that since I became interested in questions of localization of sound sources and spatialization, my image of space in music was always visually inspired by Calder's *mobiles*.

This concept of form assigns an agency to the material. The fact that musical material has the potential of agency, is not new to composers. In a similar way that stone has another resistance, qualities and texture and imposes different techniques in its treatment than wood, musical material and instruments impose their qualities. The length, duration of the notes, and contour of a melodic motive has an influence on the structure, development, tempo, and length of a fugue. A saxophone multiphonic that only occurs with extreme lip pressure in *forte* will impose a certain range of possible developments in time and give rise to an aesthetic result that is different from the one stemming from a *tonlos* sound on a cello. A glissando upwards points in a certain direction and imposes its own development.

However, intra-action and the agency of the material are not always explored in the encounter between material and composer. The composer needs to use different strategies to guarantee and allow for the agency of the material. A seminal example of the interaction between composer and instrumental agency is Helmut Lachenmann's conception and practice of *musique concrète instrumentale.* In recent years, there have been compositional experiences oriented towards opening the material's agency that built upon Lachenmann's approach. These practices explore the physicality of instruments and performance and the concept of parametric decoupling, like in the work of Simon Steen-Andersen, Aaron Cassidy and Matthew Sergeant, the sounds produced by the interaction between different frequencies as in the work of Chiyoko Szlavnics, or concepts of material agency, as in the case of Ashley Fure's and Liza Lim's pieces.

Along these lines, the composer Matthew Sergeant describes his compositional strategies for opening the agency to the material in the Baradian terms of *intra-actions* and his compositions as *apparatuses*.[186] Barad writes regarding apparatuses:

> In my agential realist account [...], apparatuses are the material conditions of possibility and impossibility of mattering; they enact what matters and what is excluded from mattering. Apparatuses enact agential cuts that produce determinate boundaries and properties of "entities" within phenomena,

186 Matthew Sergeant, "Composing Intra-Actions: Instrument(s) as Baradian Apparatus" (*MuSA 2016 Seventh International Symposium on Music and Sonic Art: Practices and Theories*, Karlsruhe, Germany, 2016), p. 9, https://static1.squarespace.com/static/56238aa4e4b059c47b4ad818/t/59025523a5790a07c3f913b6/1493325121091/sergeant_baradian_apparatus_2016.pdf.

> where “phenomena" are the ontological inseparability of agentially intra-acting components.[187]

Like with regard to the generation of knowledge in Barad’s experiment, the *apparatuses* allow for the agency of the material in the emergence of the sound result in Sergeant’s musical experiments. Sergeant uses different strategies to allow for the emergence of material and contingency. In *[shell]* 2014 for unspecified voice, the actions of the voice are separated into several layers. The interaction of all these actions result in unexpected sounds that are also different from one instrument-performer to another, since each voice depending on its own physical qualities differs in the rendition of the different layers.[188] In *[terrains]* (2016) for solo prepared flugelhorn, some valves of the instrument are substituted by tin foil. These temporally unstable valves transform and destabilize the intonation and quality of the sound. The sounds are contingent and not completely controlled and cannot be foreseen by either the composer or the performer.[189]

Nevertheless, in contrast to my approach, the focus of some of these composers does not lie necessarily on the agency of material in its development in time and its possible influence on form. When discussing the musical experiment as intra-action Matthew Sergeant addresses the agency of material in the sound result.[190] It can be argued that Sergeant understands the sound result as the entire work, still, in this short text there is no mention of the time parameter. In Steen-Andersen’s *Study for String Instrument #1* (2007) for any string instrument,[191] the sound result is contingent due to the encounter of the different layers of actions of the performer-instrument apparatus and due to the specific characteristics of the string instrument which is left open. However, the composer arranged the actions in a series of loops and repetitions of different lengths. The general contour of the study consists of the process of dissolving the glissandi loops into short tremoli. Regardless of the contingency of the sound result,

187 Karen Michelle Barad, *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning*, p. 148.
188 Matthew Sergeant, “Composing Intra-Actions: Instrument(s) as Baradian Apparatus”. p. 5.
189 Matthew Sergeant, “Composing Intra-Actions: Instrument(s) as Baradian Apparatus”. p. 6.
190 Matthew Sergeant, “Composing Intra-Actions: Instrument(s) as Baradian Apparatus”
191 Link to the score from the composers website, https://edition-s.dk/music/simon-steen-andersen/study-for-string-instrument-1

the overall form of the piece remains the same in each iteration despite the different performer or instrument. This is, of course, a conscious decision by the composers, since in this *Study*, as well as in the "re-cycle" *Next To Beside Besides* (2003-2006) for different solo instruments, Steen-Andersen is interested precisely in the "translations" of the same concrete gestures, structures, and abstract forms into different instruments.[192] Hence, these composers consciously choose to open the agency of the material in the sound result, while retaining their agency in the disposition of the sound material in time. In my practice, since I seek to intra-act with the material in its development in time, I try to avoid the separation into the two levels of concrete versus abstract.

One of the strategies to pursue this form of intra-action is the one of the spatialization of sound parameters. By parameters I mean not only the parameters of frequency, duration, dynamics, and timbre but also the parameters of a sound production process. For example, given a sound process that is a mass of granular sounds, its parameters would be the density of the grains, the range of frequencies for the grains, or their duration. As a first step, I scale the different sound parameters in several degrees. These parameters are localized among the different sound sources. As discussed in relation to the strategy of family resemblances, these parameters are also a form of generalization, but sound entities emerge in their encounter. Moreover, the sound entities that result from these parametrizations are inherently spatial since the constituents that allow for their appearance are localized in space.

Parameters, processes, their relations, and therefore the sound entities that they enable to emerge, do not remain statically fixed in a certain position, but they move. These movements do not describe trajectories (see 4.3. Space – Form created by localization of sound sources). Instead, the different parameters move and rearrange themselves differently among the sound sources and, by doing so, distribute the constituent elements of the sound result differently in space.[193] The parameters and with

192 Score and description of the piece in Simon Steen-Andersen's website http://www.simonsteenandersen.dk/eng_scores.htm

193 An interesting work in the use of parametric spatialization is the one developed by Erik Nyström, "Topographic Synthesis: Parameter Distribution in Spatial Texture," accessed December 7, 2018, http://www.academia.edu/37191903/Topographic_Synthesis_Parameter_Distribution_in_Spatial_Texture.

them the shape of the sound result evolves and changes continuously in space. The relations between the parameters and material change with it, as well as the understanding of the listener, since this depends also on the addressee's position in relation to the localization of the materials. Form emerges in the intra-action between the different elements and parameters, in their rearrangements and movements between the sound sources and in the relations that they create among each other and with the listener. In this sense, form can be also described similarly to space, as a relational arrangement of elements, sound material, sound sources, and listeners in time that does not allow for an absolute perspective but is always experienced in a situated way. Since space is inherent to the material, the emergence of a relational space coincides with the emergence or the form of the musical work and the listener's understanding of it.

In my piece *Parallax* (2019-2020) for symphonic orchestra[194] I have experimented among others with the strategy of spatializing parameters. The whole piece is a continuous development of different non-resolving processes, an ambiguous sound mass, that is the product of different networks and parametric organization. In 4.2. I have described the strategy of family resemblances for *displaced* and how the network of materials used in *displaced* is similar to the one in *Parallax*. However, *Parallax*'s network of relations is extended, given the work's longer duration, its larger instrumentation and its distribution of sound sources in space.

I will not repeat the description of the network of relations in *Parallax*, instead I will focus my description on the related spatialization of parameters and how it influences the perception of the piece in time. The orchestra is divided up asymmetrically into three groups. The disposition is based on the *Baar-Sporthalle* in Donaueschingen (figure 4.14). The first group is situated in a gallery above the audience and to its left. The second group is seated on stage, subdivided into three subgroups. The third one is located behind the audience. The instrumentation of each group is as follows:

194 *Parallax* (2019-2020) for symphonic orchestra, commissioned by *SÜDWESTRUNDFUNK* for the *Donaueschinger Musiktage 2020*. The premiere has been postponed to the 2022.

- Group 1 on the gallery at the left of the audience: 1st flute (muta piccolo), 1st oboe, 1st Bb clarinet, 1st bassoon, horn 1-2, 1st trumpet, violin I 1-3, violin II 1-3, viola 1-2, celli 1-2, contrabassi 1-2.
- Group 2 on stage, subdivided into three subgroups:
  - Group 2 left: 2nd Bb clarinet, 2nd trumpet, 1st trombone, 2nd percussion, violin II 4-12.
  - Group 2 center: 2nd flute (muta piccolo), 2nd basson, horn 3-4, 1st percussion, violin I 1-14.
  - Group 2 right: 2nd oboe, 3rd trumpet, 2nd trombone, 3rd percussion, viola 3-10.
- Group 3 behind the audience: Bass flute, English horn, bass clarinet, contrabassoon, bass trombone, tuba, celli 3-8, contrabassi 3-6.

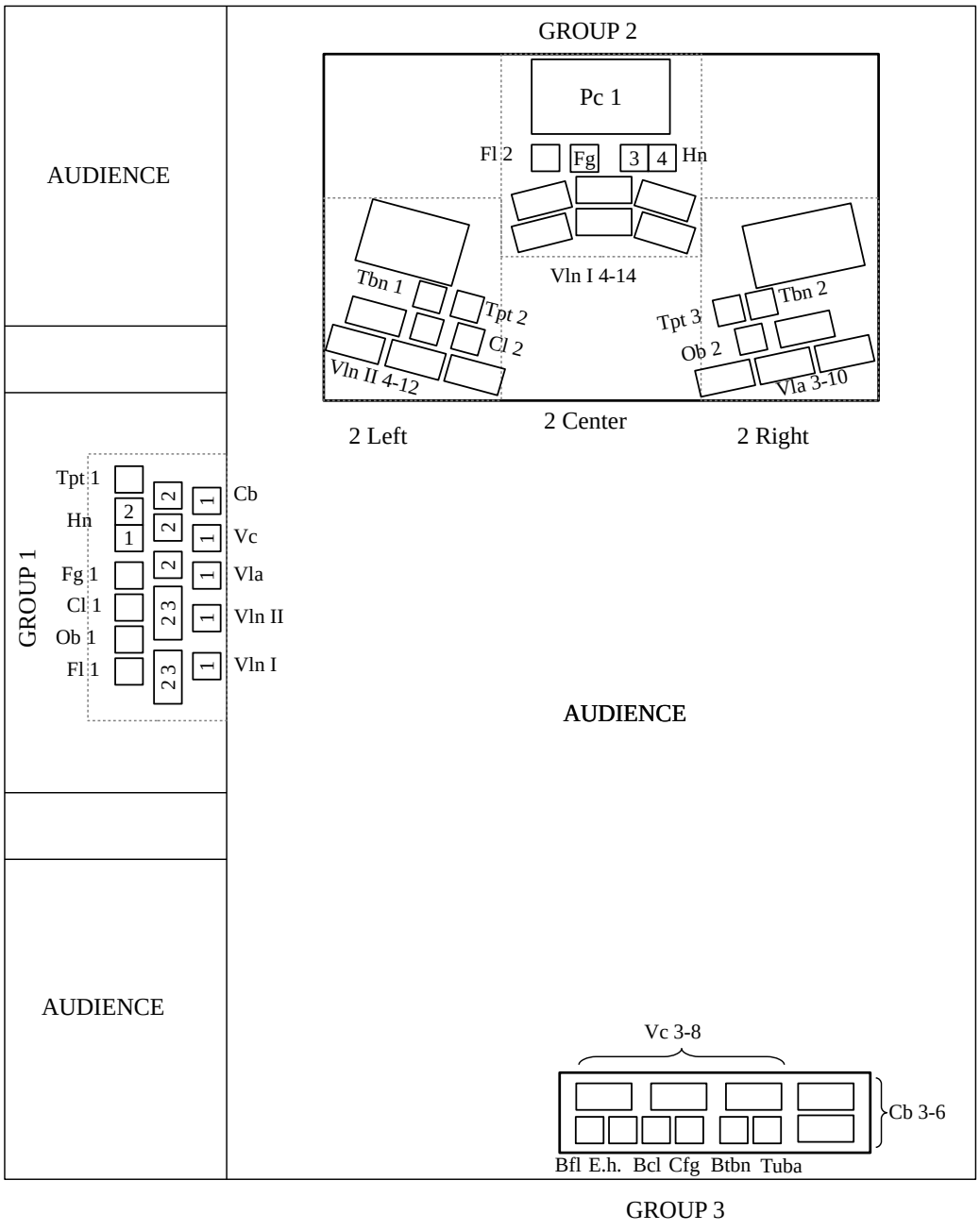


Figure 4.14: Disposition of the musicians of the orchestra in the hall, Parallax.

In the subsequent description, I follow the chronological sequence of the different appearances of the network of materials, its spatialization, and its movements. This should by no means be understood as a description of form, of "what happens in

the piece," since – as I explained above – form is not structure. Form is the relations between the materials, composer, and listener in time, but more importantly, form emerges in and within space. Hence, in this section I try to describe the conditions that I established together with the material to allow the form to emerge, and the ways in which it emerges in the performance and in space. Since form refers to the complete musical work, I must describe *Parallax* in its totality – although without going into details. As mentioned in the introduction, I describe what I did in my practice in *Parallax*, and subsequently explain my aesthetical intentions and motivations in doing so. However, the aesthetic experience itself is missing from this description. The result of this practice is only apparent in the performance. Rather than being a sophistic subterfuge to avoid addressing results of the research project, the circumscription of the aesthetic experience is a necessity since it only emerges in the performance.

Although Parallax is not thought to be divided in parts, I divide this description in sections for easier reference in the evaluation of the case study.

A) *Parallax*[195] begins with a sonic aggregate – a harmonic scheme based on the sum and difference of two frequencies – in a rhythmic pattern, which is shared by all woodwind and brass instruments of the orchestra, and which lasts until bar 12. From this moment on, the pattern bifurcates into a continuation of the pattern in the woodwinds and brass in group 1 and into a dissolution in a granular gesture that moves among the strings and percussion in the subgroups of group 2 and group 3. This process collapses into a sustained note in the 1st trumpet in bar 23 that is late shared – in the passage lasting from bar 25 until 32 – by the trumpets 2/3 and horns 3/4 in subgroups left, center and right of group 2. The sustained note in the trumpet dissolves again into a granular element in the strings of group 1, subgroup center of group 2 and group 3 in bar 33.

195 See complete score in the online repository: https://www.researchcatalogue.net/view/1228054/1253913

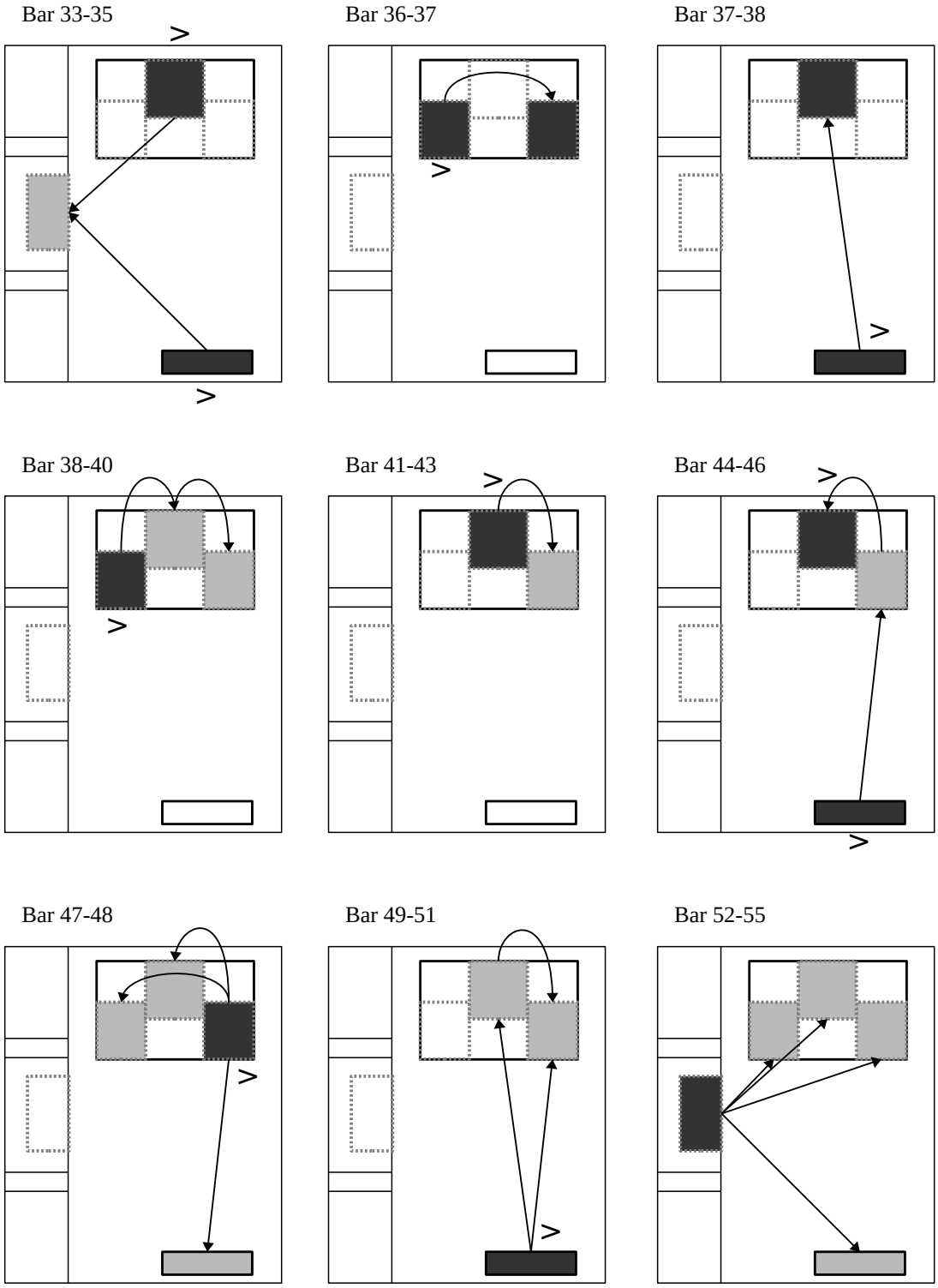


Figure 4.15: Different movements of the granular gesture in bars 33-56, Parallax

B) From bar 33 onwards, the spatialization of parameters becomes increasingly important. Two main processes develop from bar 33 until bar 56. The first is another transformation of the aggregate in a rhythmic pattern now in the strings of group 1, which slowly moves to the violins of subgroup left of group 2 – bar 42. The second process is once again the granular gesture spread among the different groups. In bar 33, the beginning of the granular gesture is in the strings of subgroup center of group 2 and group 3 before moving into the strings of group 1. While the granular gesture in group 1 transforms itself into the aggregate that is played in a rhythmic pattern, the granular gesture in subgroup 2 left and 3 continues its movements and transformations. The spatialization of parameters first appears in this last granular gesture, in which the density of granular events is spatialized. For example in bars 49-51 the density is as fast as possible in group 3 while increasing in subgroup center of group 2, and later decreases in bar 50 in subgroup right, group 2. The granular contour is extended and divided in space. Figure 4.15 shows the different movement of the granular gesture. The accent denotes the trigger of the granular gesture and the arrows indicate its movements between the groups. Groups colored in black indicate that these group(s) initiate the gesture. A group colored in gray denotes that this group plays the gesture after the trigger.

C) From bar 57 to 83 the localization of parameters in space comes to be the main activity. The granular process of previous bars solidifies into a glissando in violins II of subgroup 2 left. The violins start in a cluster and move upwards until they reach a minor sixth in the strings. At the moment of reaching the sixth, the other groups play a multiphonic and an aggregate – another harmonic scheme derived from the multiphonic. The glissando and the aggregate are repeated and they are transformed in each iteration. In some of the repetitions, after the pair of upwards glissando and aggregate appears a downwards glissando. In addition, in their iterations the aggregates have an inner movement which relates to the previous granular process – example of the inner movement

bar 64 violin II, 1-3 and oboe 1 in group 1, but also bars 68-69 oboe 2 and percussion 2 in subgroup right, group 2. Examples of the spatialized process are:

- Bars 57-60 glissando in violin II in subgroup left of group 2, aggregate in bar 60 in flute, violins and viola of group 1, trumpet 2 and trombone 1 of subgroup left of group 2, and the entire formation of group 3.
- Bars 61- 63 glissando upwards in strings of subgroup left of group 2, bar 63 aggregate only in group 1, 63-64 glissando downwards in strings of subgroup center of group 2 and trombone 2 in subgroup right, group 2.

Figure 4.16 shows the diverse forms of spatialization among the different groups. A rectangle colored in black signifies which orchestral group is playing the glissando, a group colored gray denotes which instrumental group is playing the aggregate, arrows show the direction of the movement. In addition to the movement and spatialization of the elements of the process, there is a spatialization of frequencies of the aggregate – for example in bars 72-73 high frequencies in group1, low frequencies in group 3. Moreover, glissandi are per se movements in pitch space. Each iteration of the upwards glissando reach a higher point than the previous one. In this way the register of the orchestra moves steadily to reach the highest point in bar 84.

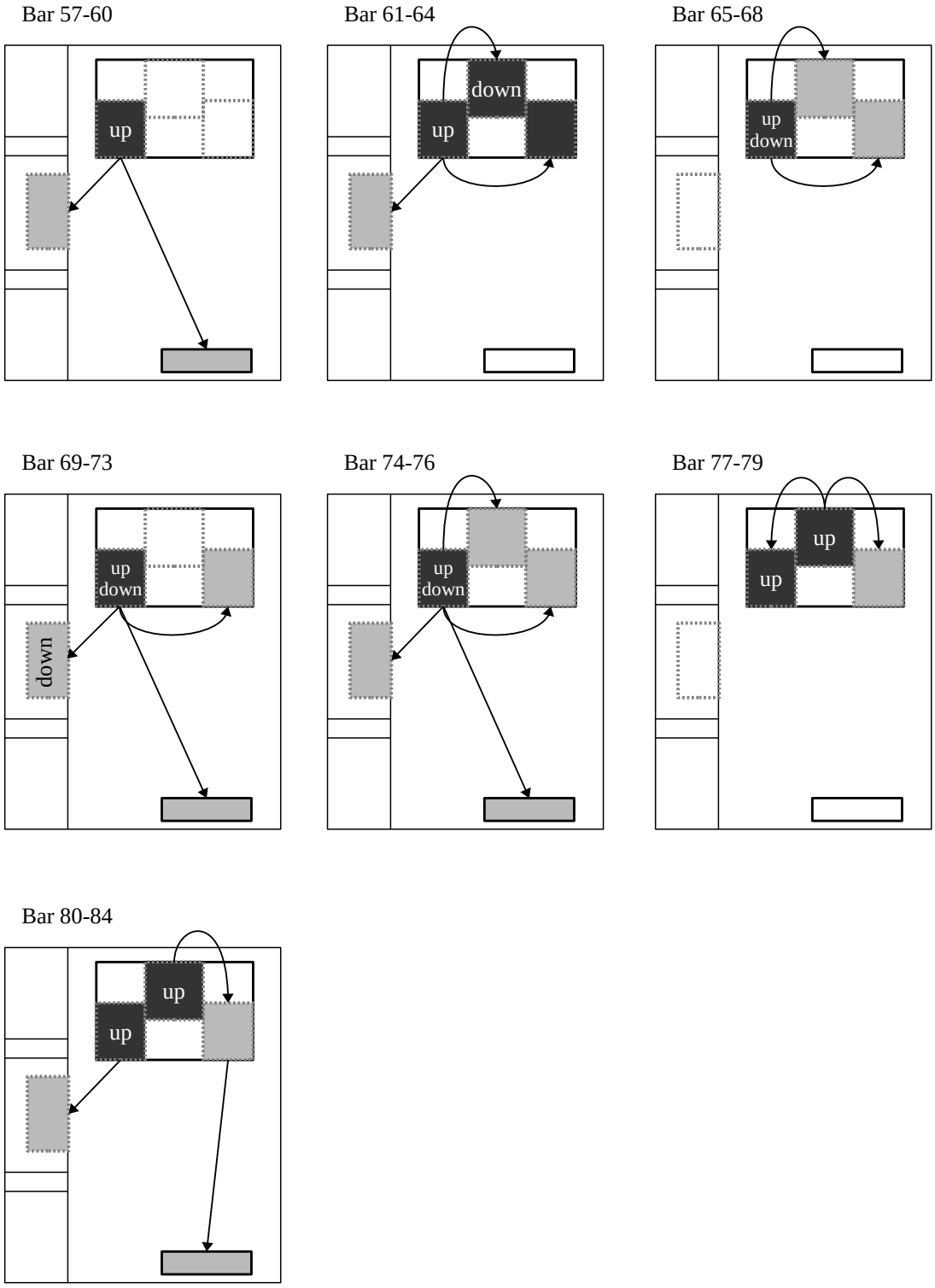
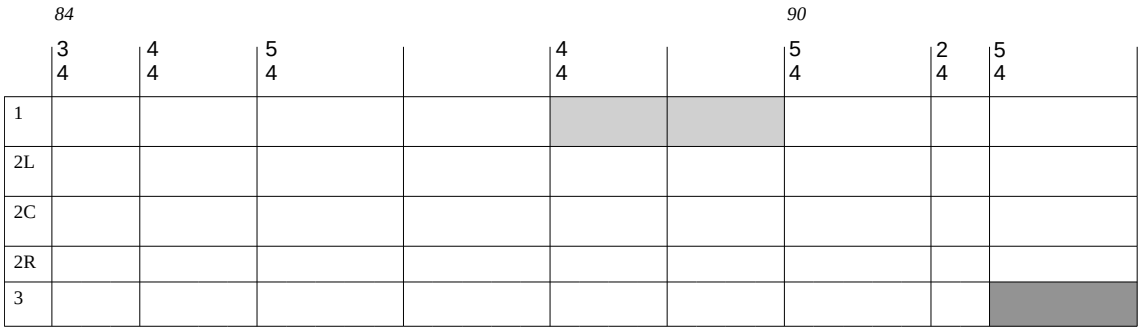


Figure 4.16: Different movements in bars 57-83, Parallax

D) The last iteration of the process ends in bar 84 with the glissando arriving at a sustained interval in violins II of subgroup 2 left and the violas of subgroup 2 right. The interval expands into an aggregate among all the strings of the orchestra distributed over all groups. The strings in this passage play a slow procession of new aggregates that melt into each other. Proceeding from these aggregates in the strings, a derived aggregate in the woodwinds, brass and percussion surfaces at certain intervals and each time in a different group. Examples of the irruptions of these derived aggregates are to be found in bars 96-97 in woodwinds and percussion of group 2, in bar 99 in woodwinds of group 1, of subgroup 2 center and of group 3, in bar 101 in woodwinds and brass of the same groups and in bar 103 in brass of group 1 and subgroup left 2. Each appearance of the derived aggregate in the woodwinds and brass creates an area of activity that is internally animated by different combinations of instrumentations, oscillations of frequency, distortions, rhythmic repetitions, amplitude modulations, and timbre changes. The constituents of the process, that is the progression of aggregates in the strings and its derived aggregates with inner actions are localized in different areas and activated at different times. The result is a magma of sound on the strings that is highlighted by woodwinds and brass in areas of activity at certain locations at certain times. Figure 4.17 shows the progression in time of these areas of activity of the woodwinds and brass. The different shades of gray signal the groups; the lightest gray is group 1, the darkest is group 2, medium gray represents group 3.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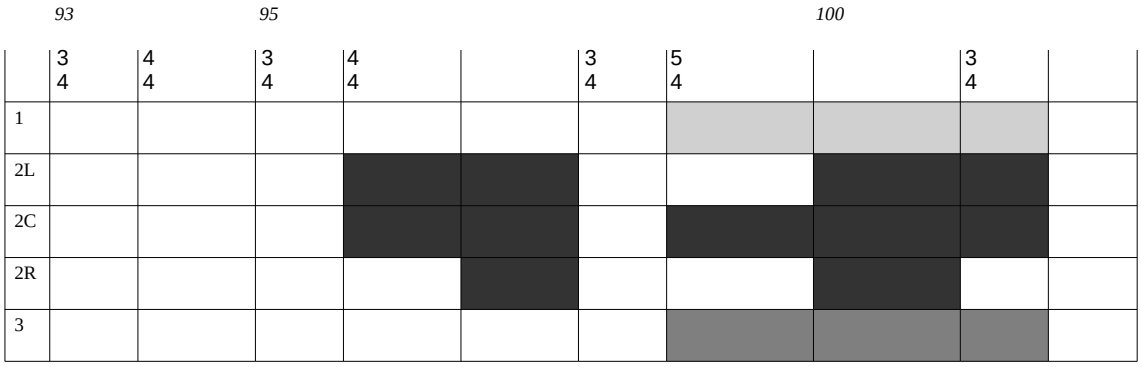
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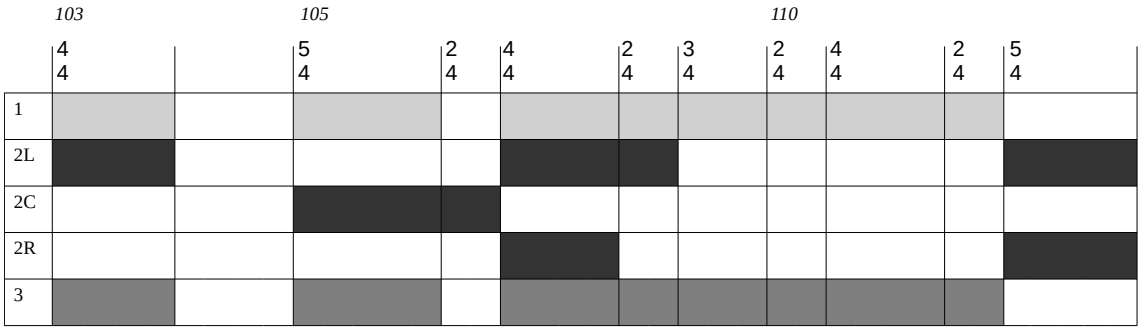
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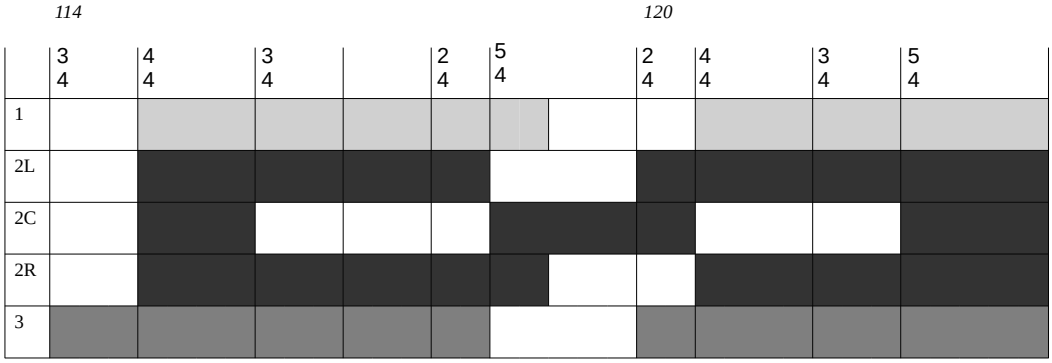
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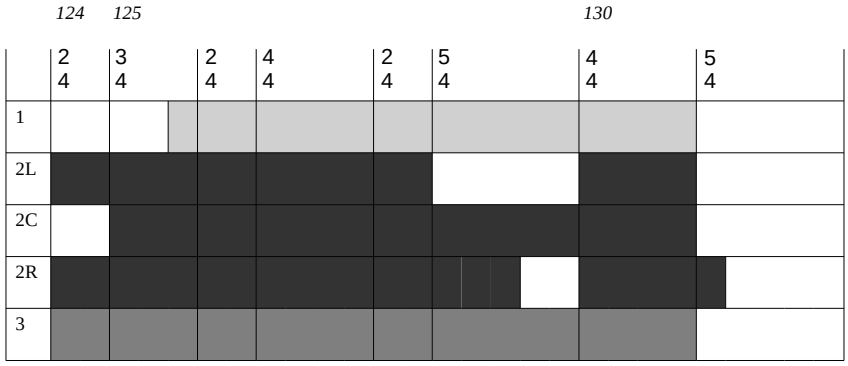


Figure 4.17: Different areas of activity from bar 84 until bar 131.

E) From bar 132 to 213 a process takes place that is similar to the one described in 4.2. with regard to *displaced*. The passage is the sonification of the paths of reflection of an imagined sound moving between five points in space by using an acoustic raytracing algorithm. These points are localized among the instruments of the orchestra. The points are distributed in space and time in the following connected trajectories:[196] (1) From group 1 to subgroup 2 right, (2) from subgroup 2 right to subgroup 2 left, (3) from subgroup 2 left to subgroup 2 center, (4) from subgroup 2 center to group 3, (5) from group 3 to subgroup 2 left, and (6) from subgroup 2 left to group 1 (figure 4.18: trajectories in time, figure 4.19: trajectories in space) The network of family resemblances and the mapping of the reflections are similar to the one used in *displaced* (see 4.2.)[197] The passage can be described as follows: An impulse emitted in group 1 creates differently delayed responses in a point in subgroup 2 right. These responses correspond to the rhythmic pattern, instrumentation and dynamic level generated by the mapping of the paths. The first response in subgroup 2 right occurs at the same time as the impulse of the second trajectory and generates the responses in

196 The term of trajectory here should not be confused with the sound trajectory criticized in 4.3. What I called trajectory here is the movements of sound that connect two areas of activities, that is a link of the network. Although the attention of the listener will probably follow the movement, it is not the main role of the link to trace a movement in space to be followed, but rather to link two elements.

197 The scaling is faster in *Parallax*, for mapping the different reflection time at the macrolevel they are augmented by a factor of 420 for the microlevel the augmentations are the same as in *displaced* by 15, 20 and 30.

subgroup 2 left. The process is repeated throughout the six trajectories (figure 4.18). The different paths overlap and encounter, in doing so, different spatial activities concur and interact with each other. Like in *displaced*, within each response "inner reflections", a feedback inside each group occurs. The chain of reactions and feedback processes is increased in *Parallax*, due to the larger amount of groups and trajectories. For each orchestral group there is a different aggregate of frequencies derived from the room modes[198] of the space that each group occupies (figure 4.20). Therefore the parameters of duration – the different paths of reflections – and frequency – the different aggregates – are spatialized among the groups.

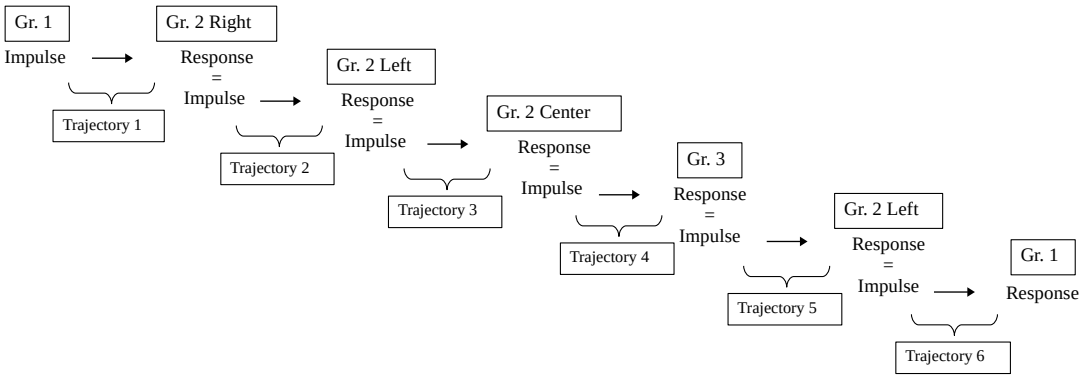


Figure 4.18: Temporal order of trajectories, Parallax

198 The different room modes for this piece have been calculated with the tool *Amroc* https://amcoustics.com/tools/amroc

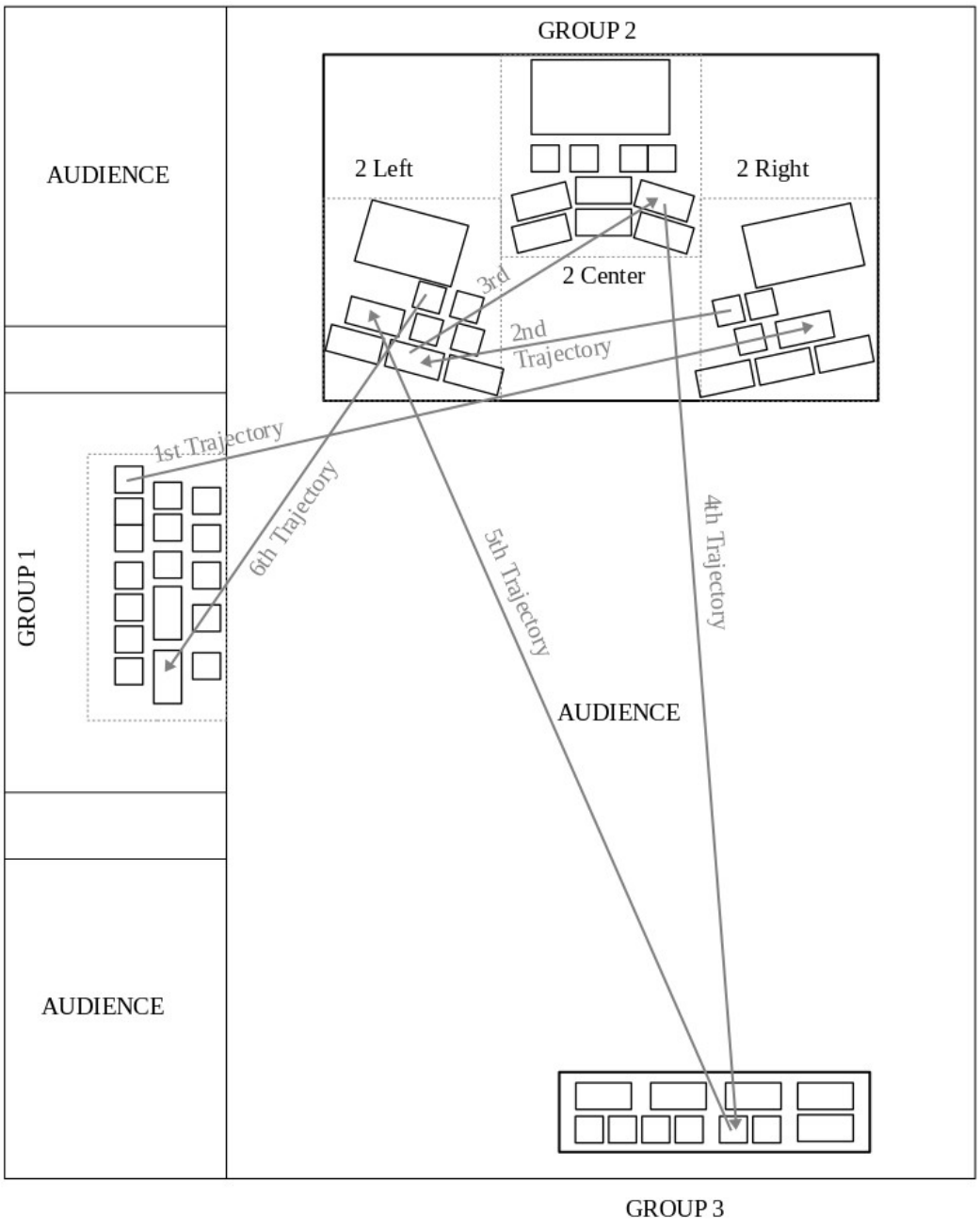


Figure 4.19: Trajectories in space, Parallax

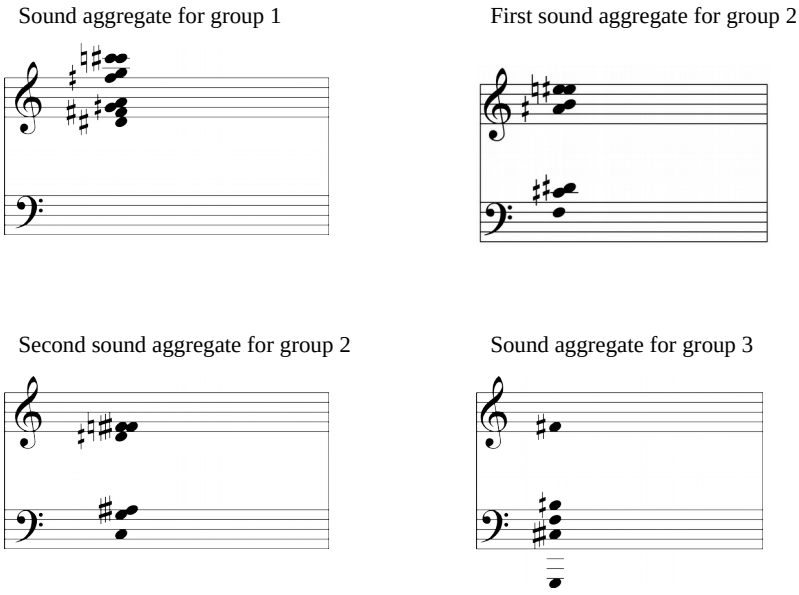


Figure 4.20: Aggregate for bars 132 to 213, Parallax.

F) The last reflection dies out in bar 214 in horn 3 – subgroup 2 center – with a new impulse in the orchestra that again triggers all the trajectories at the same time, although each in their own rhythmic pattern. In addition, all of the groups contribute to the same aggregate (figure 4.21). The material that in the previous passage had been arranged in simultaneous and overlapping processes localized in the different groups, is now transformed and newly arranged in one single process. The single process is constituted by the different rhythmic patterns and mappings of the reflections of each group. In addition, the frequencies of each group contribute to the totality of the aggregate. In this way, the parameters of duration and frequency of the process are localized in the different groups. Yet, as in a kaleidoscope, the attention and understanding of the listener in this passage can either be drawn to the whole process in its unity or to the inner activity of each group. What one's attention is drawn to will depend on the listener but also on their position in relation with the groups and activities. At certain intervals a group is emphasized by silencing the others. The order of the

emphasized groups is: emphasis on subgroup 2 left bars 229-232, emphasis on group 3, bars 240-243, on subgroup center of group 2, bars 247-251, on group 1, bars 258-260 and last emphasis, and with it the end of the piece, on subgroup 2 right, bars 267-272 (see figure 4.22).

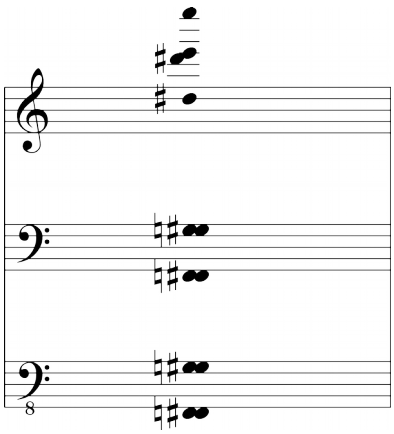


Figure 4.21: Aggregate for bars 214 to 272, Parallax.

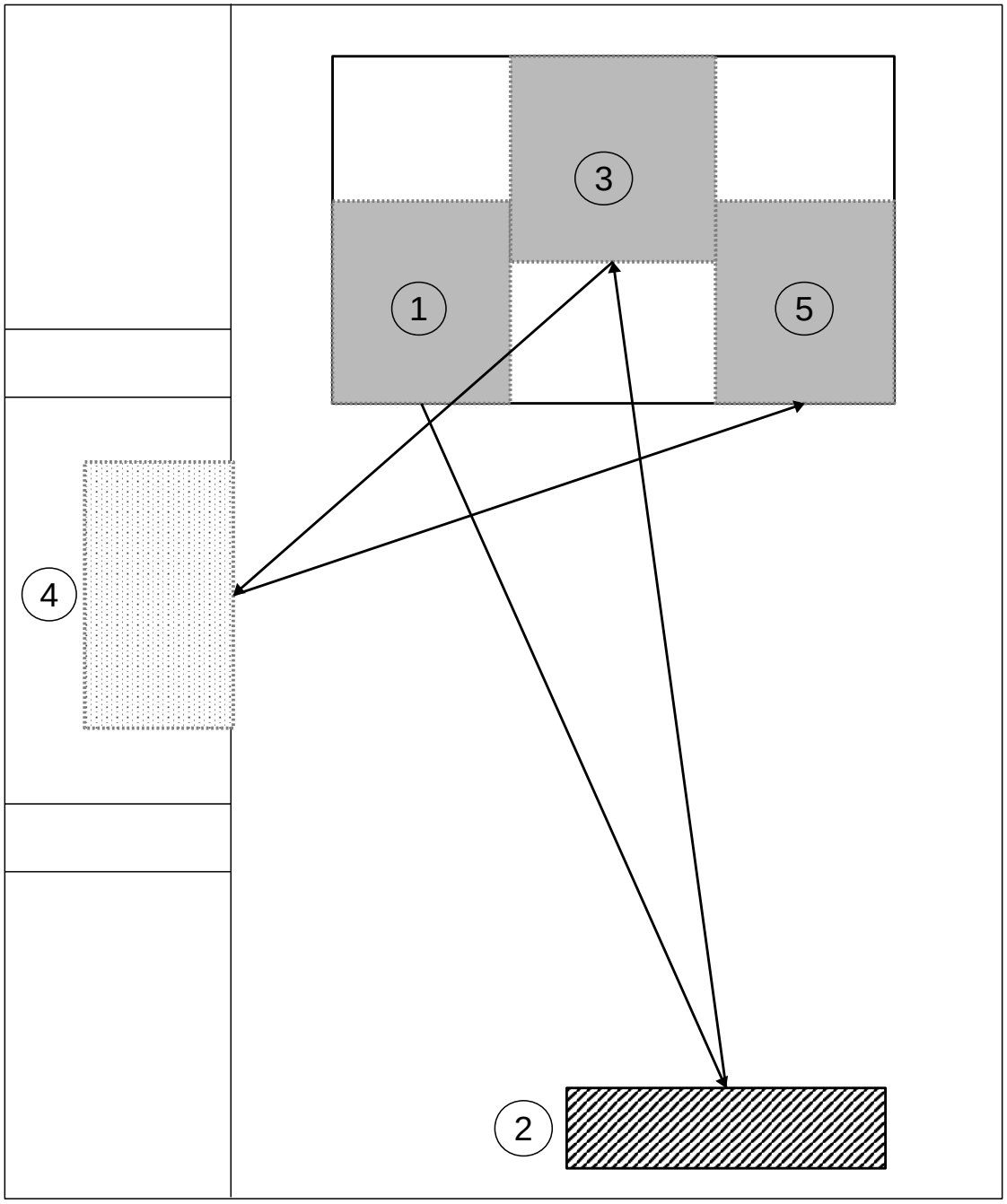


Figure 4.22: Order of emphasized groups, Parallax.

Parallax can be described as a progression of processes that exhaust themselves and collapse into each other without a clear teleological development. An analysis of the material will also show that the ambiguous materials are related to each other by different features that I have described as a network of relations. Each transformation of the network of relations in time and space serves a different compositional intention. In what I called section A for analytical purposes, *Parallax* is setting up a network of relations while immersing the listeners in sound and by doing so making them aware of their position in space in relation to the sound sources. Bars 21-32 focus the attention on the four points in space marked by the trumpets and horns and in doing so it moves the attention from the immersion into the whole space to these singular four localizations.

The glissandi and aggregates of section C can be understood as a single spatialized morphology or as two separate entities depending on the localization of the listener. Besides, upwards glissandi, aggregates, and downwards glissandi are localized differently in each transformation (see figure 4.16). The process expands or reduces the space in each repetition, and with it its perception. A similar result of changing the spatial configuration is the one created in section D.

In passage E, the listener is immersed in the multitude of outer reflections and inner reflections of the different groups in time. The listener may follow the paths of reflections, the sound's ricocheting, and the relations between sounds depending on their position. They may focus on the group closest to them, or draw their attention to the spatial relations between the different groups. The listener may focus on the microlevel of each path or on the macrolevel of the groups. This spatial multiplicity, the concomitance of different spatial levels and organizations at the same time opens the experience. The form is open to be traced by the listener, not from a pool of juxtaposed materials but from a network of sounds related by their relations of family resemblances localized in space and by the spatialization of sound parameters.

In the last section F, the emphasized groups again accentuate their position in space while disclosing the contribution of each group to the whole process, creating a different perspective of the same event.

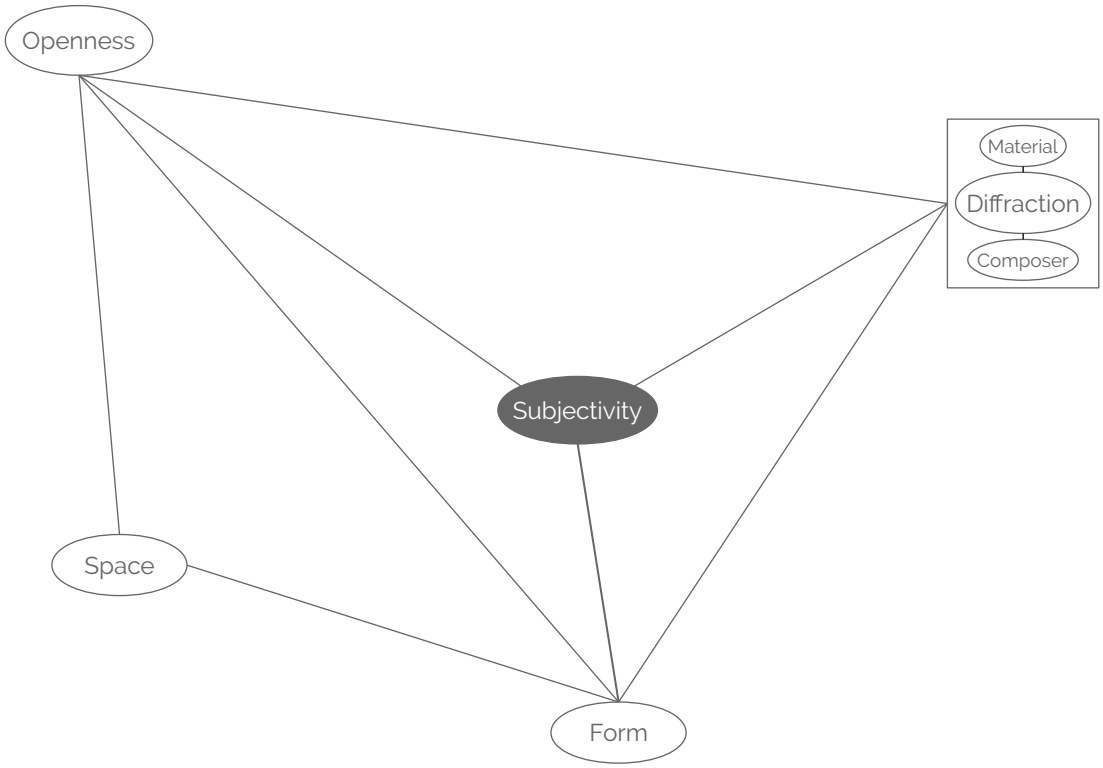
Parallax is the result of encounters and intra-actions of all these different layers of activity – reflection, pathway, and feedback patterns, sound aggregates, instrumentation and distortion – that develop in space in a continuous movement and process. The experience of these encounters is consciously ambiguous, open to interpretation in the listening.

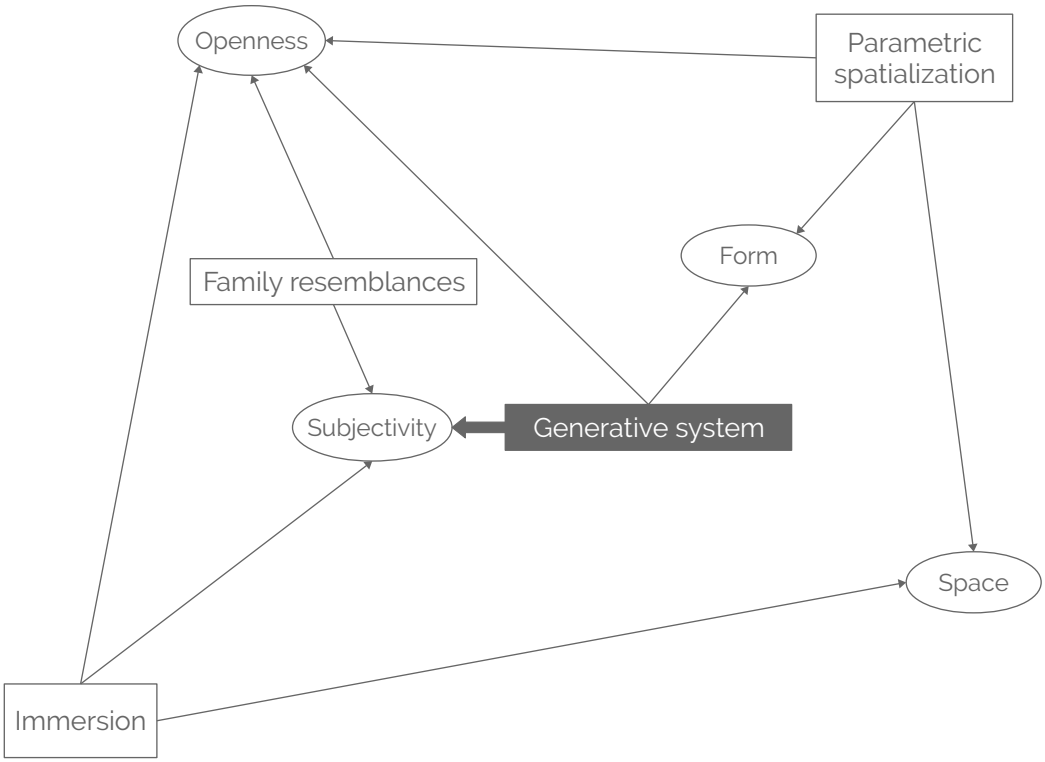
While the form and the work is open to the materials' and the listeners' agency, I retain my agency as a composer. I create the conditions and structures for material, form, and the work to appear. Still, I do not impose a form onto the material, no certain meaning onto the listener. Materials have agency by means of their relations and the listener has agency through their active listening. I understand "active listening" as a mode of engaging with the piece, in which the listener, instead of following a straightforward development, has to find a path through an open field of ambiguous events. Agency is not only decision making, materials do not take decisions, however, they influence the result. Listeners remain seated in the work discussed in this dissertation,[199] in this sense, they do not decide where to be once the performance starts. Yet, they do have agency due to their active listening, which rests on the specific spatial situatedness.

A new situation emerges in the described practice, a musical event, that is not the reflection or material realization of a composer's idea, but rather the intra-action between the composer and the characteristics and potentialities of a concrete material. In the case studies, material and form are not prior to the work, they rather emerge in the composition process. In the case of *Parallax,* material and piece are the result of a network of relations localized in space. The outcome is the continuous transformation of a material that is being formed but is at the same time transforming subsequent developments. This new situation proposes a different relation between composer and material in which both share agency, and thus criticizes the binary hierarchical relation of subject and object. I regard it as fundamental to reconsider the category of composer along these lines. A different subject emerges when they search for the potentialities of sound material and reinforce their emergence in the musical work.

199 Listeners in *Parallax* are not advised to move, since movements of both sound and receptor annihilate the perception of movement.

Illustration 5: Topography of concepts and strategies from the perspective of subjectivity and generative systems





4.5. Subjectivity and Identity – Form through the Use of Generative Systems – Case Study *MTRAK (*מטרקא*)*

As I discussed previously in relation to form, the figure of the composer and the associated ideal of "mastery" has been criticized by divergent experimental practices embracing openness. Since then, experimentation has been influenced institutionalized practices of musical composition, however, in many educational institutions and in some contemporary music practices there is a perpetual uncritical consensus that still understands composition as the "mastery" of skills and sound-materials. Composition is thus understood as the manipulation and transformation of a material in accordance with a composer's plan or idea. In other words, the imposition of a form onto formless material. The ideological aspects of this type of hylomorphism have been discussed in the previous section about form (see 4.4).

John Cage's rejection of the subjective manipulation of sounds by the composer is well known, let the sounds be "themselves". This solution, also followed by some practices of sound art, implies the removal of the composer's agency to varying degrees. According to this understanding, the activity of the artist is that of presenting "raw" and unshaped sounds to the listener. This approach has been artistically productive and successful in demonstrating the necessity of a critique of composition and in revealing the possibility of agency of the material itself. However, the process of presenting things, of re-presenting reality, is not free of ideology and subjective influence. A presentation implies a selection and a judgment of what is worthy of being presented and of the context in which it is to appear. On the other hand, a re-presentation of things involves an understanding or a translation of a reality into another form of signification, which implies decisions, generalizations, and subjectivity.[200] Hence, the impossibility to eradicate some form of control by the artist and the inexistence of a non-representational sound "in itself" constitute the limitations of this position. Moreover, an external law is imposed on art here, which is thus limited to being the frame that

200 Even in experiences of field recording that claim to be devoid of any subjective influence there are decisions – microphone positioning, recording technology, and the performance situation, just to mention a few – that influence the presentation and perception of the "thing itself."

exposes a sound phenomenon to be heard. In addition, a different hierarchical relation is formed, a relation between an observant subject and a passively observed object.

Another practice that criticizes the notion of the composer as “master” is the one that opens the agency of the musical event to others, such as in collaborative and improvisational practices. The critical potentiality of such practices has been proved to be prolific and is well established in the composer-performer and the work of collectives. Although the question is far from being exhausted, I consciously center my practice on the less researched question of openness and its critical potential in the compositional process and in the relation between material and composer.

In light of social movements of re-claiming agency by members of excluded collectives, current transformations of notions of subjectivity and new conceptions of non-hierarchical ways of interacting with the world, I find it necessary to rethink the category of the composer and its critique. In this current context, the solution proposed by Cage of rejecting the subject is not enough. A member of an excluded collective – woman, queer, non-binary, non-white, marginalized, migrant – gains agency by acting. To negate the agency of the composer when they are a member of such a collective is to negate their agency once more. However, this new agency of the composer is not to be gained by mastering the material and reproducing the same power relations. In a world that is in a state of ecological crisis produced by human use and abuse – by human “mastery” – of materials, beings, and surroundings, it is necessary to imagine and practice other possible relations between subjects and objects. Therefore, I find it necessary to reformulate the critique of the composer and, in light of feminist theory, the nature of their agency.

Diverse practices have proposed a relation between material and composer in connection with feminist theories and practices. Practices of embodiment, improvisation, collaboration, or performativity have successfully explored questions of identity and subjectivity by allowing other agencies while retaining the composer’s agency. In my own practice, I use generative systems, the use of electronics, and the localization of sound sources to share my agency with the material and with the listener.

In the chapter about methodology (chapter 2) I have discussed how a composition process oriented towards openness and experimentation could represent a practice that fosters a non-hierarchical relation between composer and material. In chapter 4, I described this composer-material relation in my compositional practice with the description of my compositional strategies and on the basis of the case studies. In this description, I have also recounted the non-hierarchical relation between the musical work and the listener that emerges in the performance. In this section, I center on the nature of this different notion of subject-composer and how it can be qualified as feminist. The emergence of this feminist composer – as the emergence of form or openness – is aided by all of the four strategies presented in this chapter. Yet, for the sake of clarity, I exemplify this concept primarily with reference to the use of generative systems. In addition, I discuss the use of technology in a practice oriented towards openness. Later, I exemplify the strategy with the analysis of the fixed-media piece *MTRAK* (מטרקא).

As mentioned in relation to *Parallax*, neither composer nor material are prior to the piece. Composition starts in a *tabula rasa* state, similar to what the philosopher Christoph Menke defined as *ästhetischer Nullzustand* ("aesthetic zero state").[201] That does not mean that there is nothing before the compositional process, or that it starts *ex nihilo*. It rather refers to a conceptual shift, a different initial approach in practice and concerning the concepts of material and composer. In this *tabula rasa* state, the material is not a passive object waiting for the action of the composer, it rather appears in the process of composition, in its development and transformation, while at the same time material establishes the conditions for its own development based on its own characteristics. *displaced*, *ins Offene*, and *Parallax* are the result of the research of a material that emerges from a set of conditions established by the network of behaviors localized in space. Systems, tools, instrumentation, localization of sound sources, processes and parameters set up conditions for the material to emerge and enable its agency.

201 Christoph Menke, *Die Kraft Der Kunst*, Erste Auflage, Suhrkamp Taschenbuch Wissenschaft 2044 (Berlin: Suhrkamp, 2013).

In this *tabula rasa* state, a composer becomes subject by intra-acting with an object, the piece, which does not yet exist, but in the process of formation. In this "zero state", the composer is not a fully all-knowing master with total control over the sound-matter. This refusal of total control does not mean a lack of expertise nor a renouncing of the composer's agency, but rather an open mindset embracing experimentation. In this practice, the composer does not mold a sound matter to explain the world to a passive listener. The experimental composer rather uncovers a new entity, the piece, by intra-acting with material, and by doing so they regain their agency. Piece and material, but also the composer are in a continuous process of *becoming*. In this sense, we can relate the composer as subject with the *feminist nomadic figuration* described by Rosi Bradiotti in *Nomadic Subjects: Embodiment and Sexual Difference in Contemporary Feminist Theory.*[202] Bradiotti describes "figuration" as a method of thinking, as a way to conceptualize something that is in fluctuation and in movement. It is opposed to the principle of identity in which the described is identical to the concept that describes it. It is opposed to generalization, while being a means of approaching difference.

> The quest for multiple connections – or conjunctions – can also be rendered methodologically in terms of Donna Haraway's *figurations*.[203] The term refers to ways of expressing feminist forms of knowledge that are not caught in a mimetic relationship to dominant scientific discourse.[...] The 'nomadic' style is the best suited to the quest for feminist figurations, in the sense of adequate representations of female experience as that which can not easily be fitted within the parameters of phallogocentric language.[204]

A figuration is a tool that attempts to grasp difference, "the other", the female, the queer, the non-white, what is left out by the category of the male and conceptual generalization. The nomadic figuration is itself in a process of continuous formulation. It does not impose its mimetic reflection onto the world but rather explores the world in its nomadic *dérive* and in the fluctuations of the world itself. By doing so, the nomadic figuration creates a knowledge of itself and of the concrete. In the same way, the composer proposed in my compositional practice explores concreteness and difference

202 Rosi Braidotti, *Nomadic Subjects: Embodiment and Sexual Difference in Contemporary Feminist Theory, Gender and Culture* (New York: Columbia University Press, 1994).
203 Donna Haraway, "'Gender' for a Marxist Dictionary: The Sexual Politics of a Word," in *Simians, Cyborgs, and Women*, pp. 127-148 (London: Free Association Books, 1991).
204 Braidotti, *Nomadic Subject*s. p 75-76.

in the material and exercises their own difference and agency. This figuration-composer does not exercise their agency by displaying their authority nor by shaping the sound material into a “expression of the self” – which would be a form of reflection. The composer is rather shaped by their encounter with the material and by the concrete knowledge unveiled in the compositional practice. This composer explores the possibility of a subject that does not need to comply with generalization and with control mechanisms but rather finds in their nomadic movement a way of claiming and rendering perceptible their difference.

Within the range of social behaviors known as gender roles, the use of technology, technical proficiency, and "hard" mastery in electronic music production has been associated with masculinity, while non-technical soft knowledge is coded as feminine.[205] According to this paradigm, the relationship with technology is one of control and mastery and the ideal is to control technology to achieve foreseen results. Electronics, MIDI controllers, pedals and joysticks are means of avoiding possible contingencies and controlling every aspect of the sound result. As with certain classical notions of the experiment, the ideal is that the subject dominates nature through technology. In contrast, an approach to technology that fosters openness avoids control. Instead, the technology may be a means for searching and experimentation. Technology becomes a way to research a sound material.

The use of generative and nonlinear systems allows for this search and the emergence of other agencies. The result of a nonlinear system may be unexpected, since it is not in proportion with its input and sensitive to initial conditions.[206] In contrast, the output of a linear system is proportional to its input. Linear systems can be analyzed by examining their parts and constituent relations and their results are predictable. As Strogatz writes, in linear systems “each part can be solved separately and finally recombined to get the answer.”[207] In this sense, linear systems as idealizations are

205 Tara Rodgers, *Pink Noises: Women on Electronic Music and Sound* (Durham [NC]: Duke University Press, 2010).

206 In this sense, the strategies of networks of family resemblances and of the localization of parameters can be also described as nonlinear generative systems.

207 Steven H. Strogatz, *Nonlinear Dynamics and Chaos: With Applications to Physics, Biology, Chemistry, and Engineering*, Studies in Nonlinearity (New York: Addison-Wesley Pub, 1994). p 8.

important tools to represent reality and emulate behaviors. On the other hand, a nonlinear system is difficult to analyze, its parts collide and intra-act with each other. Its results are not proportional to its inputs and it can therefore not be completely foreseen. As I mentioned in relation to experimentation (chapter 2), in classical scientific and technological conceptions of the experiment, linear systems are used to confirm theories. While linear systems are a means of translating ideas into music, nonlinear systems do not necessarily prove or translate ideas into sound matter. Nonlinear systems can be used as means to allow openness in the composition process and to enable a search for the unknown, as well as to intra-act with sound and to discover the musical work while creating it. In the diverse interactions of its parts, a nonlinear system allows the material to have agency in the creation of the musical work.

In my practice, I use systems, like the one described as a network of relations – *displaced* and *Parallax* – and nonlinear feedback systems in the case study *MTRAK*. Yet, I do not intend to erase the composer's agency by using systems. On the contrary, my intention is to retain and reassert my agency, while allowing other agencies. In the system, I set the conditions of a process, and the conditions of the material to appear. I ultimately choose, through experimentation, from the result of the system which processes will take part in the piece and which not. The relation between composer and material resulting from the use of generative systems is one of intra-action. On the other hand, the use of systems is not a pretension of objectivity, not a lack of expertise or imagination. The figuration-composer is opposed to the master-composer not due to missing experience and technical knowledge – or due to the state of their career – but rather because of their position with regard to experimentation and their pursuit of new knowledge. The use of systems is rather a way to discover something unknown, and to avoid my own mannerisms and assumptions. But more importantly, it is a way to share my agency with the material, and allow it to co-create the piece.

The piece *MTRAK (מטרקא)* (2018)[208] was created in a process in which its parts intra-act with each other. First, I created an audio file in the non-standard sound

208 The piece was commissioned for the CD *SEGMOD*, "SEGMOD, by DUMPF EDITION," DUMPF EDITION, accessed March 17, 2020, https://dumpf.com/edition/12?lang=en

synthesis program *SEGMOD*,[209] whose resultant synthesized sounds are made by concatenating simple periodic waveforms. *SEGMOD* being open to micro-composition and at the same time a closed system that is reduced to a few parameters forces the composer to abandon established clichés and to explore the material and the process. The composition of the microlevel gives the possibility of creating materials with certain characteristics that have the potential to have an effect on the future state of the system. In this way, the material has agency, because it shapes its own development. Experimentation with different materials has demonstrated that not all materials are suitable to have such a potential to affect their development within the system. In this way, the composition process links material and its own development. If I may continue with the kaleidoscope metaphor, at this moment of the compositional process, I choose crystals with specific shapes, rugosities and colors.

In a second step, this audio file becomes the basis for a granular synthesis process with two channel output. The parameters of both channels are equal by default, however, the parameters of the second channel can be scaled with a factor. By doing so, the divergence of both channels can be modified, which will have repercussions on the sound's spatiality. The granular synthesis process starts with given initial values for each parameter. Later on, the output of the granular synthesis process controls some of its own parameters in a feedback process (figure 4.23). The transformed signal is thus affecting itself and this process is repeated recursively. This is an important aspect since sound itself is affecting its parameters. Instead of influencing the development of the material with symbols, forms, or notations it is done with the material itself, sound. The borders between the categories of what is control, and what is sound become blurred.

209 *SEGMOD* (c) 2013-2018 by Luc Döbereiner and Martin Lorenz, accessed March 17, 2020, https://github.com/lucdoebereiner/segmod

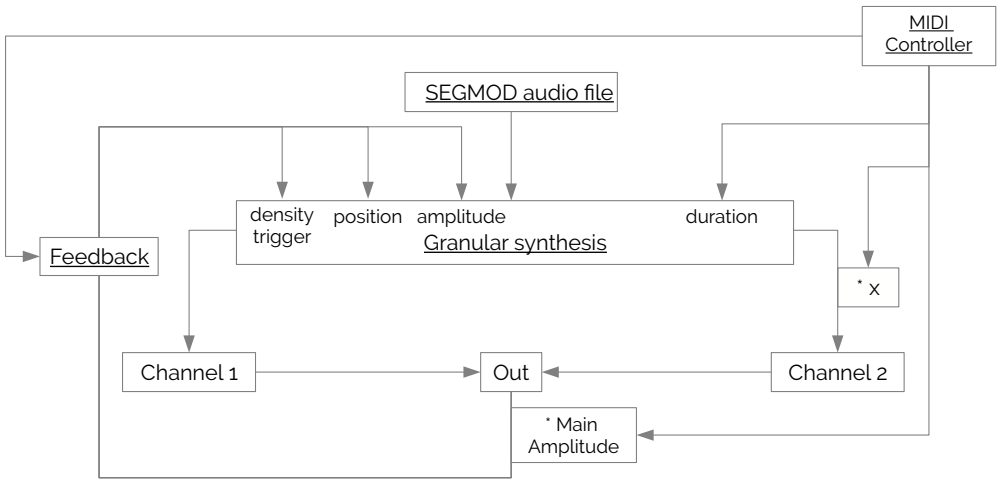


Figure 4.23: MTRAK (מטרקא), flow chart.

In addition, I can modify other parameters of the granular synthesis process by using a MIDI controller and thereby also change the feedback. In this manner, I have created a system that partly controls itself in order to enhance contingency and the material's agency. In the next phase I explored the system that I created by playing and improvising with it. Once I achieved some knowledge of the possibilities of the process, I recorded a stereo layer. This first layer became the backbone of the structure of the piece and the basis for further improvisation. Using the first layer as the fundamental track, I created and recorded a second stereo track. The two stereo layers were reworked and edited as a four channel fixed media piece. These four channels are separated in space, yet, they are not fixed in a certain position, but rather move between the different speakers.[210] As in previous case studies discussed above, *MTRAK* does not favor the creation of a sweet spot of an ideal sound, but rather offers different perspectives of itself. Each layer is a complex sound that behaves differently and moves between the

210 The version on the CD *SEGMOD* is a stereo version of *MTRAK*. https://dumpfedition.bandcamp.com/track/mtrak. The concert version is quadraphonic.

speakers. Depending on where the listener is seated in relation with the speakers, the four layers and their relations will thus be perceived and understood differently.

The sound result is an ever-changing, unexpected, highly dense, fluid sound that is partly controlled by me and partly controlled by itself. The influence of the feedback and of the actions that modify the feedback has immediate effects and affects subsequent transformations. The sound is influenced by the nature of the audio file created with *SEGMOD* and by previous changes and actions. Material and its development affect each other. Moreover, instead of being the translation of the composer's idea forced onto sound, *MTRAK* is an encounter of the material produced by the system and the composer. In this sense, *MTRAK* may also be understood as demonstrating a feminist approach to technology embracing experimentation and openness. The granular transformation and the feedback process that I use in the work are not intended to achieve a preconceived sound result. Rather, in *MTRAK*, technology has the role of a tool to explore the material and generate new sound results instead of designing an expected outcome.

This collaboration of different agencies manifests itself in different unexpected appearances and transformations. The diverse iterations retain a coherence that is based on the tracing of relations between the different reappearances of the material similar to the networks of relations discussed above. In doing so, the musical work maintains cohesion while advancing in continuous unexpected drifts. An open experiment creates unexpected outcomes but can also display multiple results, multiple behaviors, relations, and activities, allowing for the emergence of different understandings of itself in the performance.

Like the other case studies, *MTRAK* promotes different understandings of the work depending on the listener's position. In the repository of additional media, there are three recordings created with the spatial model programmed in *SuperCollider* which render the piece *MTRAK* from three different listening positions. In these simulations, it is apparent how the different appearances of a material in continuous transformations uncover the piece's intrinsic openness and how the use of space contributes to enhance a multiplicity of understandings of the musical work. If, for example, we compare the

first 40 seconds of the beginning of *MTRAK* from the three listening positions, we will clearly hear the different understandings that spatialization can provide. From the first listening position – the listener is in the front in the center – the appearance of a third voice is perceived as a rhythmical shifting of the first two. However, the second position – the listener is close to the left back corner – shows the third layer clearly as independent and in rhythmic contrast with the other two. From the third position this layer is understood as a stronger and different rhythmic shift than from the first listening position, while a high pitch results from the sum of the low frequencies.[211]

מטרקא (*mtrak*) in Aramaic means a whip, something that hits. It is derived from *ṭrq*, (to hit, sting, bite, close a door, mix). Later it developed into dialectical Arabic مَطْرَق (*maṭraq*) (stick, hammer) and from that to Spanish *matraca*, a percussion instrument, a rattle.[212] This contingent wandering of the word's etymology and its meaning also reflects nicely the different transformations of *MTRAK* in its compositional process. It also exhibits the relation of the figuration-composer and their activity in their *dérive*. They do not fix their knowledge, they rather encounter the material in their experimentation and together composer and material co-create the new knowledge that is the musical work.

4.6. Conclusion

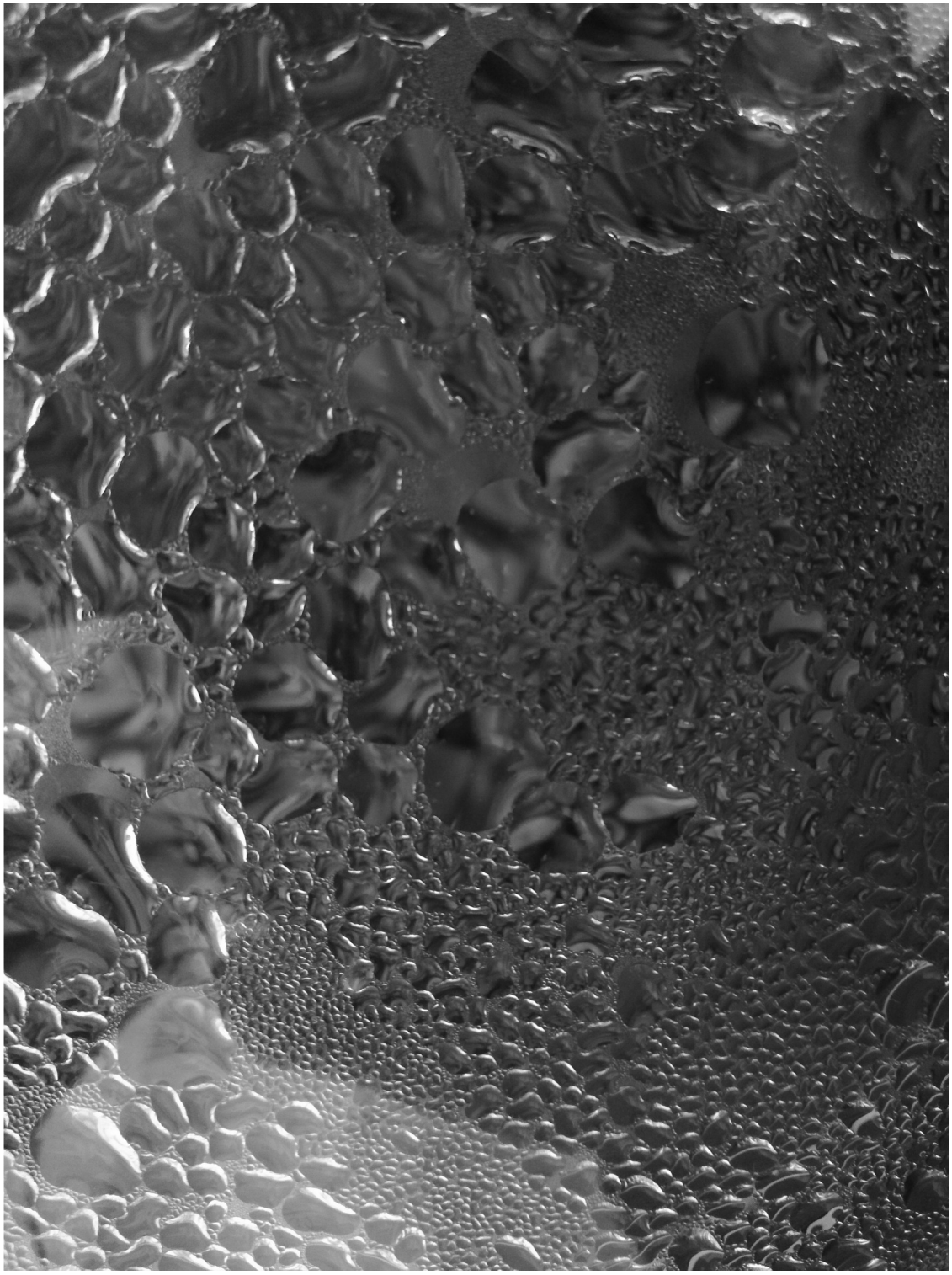
In my practice, I seek an autonomous openness of the work as well as an openness in its perception in the performance. Openness is here understood as contingency instead of as chance or probability. Contingency is displayed as an unexpected multiplicity resulting from the contingency of the object itself – the work – as well as its multiple possible understandings and experiences in active listening. To allow for the agency of the material and the emergence of multiple understandings in the performance, I use several strategies in the composition process. These strategies can be summarized as the use of generative systems, especially nonlinear feedback systems – *MTRAK* – and

211 Link to three binaural recordings to be listened to with headphones that reproduce a quadraphonic version of *MTRAK* from three different listening positions: https://www.researchcatalogue.net/view/1228054/1253951

212 The *matraca* was used in religious ceremonies and festivities. In colloquial European Spanish "dar la matraca" is to be annoying by obsessive reiteration.

networks of materials – *displaced* and *Parallax* – to open the agency of the material and the use of the localization of sound sources and spatializing parameters – *Parallax* and *ins Offene* – to enhance the multiple nature of the sound event in the performance. In my practice, space is manifold. By being included in the network of relations, the spatial dimension becomes inherent to the sound material. Moreover, the localization of sound sources serves to create a situation that immerses the listeners in the sound event without imposing a certain perspective. The asymmetric disposition of sound sources creates several partitions inside the space of the sound event. These different areas of activity and their movements offer diverse perspectives to the listener. The resultant space can be described as relative to the relations created by the localization of sound sources, by the positions of the listeners, and by the movements and position of the sound material, processes, and parameters. In this way, the sound event is open to be interpreted and experienced differently by each listener. Hence, this artistic practice proposes a different relation between listener and sound work. Due to the immersive and multifaceted nature of the work, the listeners need to participate with their active listening in its understanding. The result of the interaction between composer and material in the composition and later in the performance between piece and listener in space is what I define as the form of the work. Due to these two different encounters – composer-material and listener-work – this notion of form can be qualified as open. In addition, in the intra-action (Karen Barad) between composer and material in the composition process, in which both contribute with their agencies, arises a different composer subject. I have characterized this composer as *figuration*, borrowing the term from the philosopher Rosi Braidotti. This is a subject that renounces control over material and techniques in favor of engaging in research and experimentation of an open and multifaceted phenomenon of the musical work that, like the subject, is in a process of continuous formulation.

Illustration 6: Network – water vapor condensation



5. Conclusion

> Ce qui me passionne surtout dans la musique classique, ce sont les modulations, où il y a cette ambivalence tonale ou modale, où on peut se laisser aller à un moment suspendu, léger, où tout semble ouvert. On ne sait pas quelle direction cela prendra, c'est passionnant. (Éliane Radigue)[213]

5.1. Results and Relevance

The project has produced the following findings:

- **Development of compositional strategies**. The strategies are the compositional tools developed to achieve an open form through the use of space and with the co-agency of sound material. During this project, I have developed four concrete compositional strategies that assist in the creation of a multifaceted and open musical work. The strategies are: "family resemblances", "localization of sound sources", "spatialization of sound parameters", and "use of generative systems."
- **Development of the concepts of space, openness, form and subject and their topography**. My particular approach to space and openness – although influenced by its context – distinguishes itself from the practices of others. Given that, it was necessary for this research project to formulate my use and understanding of space, openness and the related concepts of form and subject. The formulations of these concepts constitute one of the results of this dissertation. Moreover, these concepts are not isolated in my compositional

213 Éliane Radigue, *Intermediary Spaces/Espaces Intermédiaires*, ed. Julia Eckhardt, Engl. trans. Eleanor Ivory Weber (Brussels: Q-02 Umland, 2020). p. 42. "What especially fascinates me in classical music are modulations, when there is this tonal or modal ambivalence, where even if you know what will happen next according to the rules of modulation, you can let yourself go in a suspended moment of lightness, where everything seems open. These moments when you don't know what direction the music will go in are amazing."

practice and thinking, but they are intertwined and relate to each other in several ways. Following the different interconnections of these concepts, I have also developed a topography of their relations.

- **Spatialization model**. I programmed a spatialization software model in the programming language *SuperCollider*.
- **Development and formulation of an experimental practice**. During this project, I have practically and theoretically elaborated and formulated an understanding of the artistic experiment, which I regard as a contribution to the current discussion on artistic research. My formulation of the notion of experiment is elaborated in extension in my book chapter "Experiment and Experience: Compositional Practice as Critique", published in *Sound Work: Composition as Critical Technical Practice,* Jonathan Impett (ed.) Orpheus Institute book series, Leuven University Press, which is currently in preparation to be published in July 2021.[214]
- **Experiments – Compositional works** The aesthetic result of this project is a series of compositional works which represent the result but also part of the artistic investigation. An important part of the knowledge generated in this project is only apparent in the experience of the performance of the musical works. However, the works have been documented by means of scores and audio documentation. The compositional works created as part of this project are:
  - Compositional works discussed in the dissertation and included in the documentation:
    - 2018 revision of *ins Offene* (2021-2013) for ten instruments and live electronics
    - *Dérive* (2017) for string quartet and live electronics
    - *MTRAK (*מטרקא*)* (2018), for fixed media
    - *Parallax* (2019-2020), for symphonic orchestra

214 See Leuven University Press https://lup.be/products/129486

        - *displaced* (2020), for chamber orchestra
    - Other experiments related to the project:
        - *Entmündigung*, (2015-2016) for two sopranos, alto and live electronics
        - *die Wanderung*, (2016-2017) cycle of six pieces for solo instrument and live electronics
        - *alla deriva* (2017-2018) for violin, piano and live electronics
        - *Nomadic Traces* (2019) solo piano

- **Written dissertation**. Strategies, concepts and analysis are described, reflected and contextualized in this written dissertation, which allow for the sharing of part of the knowledge created in this dissertation with peers in the field.

Several aspects of this dissertation can be enumerated as relevant to its context. Of relevance is my practice of openness in composition and the role of space. My use of openness goes beyond randomness and probabilities. Openness in my practice is the product of the encounter of different layers of activities and materials localized in space. That is what I have termed a spatialized network of materials, which can be described as a generative system. Moreover, of importance in my practice is that the spatial dimension is inherent to the sound material, rather than imposed on it. My approach to space and openness, although influenced by other composers' works, is unique in its use and conception. Moreover, I expect the compositional strategies developed in this project, as well as the compositional work to be of relevance and inspiration to other composers.

Contingency and immersion are topics of the *Zeitgeist.* However, their formulations and their relations with the concepts of subject and form in the topography of concepts are specific to their contemporary context. Besides, my reformulation of the figure of the composer as well as of the notion of experiment as critical practice are relevant regarding questions of identity and feminism. Moreover, the practice and concept of openness in the experiment and experience, and my understanding of experimentation imply a significant contribution from the practice of composition to the

field of artistic research. And finally, I hope that the compositional work of this research project contributes to its compositional context.

This project also means an important stage in my compositional practice. During the project, I have developed and deepened the compositional tools and concepts that prior to this project had only been mere intuitions. Both practice and formulations will be further enriched in future projects. Moreover, thanks to this research project, I have broadened my compositional and conceptual practice by embracing the risks of artistic experimentation and openness. During this project, I have developed a habit of self-reflection that not only helps me to analyze and assess my compositional decision making and results, but also to identify the aesthetical reasons and intentions behind them. And finally, I have developed the language and the tools to share the results and conclusions of this project with others.

5.2. Unanswered Question(s) – Future Developments

From the beginning, I have understood this project not only as closed-ended research in itself but also as the foundation and opening for further developments in my practice. And indeed, this project has proved to be far from being exhausted. Openness – as the result of a localized network of materials – can be deepened with further experimentation. The conceptual and compositional work realized in this project is a valuable frame for the direction of my future work. The spatialization model developed in the project will be certainly used as a tool for experimentation in my next pieces. The compositional strategies will be further developed and adjusted to specific future projects. The conceptual frame signals a clear direction for my composition, still, I am positive that the concepts themselves will be enriched through practice with each compositional project.

One concrete question that remains open and will be researched in the future is the question of openness, necessity, and space in installation works. I envisage an installation, in which the listener can move freely among a fixed network of sound materials localized in space. The sound material used in the installation[215] will be

215 Installation with the support of *Förderprogramm Neustart Kultur Musikfonds 2020*.

reworked recordings of another project for accordion, electric guitar, theorbo and live electronics.[216] The recordings of accordion and theorbo will be done with contact microphones which have the particularity of collecting the reflection of the inner space of the instruments, rather than those of the room in which the recording was made. The recordings will be played by transducers into different objects, which will be localized in several places of the exposition's space. This will result in different spatial aspects or layers; the inner spaces of the instruments in the recording, the inner spaces of the localized objects activated by the recordings, the different points of the exhibition space activated by the objects, the different relations and connection produced by the objects and materials, the movements of the listener and their connections, and the virtual space in the network of materials. In this installation, I want to explore all of these different spatial layers and their connections, as well, their behavior in time and the openness of the installation format. In addition, this installation has a visual aspect. Close up video recordings of the instruments will be projected onto the resonant objects, which themselves will be made in different shapes, materials and dimensions. The installation will have a physical version in an exhibition space yet to be determined and an online version. The online version demands another perspective on space and openness. It should be able to translate the contingency created by the spatial aspects of the physical version into the stereo system and frontal view of the digital devices. This concrete realization of the second version is yet to be decided and will be an interesting challenge to elaborate.

The use of generative systems whose elements are distributed in space was explored in *Parallax* and *MTRAK*. Yet, I feel this process has a great potential for bringing together the ideas of contingency, co-agency with the material, and space that are worth further research in future work.

It is my opinion that the practice of sonification that I have called *subjective sonification of spaces*[217] has the potential for further investigation. Subjective

216 New piece commissioned by *Azione_Improvvisa* with the support of *Ernst Siemens Grants-in-Aid 2020*.

217 The discussion of my piece *Dérive* can be found in the description of the musical experiment, section 2.4.

sonification of spaces has the particularity of connecting the space covered in the walk with the intra-actions between the composer and contingent events of this walk. In this way, subject, material contingency, openness and space are connected in this practice in a unique way that is worth additional investigation. Moreover, I am interested in the possibility of referring to the historical and social aspects of places in an indirect way. In my practice, I am resistant to direct references like the use of field recordings. Direct references sometimes entail an unequivocal understanding of a piece. However, the process of subjective sonification, in which recordings and transcriptions are transformed and reinterpreted gives me the possibility of aesthetically researching the social aspects of places, while guaranteeing an open interpretation for the listener.

As I had hoped at the beginning of the project, this investigation did not mean a closed episode in my work. During this investigation, some questions were answered and new questions appeared in the process. Still, I am interested in those questions that remain unanswered, those paths whose meandering branches move into the open.

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