

Abstract

The world of composition and music production has been quickly changing in the last 20 years especially with the democratization of digital technology. This project seeks to illuminate these new practices and how they affect production and composition through the hybrid role of the producer/composer. The aspects of production, acoustics and the role of the producer/composer are explored in depth before showing case examples of how this role was used in different productions and compositions in a portfolio-like section.

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Dédié à tout les morts et les vivants qui m'ont fait chanter

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Introduction

The 20th century has seen radical changes with huge paradigm shifts in the world of science as well as economy and politics. It was a century of change in all its glory, as well as a century of extremes having seen much of the world ravaged by two world wars which has left a deep impact on the 21st century. The face of music has changed as well, especially with the arrival of recordings which is without a doubt the biggest change that has ever happened in music and not only on a technological level. The appearance of recordings towards the end of the 19th century brought a new role within the world of music: the producer. His/her role is still nebulous at best to most musicians, but he/she would become a major force within the shaping of musical aesthetics throughout the 20th century.

The arrival of digital music technology in the 80's was another seismic shift within the world of music. The arrival of cheaper computers as well as powerful software and programming languages have changed the face of music production and composition. These changes have brought the roles of the producer and the composer to be closer to each other and sometimes completely crossover, perhaps especially in the field of contemporary classical music. This project takes a look at the effects of the hybrid role of the producer/composer on the production and composition of contemporary music.

Structure

The thesis is separated into two distinct parts modeled on the concept of Dionysian theory by Nietzsche (in *The Birth of Tragedy*) and Schopenhauer's *principium individuationis* in the first part, and the individuality of Apollonian examples in the second half representing examples of the previously discussed theory. The first part is divided into a triptych of production, acoustics and the role of producer/composer. In the chapter on music production we will explore three different paradigms looking at the traditional methods of classical music recordings, the work of Manfred Eicher & Jan Erik Kongshaug, the work of Morten Lindberg on his 2L record label and finally how this author as a producer and composer approaches the subject. In the chapter on acoustics, we will look into spatial aspects when recording classical music, as well as how to work with depth in post-production before having a discussion on the difficulties of mixing acoustic and electroacoustic sound sources as it relates to mixed music. In the third and final chapter of the first section we will explore what the role of the traditional producer and composer is. Afterwards in the third chapter we will explore the hybrid role of the producer/composer and how this role affects all aspects of

writing and recording music with an emphasis on mixed music which is perhaps the most challenging type of contemporary classical to write as well as record. This third chapter has emphasis mostly on the areas of what I have been working with as a composer over the last few years. It is mainly based on the traditions and new practices that have risen out of France and Northern Europe as the aesthetics that I personally prefer from out from these two vastly different regions. There are many more aesthetic paradigms and practices which exist in the world, but this project is not meant as a musicological overview of these different paradigms.

The second section titled Apollonian Compositions will go through several of the compositions I have written in the last two years and how they relate to the hybrid role of the producer/composer. Most pieces presented use electronics, but I have included a few short acoustic pieces as well as a mix of a composition by Alexander Scriabin to demonstrate how these concepts can be used with any type of music and even as a producer or recording engineer. All of these compositions present different aspects of the producer/composer such as discussed in Dionysian Theory. They show the result of the research which is presented. The first of the DVDs that accompany this project also includes the final mixes of all of the discussed compositions (more info on the content of the two DVDs is in Appendix A).

List of Included Compositions

Studie I: Dissolving Time – Solo piano & electronics

Studie II: Nyctalope – Solo cello & electronics

Studie III: S'effondre – Solo cello & electronics

Suspended Mirrors – Solo oboe & electronics

Solace – Mixed choir & electronics

In Sleep – Solo piano

Entre les nephilim et les gargouilles – Solo piano

Alexander Scriabin's Sonata-Fantasy No. 2, Op. 19 Mvt. 1 – Solo piano

Part I: Dionysian Theory



Chapter I: The Recording and Production Process

The possibility of recording music and how it has evolved is considered by many to be the apex of the 20th century (Zorn, 2012). Since its inception in 1887 with Thomas Edison's first phonograph, recordings have gone through a torrent of changes. These changes have often been technological such as the evolution from mono to stereo, but others have been more aesthetic or technical or sometimes both such as recording techniques. This section will go through a few different post-World War Two recording paradigms and how they relate to the recording and production of contemporary music. The first section (1.1.1) will look at the tradition that rose from engineers in the 60's and how it is still upheld by many such as the engineers at Norsk Rikskringkasting (NRK). The next two sections will focus on the work of two record labels, ECM (1.1.2), 2L Audio (1.1.3) and their views on the aesthetics and technical aspects of production. The final section (1.1.4) will be an explanation of how this author has adapted these different views and paradigms to form an aesthetic that fits contemporary music ranging from acoustic to electroacoustic music and everything in between such as mixed music. Mixed music is defined as a form of electroacoustic composition that combines a live/acoustic performer with the use of electronics of some sort (Fregel, 2010). It is also the genre which has occupied this author the most as a composer.

1.1.1 - The Traditional Orchestral Recording

Since the start of the music recording industry in the late 19th century, recordings have been advertised as being “lifelike”, as being in the same room as the performers (Day, 2000). When one listens to these older recordings a century later, these advertisements sound ludicrous but this author believes that they have formed the way many record labels have recorded music up to today. Many labels used to be secretive about their recording techniques and engineers were not allowed to work with any other labels. An example is the famous Decca Tree technique which is obviously derived from the Decca record label.

This author has oftentimes heard the concept of a neutral recording described as the ideal for classical music. “It should sound as if you were in the concert hall” is a common utterance that one hears from classical producers, engineers and musicians. Yet the action of putting a microphone anywhere makes a recording not objective, but subjective. Placing a microphone anywhere is like placing an ear at that specific position. This ear is further influenced by the characteristics of the microphone, its frequency spectrum and everything else that is inserted within the signal chain such as outboard gear. A recording of any classical work, whether it is orchestral, chamber music or

even a solo piece is therefore an interpretation of that composition. This is an aspect that can also be used as a tool for a composer, which is something will look at in the final section of this chapter and that this author has used extensively as will be seen in the Apollonian Compositions part of this project in sections 2.6 and 2.8.

The concept of the neutral recording has deeply influenced the way we record music. The most common aspect of orchestral music recording since stereo recordings is the presence of a main stereo pair that is meant to represent how the listener would hear. This main pair is often supported with an extra pair of microphones that are called outriggers, to enlarge the stereo field of the orchestra. Many will then add spot microphones on certain sections or a soloist as needed. Taking time to place the main pair to properly balance the orchestra is one of the most important aspects of any session as many engineers and producers have pointed out including the NRK engineers in Trondheim and Oslo (Culshaw, 1967). Even chamber music is often recorded with the same technique. In a private discussion with the pianist Paul Lewis (27th of October 2014), he remembered that in many of his early recordings only a single pair of microphone was used. He explained further that the engineer and himself would use hours to find the perfect balance between the direct sound of the piano and the hall in which the album was recorded. Tom Fine (2012) in a reply on Preservation Sounds notes for that by the early stereo recordings of 1955, Mercury Living Presence would often record with three microphones: two Neumann U-47s (later switched to KM-56s) on the sides (therefore forming a spaced pair as defined by (Huber & Runstein, 2010. p. 142) with a Schoeps M201 in the middle.

Many engineers today, including the ones at NRK, seem to prefer having the main pair set up as an ORTF (Office de la radio-télédiffusion française, defined by Rossing, Moore & Wheeler, 2002, p. 577). They will have one main pair that uses cardioid microphones (Huber & Runstein, 2010, p. 119-121), often placed in ORTF above the conductor. There will then be a spaced pair which will normally be with omnidirectional microphones (as defined by Ibid., p. 119). The reason for using omni microphones is that they have a better frequency response to record low frequencies than cardioid mics, which fits nicely with the idea of outriggers as several bass instruments such as the tuba and the contrabass are traditionally in the outer sections of the orchestra. The other mics that NRK tend to use depends on the set-up of the orchestra. Most instrument groups will then have so-called support mics which are a few instruments in the section being close miced. When recording in Olavshallen, Trondheim they tend to hang the support mics for the violins which consequentially makes the microphone not be as near as the other support microphones although this practice may vary from concert hall to concert hall.

It is important to note the effect of using microphones close to a sound source while recording an orchestra or any chamber ensemble. The first difference between a main pair and a close mic will be the time difference between the transients. If a bass drum is hit, the close microphone may capture the sound after only a few milliseconds, while the main pair may capture it thirty milliseconds or even later. The effects and consequences of this will be mostly discussed in section 1.2.2. The second effect is the timbre of the instrument which is caused by two different elements: the proximity effect of cardioid microphones (if used) (Huber & Runstein, 2010, p. 124) as well as distance cues. The second aspect is related to psycho-acoustics. Our brain is equipped with several systems such as the medial superior olive, the lateral superior olive and the medial nucleus of the trapezoid body. Some of these systems give us directional cues from the frequency content of a sound, while others use time difference between both ears (Purves & al, 1997). For example, if a sound has less high frequency information, we will perceive it as being farther away. Our ears are incredibly sensitive to this type of information and have close microphones can distort these spatial cues. This author remembers listening to Arvo Pärt's "Adam's Passion" (2015) which was broadcasted on NRK's "Hovedscenen", at a point during the concert, the strings go from playing very legato to pizzicato. As soon as they shifted to pizzicato the close microphones could be heard much more than those at a distance, therefore creating a spatial shift. This author highly doubts that the change in the listener's spatial perception was intentional or wanted. The same can be heard in several albums recorded by NRK engineers such as the album *Perfect Strangers* by The Norwegian Radio Orchestra (2014) with music by Goebbels and Zappa, and Mahler's 6th Symphony recorded by the Oslo Philharmonic Orchestra with Jukka-Pekka Saraste (2010).

To conclude, the most straightforward and perhaps popular way of recording orchestral music has not changed much in the last fifty years although the technology from the microphones to digital recording systems has changed the process dramatically. Recordings done today are much more reliable and precise in stereo picture than when Culshaw recorded the Wagner Cycle in the 50s and 60s because of the technological advances in recording technology and the refinement of mixing techniques, although the basic techniques have remained the same.

1.1.2 - ECM Records & The Northern Sound

In 1969, a young Manfred Eicher, at the time having only done a few records for Callig and Deutsche Grammophon, started his own record label called ECM which stands for *Édition de musique contemporaine*. Forty years later, ECM is a synonym of spacious albums that are recorded in high quality and played by fantastic musicians from jazz to contemporary classical. In this part,

we'll look through what is the so-called ECM sound, how were these albums recorded, and mainly how is this a different aesthetic than what would be considered to be the traditional recording technique for a classical ensemble. We will first look at how Eicher redefines the producer as an auteur, afterwards we will look into the recording and mixing practices of one of his main engineers, Jan Erik Kongshaug whom still works at Rainbow Studio in Oslo, Norway.

Eicher is a self-confessed film fanatic, having a deep knowledge of Bergman, Godard and so forth, so it comes as no surprise that he in many ways sees his role as a producer, as similar to the director in a film.

“Producer is an unclear term and signifies different functions in different media. In music the producer is the artistic director of a recording. Dedication, empathy for music and the musicians are essential. And as I understand my role, it helps if the producer is also a musician himself. A producer should be able to sense and should be able to listen so acutely to music and dialogues that the musicians feel understood and respected. Probably I have a talent in bringing people together at the right moment and then developing something with them. And in that sense we can maybe compare this work with the role of a theatrical or film director.” (Enwezor & Mueller, 2012, p. 97)

In many ways, he sees his role as the equivalent of the auteur in cinema. This is an important aspect of his art as it means that albums in themselves are an art project. This may seem to be a mundane utterance, but it has deep aesthetic and practical implications. This implies that a recording is different than a live performance (something which Eicher has said is a paramount difference (Enwezor & Mueller, 2012, p.32)) but also that it should be treated as such when it comes to the editing and production. Eicher refers to what he does as sound sculptures (Nicholson, 2001). Within this paradigm, splicing together different takes doesn't change anything as the recorded music is an art into itself, separated from realism unlike the traditional recordings we've seen previously. The author Paul Griffiths commented to the effect that holding an album by any ECM artist is “holding something composed” even if it is improvised (Enwezor & Mueller, 2012, p. 40). There is absolutely no disconnect between realism and the artificial reality of recording an album, everything fits into what is going to be become the oeuvre. One does what the music needs to be a proper and full production (in the larger sense of the word).

This does not mean that Eicher uses this liberty to alter reality and how instruments sound in a room, as one can quickly hear from any of the orchestral recordings on ECM. However, he does see the result as an artistic sound that he somehow has to reach. This is an important aspect within the context of this project that we will come back to in later sections such as 1.3.3 and 2.5. The

documentary “Sounds of Silence” (Guyer & Wiedmer, 2009) shows us the different ways that Eicher can go to achieve the desired sound, and it isn't necessarily always about a technical aspect of the recording. He often goes to discuss with the artists how they play and how the music should be presented (Ibid. & Baird, 2010). A lot of time is spent on the aesthetic choices of how and what the musicians will play, long before any single note is recorded.

His idea of how the finished product should sound can also sometimes create a result that isn't very realistic. On David Darling and Ketil Bjørnstad's album *Epigraphs* (2000) the composition “Song for TKJD” would not be possible for Darling to play in concert as he is multi-tracked several times. Although this makes the composition not very realistic, it is done in such a way as to sound completely natural, and it does not sound as if it does not fit on the album. The album *The Sea* (1995) by Ketil Bjørnstad, David Darling, Jon Christensen and Terje Rypdal is another example of something completely unrealistic. A listener can clearly discern that all of the instruments (and some parts of the drums as well) have completely different reverbs. The use of reverb here is not to simulate a room, but much more to colour the instruments in different ways and sculpting the sound. Nils Petter Molvær's *Khmer* (1997) is another example where the organic trumpet is blended with beat-based music creating on purpose a sharp schism between electronics and the acoustic instrument. Molvær's trumpet often has much more reverb than any of the electronics. The use of panning and the change of spatial depth of certain elements in the mix becomes a compositional tool. Although many of these albums are marketed as jazz albums, they do share many similarities with the production of mixed music such as will be discussed in the third chapter.

One of Eicher's oldest and noteworthy contributors is Jan Erik Kongshaug who owns and operates Rainbow Studio, although he used to work in the Arne Bendikson studio which is where he first met Eicher for a recording with Jan Garbarek in 1970 which became *Afric Pepperbird* (Ernould, 1999). The two have become a fixture of many well-regarded ECM albums, and there seems to be much more information about these sessions than some of Eicher's sessions in the Power Factory or other studios in Germany and Italy.

Kongshaug does not seem to do anything very special in his recording set-ups. He uses good and trusted microphones such as older Neumanns, Schoeps and DPA and in the last few decades he seems to prefer a close placement of the microphones to the instruments as it allows him to create the room afterwards (Guyer & Wiedmer, 2009). He also mentions the use of minimal equalization during the recording and mixing process as it is not necessary when using good mics (Nevalainen, 2010). It seems like he processes all of his sound sources very little except for reverb which he uses

as his main sculpting tool. This leaves him with two basic elements that can form all of his work: microphone placement and the use of reverb.

Many musicians that have passed by his studio also have noted that he tends to place the microphones very quickly, and tests very little, letting the musicians start playing as quickly as possible instead (Kelman, 2010). His use of reverb and other processing on the other hand is much more calculated. He mentions using many different reverbs, sometimes even different reverbs on one drum set to get the desired sound (Nevalainen, 2010). He also mentions the importance of maintaining dynamics and only using a minimal amount of compression for the peaks during the mixing stage (Ibid.).

Both Eicher and Kongshaug have mentioned the importance of the ensemble as a whole musically, not just every musician and every microphone individually. The complete sound of everyone together, the final result is what matters. This gives us a very clear image of how they work towards a final product in which the music imposes the rules, not the other way around.

1.1.3 - 2L Audio & Morten Lindberg

Morten Lindberg is a Norwegian sound engineer and producer that has become well known in the audiophile community for his recordings which are released on his label 2L. The label has been releasing mainly Norwegian musicians and composers with music varying from Renaissance chant with Schola Cantorum to the contemporary music of Ståle Kleiberg. In the description of his record label in every booklet, he is pretty clear as to his objective and aesthetic choices:

“The qualities we seek in large rooms are not necessarily a big reverb, but openness due to the absence of close reflecting walls. Making an ambient and beautiful recording is the way of least resistance. (...) This core quality of audio production is made by choosing the right venue for the repertoire, and balancing the image in the placement of microphones and musicians relative to each other in that venue. There is no method available today to reproduce the exact perception of attending a live performance. That leaves us with the art of illusion when it comes to recording music. As recording engineers and producers we need to do exactly the same as any good musician; interpret the music and the composer's intentions and adapt to the media where we perform.”

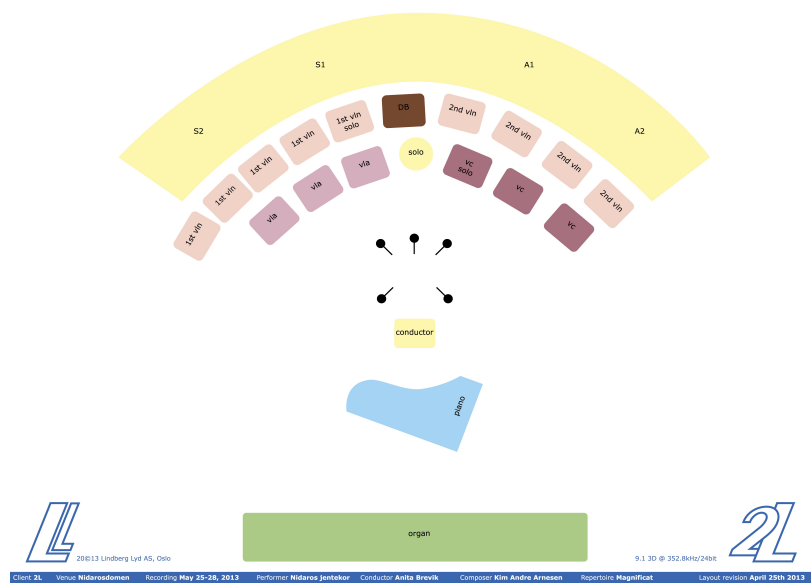
This gives the listener a clear idea that Lindberg understands that it is not possible to re-create a live situation as has often been the wish of many current and earlier engineers. There is little information available about how Lindberg works with the musicians, and if so how much he is

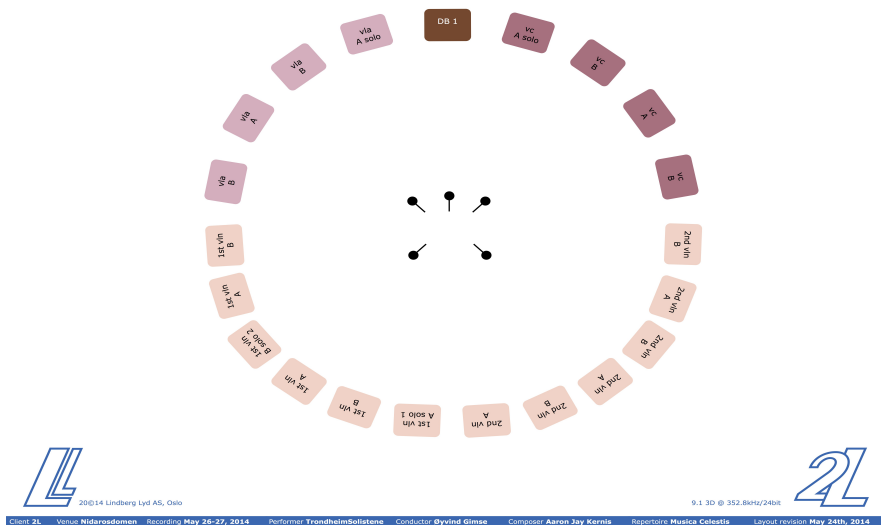
involved with the forming and shaping of the performance.

Lindberg's use of surround sound is of crucial importance to understanding his views on the aesthetics of recording. He first garnered many positive reviews for his releases on SACD and Blu-Ray which allowed buyers to listen to art music in full surround sound experience varying from 5.1 to Auro-3D more recently. He says that a good surround mix is already created in the recording session by good microphone technique, not afterwards in the mix (Colletti, 2014). This is Lindberg's main aesthetic point as he will place his microphone array in the middle of the musicians, moving the musicians instead of the microphones. The placement of the musicians is his main aesthetic tool for his recordings, and it is something that will not be changed at all from recording to the production except when he makes a stereo mix.

The microphone array Lindberg uses is composed of DPA microphones, and he has recently upgraded his selection to include the new DPA4041 model microphones (personal communication, 21st of May 2015). He also varies how many microphones are in use depending on the final surround standard of the album. If the album is to be released in 5.1 then it will be recorded as 5.1, and so forth. Here are examples from the *Magnificat* release by the Nidarosdomens jentekor & Trondheim Solistene (2014):

Figures 1.1.1 & 1.1.2 – The placement of the ensemble and microphone array for the recording of Magnificat (2014). Figures from the booklet of the release.





The interesting aspect of Lindberg's recordings is his theories around concert-like and life-like. Although he is quick to dismiss the idea of re-creating a concert as explained in every booklet, he has also commented that his recordings re-create the recording situation perfectly (Lysvåg, 2009), describing it even as “analogue-like” (Magnificat liner notes, 2014). He also furthers his point writing that:

“Historically one always enjoyed the music in the midst of the musicians. The rationale behind having the musicians on a podium up front is simply a matter of economics; it only became the norm when it became necessary to attract a lot of people to concerts. The prevalent and dogmatic notion that music is best experienced from the fifth row in a concert hall is really quite strange, because it is based on a situation where the audience is largely (sic) excluded from the actual musical situation.”

Yet this is historically false for most of the music that he has recorded. The concert situation in the time of Mozart is well recorded (Brown, 2002, Rosen, 2005) and as well as in Renaissance chants (Howard & Moretti, 2009), and in both cases his assertion is false. The only exception is perhaps the idea of chamber music (such as the hausmusik tradition in Germany) when people played at each other's houses for pleasure. Lindberg also argues against re-creating concert situations, but then defines his recording aesthetics as going back to older concert situations which is paradoxical.

Lindberg's main aesthetic tool is really how he places the orchestra or ensemble around his microphone array. The signal chain after that is kept as clean as possible and he does little sculpting compared to Eicher. His vision of a good recording, is to give back as much as possible exactly what was in the room during the recording session therefore perhaps being closer to the traditional ethos of classical music recording, yet with a new twist of surround sound and its inherent aesthetics.

1.1.4 - Personal Approach & Concluding Thoughts

All of these different paradigms for recording classical music have their advantages and drawbacks. The traditional method concentrates on the outdated idea of giving the concert ideal (which is already difficult to define by itself) for listeners at home. Manfred Eicher prefers to sculpt sound to create something that is sometimes different than how things would sound acoustically in a room but fits the music and perhaps even gives it a deeper meaning. Morten Lindberg describes the idea of the ideal concert position, but still validates his paradigm by re-creating the exact situation during the recording sessions. It is important to remember that however one validates his/her placement of microphones, as soon as a microphone is placed it is an aesthetic choice. The position of the microphone will be especially crucial when placing a microphone close to an instrument, because of the very complex radiation patterns of acoustic instruments such as shown in Meyer (2009). There is a clear tonal effect as to where one places a microphone when it is in near-field such as covered in Bartlett (1981). Therefore the placement of a microphone influences the final result in such an intrinsic way that it is part of what forms the aesthetics of any recording.

This author finds that defining recordings as realistic is slightly misleading, exactly because of the idea of the microphone. How often does someone listen to an orchestra right behind the conductor as the main stereo pair is often placed? How does one even define what is the “ideal” placement to listen to an ensemble? There are too many loose ends to make any credible point out of recording something as if the listener was at a concert.

Recording in itself is unnatural to the human ear. It is not normal to be able to listen to recordings of musicians that are not playing nearby over and over again. This is something that should be exploited to the producer's and composer's advantage, much like Eicher does. Since the medium is so flexible, it should be used as such. The microphone positions and aesthetics that will work on one composition won't necessarily work on another, and this is an important point. This author does believe that producers such as Lindberg also have a say in what would fit a certain

recording session, and to a certain extent I expect this to also be because of what would fit certain compositions. I doubt that he would record a composition of Renaissance chant the same way and in the same venue as a serialist instrumental work by Boulez. An extra example of this would be the way one recordings drums for a jazz recording compared to say a metal recording. Within jazz the use of condenser microphones with very low self-noise to have a perfect blend of the acoustic instruments is of central importance. On the other hand, while recording drums for death metal the use of microphones which can take a serious amount of sound pressure and separation between the drum set's parts are more important. The original drum sound is of less importance since it has become common practice to do sample replacement and triggering afterwards except for the overheads (Dunkley & Houghton, 2011).

If there is anything which should be remembered by anyone interested in recordings is that the medium should not dictate the content. It is the content of the music which will dictate how something should be recorded, mixed and mastered. Although presenting another aesthetic to a piece can sometimes bring an interesting view point, such as Lindberg's surround recordings or the practice of playing certain pieces on period instruments (so-called historically informed performances). This is true for acoustic music as well as mixed music, where it gains perhaps even more importance to be able to mix the electronics with acoustic instruments, which will also be elaborated upon in chapter II in section 1.2.3.

In many of this author's own compositions, the idea of recording the solo musician as if he/she was in a traditional concert hall would not fit the aesthetics of the piece. Nonetheless that doing live processing (which will be explained in section 1.3.3.1) only on distant microphones is ludicrous and would work poorly. Eicher's aesthetics of being an auteur are what strikes me as the correct path for my own music, using production to shape it into what it should be. However, there is also much to be learned of the traditional methods as well as Lindberg's methods. It should also be of note that the traditional classical method of recording all instruments together can sometimes be a detriment to the piece or sessions. The possibility of recording each part separately as in normal within popular music can have its advantages such as when this author recorded "Solace" as described in section 2.5.

Chapter II: The Role of Acoustics in Production

It is often said that the main elements of any composition can be seen as three pillars representing rhythm, harmony and melody. In this conception of music, acoustics and the idea of the room is sorely missed. Acoustics have often seemed to be an after-thought to many composers and musicians throughout time, yet this isn't completely the case. Deborah Howard and Laura Moretti (2009) have amassed enough data to be able to conclude that Renaissance-era architects and musicians must have had a certain amount of understanding of acoustics. During the Classical and Romantic periods, acoustics were used as spatial effects (antiphony for example) within the orchestra such as in Joseph Haydn's "Symphony No. 103 in E-flat Major, Hob.I:103" (1795), 4th movement measure 368 or Ludwig van Beethoven's "Symphony No. 4 in B-flat Major, Op. 60" (1806), 4th movement measure 293 such as illustrated in Meyer (2009, p. 277). In the 20th century, the idea of the room has played a more direct role, in part thanks to the medium of recordings. Alvin Lucier's "I'm Sitting In A Room" (1969) is perhaps the first composition that used acoustics and the room as a main compositional gesture, an aspect which will be explored fully in section 1.3.5. Although it is easy to forget how acoustics are crucial while playing music oneself, their importance in the world of recording, such as demonstrated by Lucier's piece, is primordial and cannot be overstated. Beranek (1996) states that reverberation is definitely part of the music and it can be used as a tool to create a specific musical effect although few musicological texts and treatises deal with the idea of the room and its acoustics as far as this author is aware.

In this section we will look into acoustics and how they affect the recording and production process. Firstly, how do acoustics influence the recording of any project? Afterwards we will explore the room in post-production and how it is possible to change acoustics and create one's own spatial depth. Finally, we will go into one of the main difficulties of mixed music which is blending acoustic instruments with electronics in a room.

1.2.1 - Spatial Aspects During Recording

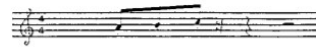
The location in which one plays or records music in is of incredible importance as it shapes the sound we hear because of the reflections from the walls, ceiling, floor and other objects in the room. By definition, these reflections create phasing which colours the sound. Phasing can be a severe issue in recordings. Although it is possible to switch the polarity of a signal in the digital domain, it is something that is difficult to fix especially when you have many microphones on the same sound source and perhaps farther away in the room as well.

Because of the importance of the room when it comes to reverb and colour, it is a major aesthetic tool for any recording of art music. The amount of reverberation in a room can influence the music played in it as well. For example, gregorian chant is supported by very long reverberation times of several seconds, but trying to record a six voice polyphonic section in a room with a very long reverberation would only muddy all of the lines, making them incomprehensible and making the harmony blurry. In many ways, one can use reverberation (whether natural or not) to “enhance the melting of the individual voices of the orchestra into a closed overall sound” as well as giving a “uniform flow to melodic phrases in their time progression” (Meyer, 2009, p. 203).

What type of room fits what type of music is a rather difficult question as there is no uniform and definitive answer. Meyer (Ibid) has reached the conclusion that the optimal reverberation time varies with the type of music, and how polyphonic it is. A time of 1.7s is what he has come to a conclusion to for Classical era symphonic music, while 2s is the optimal length for Romantic era symphonic music and this latter result is also confirmed by Winckel (1961) and Beranek (2010). Both Beranek (1996) and Meyer (2009) reinforce the point that in many different time periods composers have used the room for a special effect (although often ignored in musicological studies) and therefore the room becomes a central point to being able to recreate the situation the composer actually called for.

Figure 1.2.1 – Beranek's (1996, p.3) table which shows different musical elements and how they are affected by the reverberation time of the room they are played in.

Acoustical Conditions		Notes Played Slowly		Notes Played Fast		
Reverberation Time	Ratio of Loudness of Early Sound to Reverberant Sound	Music-Acoustic Results	Definition and Fullness of Tone	Music-Acoustic Results	Definition and Fullness of Tone	
Times of Identical Loudness	Short	Large	(a)	High definition Negligible fullness of tone	(b)	High definition Negligible fullness of tone
	Long	Medium	(c)	High definition Some fullness of tone	(d)	High definition Some fullness of tone
	Long	Small	(e)	Medium definition High fullness of tone	(f)	Low definition High fullness of tone
Times of Different Loudness	Long	Medium	(g)	High definition Some fullness of tone	(h)	High definition Some fullness of tone
	Long	Small	(i)	Low definition High fullness of tone	(j)	Very low definition High fullness of tone



This can be applied to symphonic music as well as chamber. Therefore it is clear that reverberation plays a central role not only in the live dissemination of art music, but also on record whether it is done with a physical room or digital tools. It is also important to remember that the room one is in, is important not only because of the length of the reverberation tail, but because of the presence or lack of reflections close to the sound sources as pointed out by Lindberg (Magnificat booklet, 2014). Reverberation is an aspect which has been all too ignored in many contemporary musical fields although we have historical proof showing that it has been an important aspect before. Even Wolfgang Amadeus Mozart has commented on effects of the room on his music (quoted in Beranek, 1996, p.3).

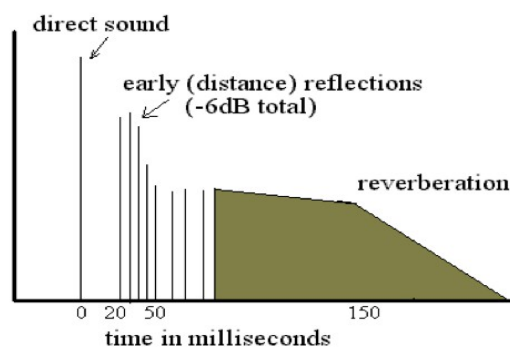
1.2.2 - Spatial Depth In Post-Production

We have already explored the importance of reverberation when it comes to art music and in the recording process. We will now explore the different ways to use reverberation within post-production to sculpt the recording to what is needed for any composition. If a recording is done in a relatively dry room and/or microphones close to the sound sources so the signal is in the near-field and that the direct signal to reverberant sound ratio is good, it is possible to modify spatial depth in many different ways. If a recording is not very dry, some small enhancements can be done, but one is generally stuck with that is on the recording. The precise use of dynamic processors such as expansion and de-compression may help to minimize the reverberation in the recording, but there is no cut and dry method to do this.

When we listen to a sound source, we receive a lot of information which is processed by our brains to help us identify where the sound source is located; whether it's close or far, more to the right or to the left, etc. The two main ways we evaluate where a sound comes from are intensity differences between both ears as well as time differences (precedence effect) between both ears. Additionally, our brain is able to understand some spectral information to decompose where a sound comes and recent research shows that we are also able to detect height to a certain extent (Purves et al, 1997, King & Howie, 2015).

Earlier in the first chapter (section 1.1.1) we went through the subject of delaying spot microphones. In this section we will go deeper into the subject.

Figure 1.2.2 – The separation of any sound into three distinct phases from Greisinger, n.d.



The first part is the direct sound which is self-explanatory. The second part are the early reflections. These are the reflections often from the ceiling and floor which are the first to reach our ears. These reflections are vital to our localization of sound (Leonard, 1991). The third part is the reverb tail which is an accumulation of many reflections to the point that we cannot differentiate between them anymore.

The traditional way of recording an orchestra is with a main pair and then some spot microphones to support weaker instruments and/or sections as we've seen in the first chapter. The problem with this is that the temporal order in which the sound of the different sections hits us will be different between the spot microphones and the main pair. Let us take an example with percussion. If the timpani is hit by a player, the spot microphones will reproduce the sound before the main pair which gives us the wrong temporality as the recording will be mixed with the main pair as our “ears”. This completely destroys spatial depth as our ears “need the appropriate values which are given by the temporal order of direct sound, first reflections and reverberation” (Leonard, 1991, p. 14). This will also cause phasing as the same signal will arrive at two different points in time, which may create a comb-filtering effect. It is important to note that this will only happen within a near-field distance as the direct sound will still be strong and clear enough. If one has a pair of microphones in the diffused field, the effect is different as the microphone will not be getting much of the direct sound, but mostly reflections. In this case, comb-filtering may still be present, but the illusion of spatial depth will not be destroyed as much as in a near-field situation.

Leonard (Ibid.) notes that there are no technical drawbacks to delaying spot microphones. However, she does also note that the extra spaciousness as a consequence of time alignment might not always be a desirable trait in a recording. The only negative consequence that it might have is from off-axis bleeding coming from other instruments than the ones the spot microphones are for, it might therefore not be the optimal solution if you have over 25-30 extra spot microphones in the

orchestra, but in this author's experience recording a few times with NRK and during this project, it definitely helps adding a dimension of spaciousness and correct depth of field which would not be present on the recording otherwise. In a test conducted with musicians and recording engineers (Ibid.) the production using delayed spot microphones was always chosen as the best recording.

On the accompanying DVD of this project you can find several examples with and without time alignment. The first example is taken from my "Studie II" played by Amund Ulvestad in the reverb-heavy Orgelsalen at NTNU. The second example is from the non-processed files from the first movement of "Solace". The third and final example is a small excerpt of the two main microphone pairs with spot microphones for timpani and bass drum with the Trondheim Symphonic Orchestra. More details on the content of the DVD can be found in Appendix A.

To calculate the necessary delay Leonard (Ibid) goes into the mathematical formulas which consider air humidity and the temperature in the room. However, this author finds these methods to be slightly heavy-handed for most cases. The easiest method is simply to play an impulse (either with a speaker or for example clapping your hands) from every spot mic position and then it is easy to compare these to the main pair and delay them accordingly. This method also supposes that the temperature and humidity of the room will remain relatively stable. The method allows one to have a sample-accurate delay if wanted, although Leonard (Ibid.) states that an accuracy of around 1 ms is more than enough.

Griesanger (n.d.) on the other hand disputes the idea of time delay and even of the idea of the main microphone stating that the position of the main microphone pair is generally in a diffused field instead of near-field or right at the critical point. He also points out that any recording with a lot of energy in the 50 to 150 ms area (effectively where a lot of the information from spot microphones would be according to him) only muddies up the recording. The latter is simply a point of subjectivity, of which this author does not completely agree with. How much "mud" (which most engineers mean lower-mid frequencies by this expression) is in a recording depends heavily on the way the technician has placed his/her microphones on the instruments, and especially which microphones are used. The former can actually be tested in any environment one is recording by calculating the critical distance using the following formula:

Figure 1.2.3 – The formula to calculate the critical distance in any environment where Q stands for directivity, V for the room's volume and $RT60$ as the amount of time before the reverberation dies down by 60 dB.

$$dc = 0.057 \sqrt{\frac{QV}{RT60}}$$

Pieter Snapper (2014) has also found a new use for short delay times: he creates a bigger room. In the same way that Leonard (1991) gets the spaciousness of the room as it is, if one delays the signal of certain instruments when everything has been recorded with microphones close to the sound sources, one will have the feeling of a bigger room as the time each note takes to reach our ears will be longer. This is an effective method to create a bigger room and in many ways is quite similar to how one can work with an algorithmic reverb. When using a digital reverb unit, the time of the pre-delay is the first element that allows us to control the room. A longer pre-delay means the signal is closer to the listener. The judicious use of spot mic delay, pre-delay and a good algorithmic reverb can allow us to re-create completely different situations than the room a recording was done in, as long as the recording has little reverb from the physical room on it.

1.2.3 - Difficulties of Blending Acoustic Instruments & Electronics

An aspect that is often under-discussed and misunderstood is how to blend acoustic and electronic sources. This is a problem that is at the center of the role of the producer/composer as explained in the next chapter, especially when he/she is working within the context of mixed music. All too often, this author has heard pieces of music with electronics and an acoustic instrument and it fails miserably because the two become much too separated, failing to create a meaningful counterpoint between the voices. As Frengel (2010) states, there is already a perceptual dissonance between what is heard and what is seen, since the electronics are not (most of the time, the exception being perhaps by projecting the electronics on a screen which seems anti-climactic) visual by nature. There used to be very little dialogue about this dissonance until recently when other composers and technology scholars such as Frengel (2010), Waters (2007), Croft (2007), Landy (2007) and Tremblay & McLaughlin (2009) began writing about the subject. It seems that traditionally the burden of this has been left to the sound technician of the concert venue, as this author has seen all too often. I often think back to a concert of the Trondheim Symphonic Orchestra when they played “Symphony No. 1” (2006) by the composer Lera Auerbach in which she included a theremin. The sound technician for the orchestra had not thought that the idea of sending the theremin sound out of the PA system would cause any trouble. However, it made the instrument

stand out as it arrived to the audience's ears earlier than the rest of the orchestra (because of the time difference as explained earlier in this chapter) as well as because it was coming out of a PA system, not the orchestra. In this section we will look into different strategies that can help combine the world of acoustic instruments with electroacoustics. It is also important to note that it might be an aesthetic choice that the acoustic clashes fundamentally with the electronics, however, I rarely have been given the impression that this was the composer's will throughout all my years of listening to mixed music.

The first aspect that must be explored is the use of a speaker system and its placement. It is incredibly important to emphasize that a speaker is not a simple device that only re-creates the waveforms sent to it. As Mulder (2010) points out, it becomes an instrument in itself. The choice of the speakers used, are an aesthetic choice when chosen by the composer, just like the choice of microphone is an aesthetic choice for the studio engineer.

There is an inherent difference between an acoustic sound source and an electronic sound source. For a long time composers (Manoury, Boulez and Lutoslawski among others) complained about how things sounded different between the actual instrument and what was played on the playback system. This is in part due to the natural radiation of the instrument (as documented in Meyer (2009, p. 129-178)) which cannot be accurately reproduced by the radiation of a loudspeaker (Manoury, 2012, Tremblay & McLaughlin, 2009). This is the first difficulty associated with the use of amplification and it is also therefore reinforcement should only be used when absolutely necessary, therefore letting the acoustic instrument(s) play to its/their full possibility and adding other electronics around it. This can also help minimize the risk of feedback. Not using reinforcement is however only possible for smaller sized venues and rooms. During the few rehearsals for “Suspended Mirrors” in Denmark (as will be described in section 2.4.3), I realized that by not putting any of the original signal in the octophonic speaker array, I would still have a better spatial image (such as explained in Mulder, 2010), it reduced the risk of feedback and also helped blending.

The question then becomes why one would amplify sounds during a performance? Simon Emmerson (2007) proposes six different functions: balance, blend, projection, perspective, coloration and resonance while Mulder (2010) adds the extra function of reinforcement. As Mulder (Ibid.) also rightly describes, the level of the amplification can also dictate which function is possible. In the context of mixed music, this author finds it difficult to understand why the levels would be very loud as that would destroy any semblance of blending between acoustic instruments

and electro-acoustics, as well as excite more of the room's modes (the room's resonances as explained in Rossing, Moore & Wheeler, 2002, p. 566) and therefore negatively affecting the spatialization. Mixed music lends itself particularly to the functions of blending, projection, perspective, coloration and feedback. However, the others can also be used in an artistic way although perhaps one should be more careful. Having a clear separation between both worlds could also be seen as desirable, such as Frengel's (2010) explanation of a 4-channel system where two are for the acoustic performer and the other two only for the electronics.

Another problem has been the placement of speakers. The traditional way for a PA system to be placed in a concert hall is at both ends of the stage creating a very wide stereo picture. This typical set-up will only aggravate the difference between any acoustic source and the PA. As rightly mentioned by Tremblay & McLaughlin (2009) the spatial positioning of anything will also be quickly destroyed if a listener is off-axis. A closer placement between the musicians and the speakers will promote an intimacy and closeness which would not be otherwise achieved by other means, and it also makes the music production and listening situation closer to what it would be in acoustic chamber music. It is important to note as well that the use of multi-channel set-ups can also help with the envelopment and blending between different types of sources.

Having the loudspeakers closer to the musician(s) can also make monitoring much easier for the musician(s) on stage, and less need for extra monitors is only positive to have a lower sound level and make the musician(s) feel included within the poetics of the music. Emmerson (2007) has also described monitoring in mixed music situations as inaccurate, distracting and interfering with what is going on in the room.

Tremblay & McLaughlin (2009) have done several case studies on mixed music, and the response has been unanimously better to works that do not use sound reinforcement, and that have a narrower placement of the speakers, creating a more centered spatial and sound picture around the musician(s). In their paper (Ibid.) they also had several proposals to help composers which included having more exact information about speaker type and position at the time of writing the music, and going to the length of using impulse responses of the speakers in the hall the work would be played in. This author does not see this as a definite solution for several reasons. Firstly, using an impulse response of a speaker on your own stereo set-up is the equivalent of putting an extra equalizer over your speakers' frequency response which is already not completely linear (and this is without thinking about the complications of the room in which one is monitoring). Secondly, this supposes that the work will be site specific which is not always something that a composer wants or knows

beforehand. Thirdly, when writing a work, the composer might not know in which room and/or which speakers will be in the room where the work will be premiered. The idea comes close to how companies such as Waves have been creating such as Waves Nx (2016) which can supposedly make you listen to your mix as if you were in a million-dollar studio room. It is simply unrealistic, unreliable technology that has no basis in reality. Although Tremblay's and McLaughlin's hearts are in the right place, nothing can replace being in the room where the work will be performed, with the musician(s) and tweaking what one has created beforehand. As they rightly mention, there is an inherent difference between the room in which the work will be performed and the studio in which a composer works, but that is something that cannot easily be correct and must unfortunately simply be accepted by all parties. Testing the composition in a proper room cannot be replaced by anything else, and it is partly why mixed music is so difficult to do properly.

This author has also had the chance to attend many other mixed music concerts, as well as being a technician at several of them. Most composers seem to absolutely want to have some of the dry signal in the PA. Even after explaining the acoustics of the situation, and then hearing how quickly feedback can arise (even after applying some EQ and/or dynamic EQ), many of them have been adamant about the amount of dry signal. This perhaps stems from a misunderstanding of acoustics, although a composer using electronics should have such an understanding as we will see in the third chapter. Many artists also chose to be on the stage, even when only doing electronics, which makes them hear a completely different mix than what the audience will hear (because of acoustics, placement and so on). Because of the paramount importance of what the audience hears when playing mixed music, this author believes that the best place to monitor is at the sweet spot in the room (generally where the sound technician is). Current monitoring systems cannot give a good enough idea of how the music sounds where the audience is standing, especially if the music is at high volume. These are aspects we will discuss again in the latter half of the third chapter.

Ciciliani (2014) has codified the different ways of blending electroacoustics with an acoustic instrument and he has emerged with an axis between centripetal and centrifugal models. The former means that the performer is at the center of the attention, that he/she is quite visible and that there is a direct correlation between what the musician is playing and what one hears. The latter means “the performer functions as a controlling rather than enacting entity” (Ibid. p. 2) as well as there being little correlation between the performer's actions and what one can hear, the causation between both worlds is not there. In many ways this could actually be used as a compositional parameter such as shown in Aska (2015). This author would hypothesize that to most listeners the centrifugal model might inherently mean less of a blending between both types of sound sources.

As a final note on the blending of acoustics and electronics, it is important to remember that blending is not always the desired result. The relationship between both worlds must also be interesting, they must have a “poetic relationship” (Croft, 2007, p. 1). If the composition of the piece's different parts are not made in a well thought-out way that creates a dialogue of sorts, nothing within the world of acoustics or production can create a proper blend.

1.2.4 - Concluding Thoughts

Acoustics is a vast subject that this thesis cannot hope to completely cover. However, if there is only one thing that one should remember from this is that acoustics play a major role in music from performance to recording. An understanding of acoustical phenomenon can only empower a producer and/or composer to be able to make the right choices in sometimes stressful and difficult situations. The blending of acoustic and electroacoustic sources is definitely not easy, although not impossible. The difficulties of this field of music has sadly led several to believe that its best medium is only on recordings (Croft, 2007). In many ways the basics of acoustics such as covered throughout the chapter are what forms the basis for the producer/composer which is what I will discuss in the third and final chapter of Dionysian Theory.

Chapter III: The Producer/Composer

The producer and the composer have been traditionally seen as two contrasting forces that have different and specific processes and areas of influence. This had led both roles to be very specific and the people that have these roles must generally master radically different skill sets, or at least traditionally. In this third chapter we will look into the new role of the producer/composer which is not in itself something new, but a codification and understanding of the new paradigm that this hybrid role introduces has not been written about within the context of contemporary classical music. This author believes that an active understanding and practicing of this hybrid role can only lead to a better production both compositionally and sonically as well as further possibilities on how to combine acoustic and electro-acoustics.

The first section will define both roles traditionally so that the reader has a solid understanding on the skill sets and expectations of both roles. Afterwards we will explore what is the hybrid role of the producer/composer followed by a section detailing the advantages to this new paradigm. Afterwards a short historical section with examples of this hybrid role in practice, afterwards we will look at strategies to integrate electroacoustics in real time, followed by the use of spatialization as an example of the producer/composer.

1.3.1 - Defining Both Roles Historically

The composer is a role that everyone knows about clearly, or so they think. The general public has the view of the romantic (not to be confused with Romantic) composer towering over everything and churning his soul into his music which is rather far fetched. This view stems perhaps from Beethoven's status such as Ross (2014) explains. The general public views Ludwig van Beethoven as a composer battling the odds of his deafness and writing gold every time his ink pen touched manuscript. Reality though, is starkly different.

Beethoven did not only write greatness (“Wellington's Victory” (1813) and “Fidelio” (1805-1814) come to mind specifically) and his copious amount of note show that absolutely everything was painstakingly planned and worked out like Rosen (2005) points out. The truth is indeed closer to the latter, which is the stereotype of the post-war composers, described and explained in both Ross (2009) and Griffiths (2010). To put it plainly: the composer is an erudite on the subject of music who has extensively studied arranging, orchestration, harmony, counterpoint and that has as a main function to write new works of music. Being an erudite, and knowing your craft, what has

come before oneself is one of the aspects that differentiates the master from the apprentice. To give an example, writing the harmony Arvo Pärt's "Für Alina" (1976) could be easily done by a student as the harmony is very simple being mainly in B minor. However it was the conceptualization of the piece against its historic background as well as the start of Pärt's tintinnabuli system, which make it such a breakthrough and masterpiece. The way the piece is presented and paced makes a difference separating the wheat from the chaff.

The role of the producer, on the other hand is very nebulous and the general public has little knowledge about it. The role is so misunderstood that the BBC (2016) had an article trying to explain it for laymen. One of the main threads throughout the article which features small blurbs by producers within popular music, is that they are in many ways a facilitator that helps the artist form their vision. This doesn't seem to have been the case early on where the producer was only a liaison between the label and the production which was done by technicians which often had very little musical knowledge. The change of the music industry as something more artistic comes from around the 1940's as chronicled by Day (2002).

In Culshaw's account of recording Wagner's Ring Cycle (1967) he is described as having much more of a leader role, keeping everything running smoothly and looking over the technical as well as musical details. This fits in nicely with the way Manfred Eicher is portrayed working in Guyer's & Wiedmer's documentary film (2009) as well as by many of the artists he has worked with (Lake & Griffiths, 2007). One must not forget either the ideal that Eicher prepares the sessions with the artists before a single note is played so that the artistic direction is already set, and that he compares his role as a sculptor of sound as mentioned in the first chapter.

Another aspect of the producer role which becomes interesting in the context of the producer/composer is how the studio has been used as a tool. This is something that is perhaps not as usual or accepted within classical music but it is still present. Brian Eno (2007) is perhaps the first person to have formalized this thought in writing, and within a popular music context. The democratization of studio technology because of the digital revolution has only made the studio as an instrument a much more affordable and normal procedure. This practice also definitely has its place within art music, especially in mixed and acousmatic music where it is a normal procedure such as shown in the writings of Manoury (2012) and Saariaho (2013) among many others. And nonetheless, *musique concrète* (as defined by Battier, 2007) would have never happened if people like Pierre Schaeffer had never used the studio as a compositional tool.

1.3.2 - What is the producer/composer

Explained succinctly, the producer/composer is someone that understands and will use elements of what would traditionally be the producer's and also the composer's role. On a slightly more metaphysical level, the producer/composer can be described as someone that will master the idea of the written composition as well as the abstract composition. The abstract composition can be defined as the so-called finished product, how the composition should sound in reality or on recording. One could also expand this abstract composition concept as using ideas that are not related to the direct relationship with the notes (ie counterpoint and harmony) as something to use within a compositional framework. Charles Rosen (1995) has explained that composers in the Romantic period such as Schumann and Listz already started composing by the use of tone colour, but the producer/composer goes even further and on a more abstract level. To quote Tristan Murail, the producer/composer “works with sound and time” (Murail, 2005a, p. 137 & also explained in Murail, 2005b).

To look at it in a different way, the most basic way of writing and thinking about Western music is note against note which forms the basis of counterpoint and basic functional harmony which reached its apex with J.S. Bach's music. Afterwards one could say that the next aspect is the more abstract idea of the form and tension with release which was an important aspect of Viennese classicism (Rosen, 2005). The Romantics would then draw out the forms even more and create a stronger narrative (Rosen, 1995). Afterwards composers became much more about extra-musical elements such as serial rows and other organization techniques (Taruskin, 2009). The producer/composer will think of his or her compositions in the third person and how they should sound in a recording and/or room fully finished. This requires an additional skill set than the one the composer has to think of how instruments sound and how his/her harmony and counterpoint will pan out. Even when writing for acoustic ensembles the producer/composer tends to not only think of the traditional pillars of music such as rhythm, harmony and melody, but he also thinks in term of the spectromorphology (as defined in Smalley, 1997) of the sounds and the piece. Music is now not on an axis of notes/harmony into time, but of sound into time.

Additionally the producer/composer is savvy enough with technology to know how to use it and especially how it will influence the composition at hand. This can range from using technology in the actual composition such as computer assisted composition, to the way a composition should be recorded to have the proper aesthetics for the piece. This is an area in which traditional orchestral composers have traditionally been weaker. Philippe Manoury (2007) has elaborated on the fact that improvising performers in many different genres have a tendency to be more familiar with the

advantages of technology than the traditional classical composer. They have used technology to augment their own instrument and created a new form of dialogue for a longer period than classical composers. The producer/composer should be able to do the same, the main difference being that the performer can only have an idea of how something sounds to the audience, while the producer/composer should be sure of how it will sound for audience.

The producer/composer will also think like a traditional popular music producer: How do I make this sound this way? He/she knows how to get from A to B when it comes to getting the correct sound. This can vary from the use of specific microphones, gear, a room, a certain microphone technique, so on and so forth. Just like the traditional producer he/she is also in charge of getting the best takes out of the musicians as possible. The psychological aspects of the role of the producer is very important as notated music is still very vague. The notation of music only says what note, an approximate tempo, a playing technique and perhaps a dynamic marking but in reality it is incredibly open. This openness to the written note is also partially responsible for the richness of the concert repertoire as it is today. To give an example with conductors, a Beethoven symphony played by Herbert von Karajan is completely different than one played by for example Arthur Nikitsch. The producer/composer understands this and uses it to his or her advantage to get the sound he/she wishes. The possibilities of a player bringing his or her own adaptation should also be seen as a possibility. Working with a soloist can give valuable insight into how instrumentalists think which can only help not only the recording but the composing of new music.

To summarize, the producer/composer is someone that combines many aspects of both roles. He/she will use skills both from roles to attain the wanted sound whether it is as an engineer or composer. In many ways, it can be seen as a composer with an extra attention and sensitivity to sound in itself.

1.3.3 - Why Combine the Roles?

It may not seem evident as to why one person should tackle the challenges of both these roles. There are however many advantages which come down to the type of music one works with. This author believes that the recording of contemporary music, especially mixed music can largely benefit from this hybrid role. Although acoustic music can also benefit from this role as will be explained below.

The first advantage comes in already when one is composing a piece. A composer that does not have any experience within production and/or programming most probably will not write good

mixed or electronic music as he/she does not really fathom what is possible the same way that someone that has never written for a string orchestra most probably cannot do a perfect string orchestra arrangement. The exception is perhaps if the composer has worked extensively with other technicians. Earlier in history composers such as Pierre Boulez and Arne Nordheim have given the responsibility of working with the electronics to others. Although this can be a good idea, the peril of miscommunication and misunderstanding between the composer's will and the technician's creation can be too large. A composer is expected to learn how to write for strings for example, he/she should know which double stops are possible, if a phrase is possible to play, and so forth. Why is the composer not expected to be as knowledgeable about the electronics that he/she uses in a piece? There is often an attitude that electronics are easy to do and in many ways just consist of adding a microphone and a single machine to do for example processing. This seems counter-productive and disrespectful to both technicians and producers. Boulez (1987) was also one of the early proponents that the writing for electroacoustic music and electronics should be compared to and learned like an orchestral composer would do it. This author has even seen many times the person responsible for the electronics in the concert not even be mentioned with a single word in the program notes, although it is definitely written that there are electronics.

Secondly the use of computers to help with composition becomes possible. Because of the producer/composers knowledge of computers, it becomes possible to use a lot of new calculations and formal data to create form and even harmony. Grisey and Murail are perhaps the most well known composers doing this coming out of the spectralist movement in the 1970's in France. They would analyze certain acoustic phenomenons and organize their pieces (played only with acoustic instruments) around overtones for example forming an idea that music “is ultimately sound evolving in time” (Fineberg, 2000a, p.2). It is entirely possible to organize a composition by using acoustic (or timbral) processes to generate musical form. Calculations that would take Grisey and Murail hundreds of hours in the 70's could be, by the 80's, done in only a few hours. The harmonies in Saariaho's piece “Lichtbogen” (1986) was created by the analysis of different timbres in the IANA computer program (Kankaapä, 2011). Platforms for composers that use computers have become more common in the last few decades with examples such as Open Music (Agon, Assayag & Bresson, 1998) and the newer Orchids (Esling, 2014) both programmed at IRCAM in France. Understanding electronics can only give the producer/composer even more inspiration and ideas to explore within compositions.

The third advantage is that the same person is deeply involved within the composition and the electronics making it a more complete “product” that functions conceptually. This has been

(rightly so) described as very difficult by several composers including Philippe Manoury who has explained that technology often evolves too fast giving him not enough time to adapt (2012). However, he has also been one of the main defenders of electronics also claiming that composers must learn the ins and outs of electronics. The tradition has always been that the composer would write the work and an external person would come and do the electronics. This perhaps happened first with composer Pierre Boulez who wrote “Répons” (1980-84) while Giuseppe di Giugno worked with the 4X (Manoury, 2007). The external programmer might not grasp the compositional essence of the composer's work, which can definitely cause a schism between the idea and its realization. The producer/composer is able to compose and program himself, making sure that there is a certain flow between both worlds which can only help to create works where the electronics are not just a gimmick but an important element in the poetry of the composition.

The tradition of a composer working with one programmer (or more) seems to still be definitely alive in the IRCAM environment (Manoury, 2012). This is not to say that it is wrong, as this institute is perhaps one of the few meeting points where programmers are musicians as well, and can therefore form a symbiosis. In many ways working with a programmer can be a luxury. However, the producer/composer should be able to do a good part of it him/herself to assure the quality. Of course, sometimes everyone will need an extra helping hand. It is of extreme importance that there is a good flow between the idea and its execution, and adding extra people into the equation can be risky. In many ways, this is the same discourse as the rivalry between the “composers of writing” (such as Boulez, Stockhausen, etc) and the experimental composers incarnated by the Groupe de recherches musicales (GRM) and Pierre Schaeffer (Manoury, 2007). The former always accused the latter of being unable to write while the latter accused them of not being able to experiment. The producer/composer should assume both roles being able to write and experiment/program.

The fourth advantage has to do with recording. The importance of recordings is primordial for anyone wanting to come into the world of composition. There has been a certain amount of antagonism between the composer, musician and recording engineers/producers. As one classical musician and composer explained to this author, he was always scared that a recording engineer would not understand what he was trying to do, and therefore ruin his composition. Culshaw (1967) also names several conflicts he has had, or heard of during all his years as a classical music producer. As we have also seen in the first chapter, recordings can have many different aesthetics. The choice of putting a microphone at a certain place and not another is an aesthetic choice which can deeply affect the listener's impression of any composition even if it is only with acoustic

instruments. There has been much written about the aesthetics of performance within art music, but there seems to be little written about the aesthetics of their recordings although clearly of primordial importance. The producer/composer will use the aesthetics that fit with his/her own compositions as to make it follow the poetics of the piece at hand. A very intimate piano piece recorded in a very large hall with microphones far from the piano would not fit the composition's aesthetics. This is one of the aspects that many of the artists that have worked with ECM's Manfred Eicher comment about explaining that his recording techniques and ideas are unique for each artist and piece to suit it (Guyer & Wiedmer, 2009). In other words there is no specific way of solving a problem that will work with absolutely every piece of music. The producer/composer is an eternal student that will always work towards finding new solutions for his/her current musical problems.

Many of these ideas and concepts are relatively old, but it is truly the time that we now see this as a new compositional paradigm and hybrid role. Thinking of composition as sound, which is the most important aspect of the producer/composer (whether he/she is recording or composing) is an idea that was already explored in the 1950s with the *musique concrète* movement. Although this way of thought has become normal within acousmatic music circles, it is nigh time that it be brought to contemporary music in general. The second part of this document called Apollonian Composition features many examples where the role of the producer/composer is at the center of creation from composition to recording and mixing.

1.3.3 - Approaches to Mixed Music with the Hybrid Role

The idea of what is “mixed music” has varied in time and space, and it is therefore important to define both aspects before we go on. Frengel (2010) and Tremblay & McLaughlin (2009) both define mixed music from the French definition meaning the mix of a live performer that is playing an acoustic instrument with “a non-live component projected through loudspeakers” (Frengel, 2010, p. 1) which can either be reactive or fixed. When the electronics are done by someone in real time, the term “live electronics” is often used such as discussed in Croft (2007)

This isn't the place to go through the history of mixed music, and to that end books by Katz (2010), Holmes (2008), Ross (2009), Griffiths (2010) and Taruskin (2009) give a good overview of the timeline from the early 20th century to the 80's. It is perhaps important to name that the evolution of technology and how it was used for mixed music has been tightly connected. An example of this can be seen as the difficulty of doing anything with electronics before the propagation of tape after the Second World War. Before that very few did experiments although composers such as Hindemith, Milhaud, Respighi and Varèse had already used a fixed media (the gramophone in this

case) as the basis of a composition (Griffiths, 2010, Katz, 2010 & Ross, 2009).

What is more interesting and important in the context of the producer/composer is the arrival of live processing and the combination of acoustic instruments and electronics which can be in many ways traced to Karlheinz Stockhausen. Before his groundbreaking pieces such as “Gesang der Jünglinge” (1955-56) the art music world was often separated into two camps. On the one side the French tradition established by Schaeffer and centered around the GRM and the more electronic based works of the Cologne area called elektronische musik. The French tradition was much more rooted in studio improvisation (Griffiths, 2010) perhaps as a reaction to the total serialization of the likes of Boulez and Messiaen. Although Stockhausen was not the first to combine acoustic and electronic sounds (Cage, and Maderna amongst others had already explored the medium) he definitely brought it to the fore and it became something that is much more normal and accepted afterwards. It is also of a fundamental importance to understand that the prominence of electronic music in the post-war generation probably has a lot to do with how most of the composers worked for broadcasting organizations (Ibid).

After the first post-war generation as technology became better, there were many more possibilities. In this section we will go through several of the more popular and traditional methods to work in mixed music, and explain how they relate to the producer/composer role.

Montague (1992) asserts that at the start most composers wished to combined the performance tradition of the 18th and 19th century with the idea of the studio composition which arose from musique concrète in France. This author sees this view as problematic as it is quite clear that composers such as Cage in “Imaginary Landscape No. 1” (1939) were moving far away from the performance practices of the last few centuries and the same can be said of Varèse's “Désert” (1950-54). Montague (Ibid.) goes further and classifies the use of live electronics into four different categories:

1. Pre-recorded electronic material which is played live by a performer
2. Pre-recorded electronic material, and the acoustic and electronic parts are played alternatively, not together.
3. The pre-recorded material does not necessarily coincide perfectly with the live performed material
4. The live performers must follow the pre-recorded material precisely.

These four categories seem rather archaic and in many ways do not represent the full extent of possibilities at the time, and even less today. Montague completely ignores the possibility of processing a sound with for example a ring modulator in real-time. Instead, this author proposes these broad categories which will be explained in turn:

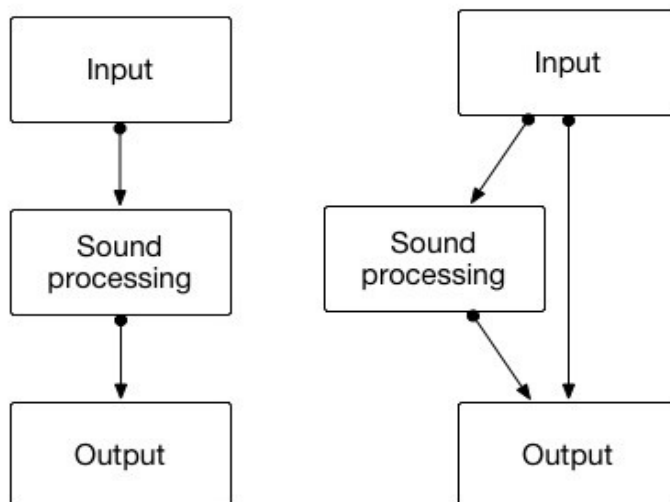
1. Live processing
2. Fixed media playback
3. An acousmatic approach

It is important to note that although only three categories are listed, there are many permutations of each of them, and it is possible to combine all of them together in the same piece.

1.3.3.1 - Live Processing

In its most simple iteration live processing is when the sound of something is sent through a type of process which changes the sound in any way. Perhaps the most common version of this is miking up an acoustic instrument and then sending it through some effects such as demonstrated in the following diagram:

Figure 1.3.1 – Two examples of simple live electronics. In the example to the left, the sound is completely processed while in the example to the right there is a possibility of doing a wet/dry mix with the processing.



Croft (2007) separates further this category into the paradigms of backdrop, environmental

and instrumental, which is quite similar to Frengel's (2010) functional axis. Both authors make a main separation between processing which makes a sound become a background or environment (such as using convolution to make an instrument sound like water) and the idea of the extension of an already existing instrument. Frengel defines extension as “the fusion of live and on-live sources into a unified sound complex. They are always monomorphological, with components merging into a single, musically inseparable identity.” (2010, p. 100) He goes on further with the possibilities of accentuation, addition, transformation and aggregation of the instrument. The important aspect here is to define the role that the electronics can play within a set piece. There are many different possibilities where the electronics can be dominant or subdominant to the acoustic instrument present, and the amount of place the electronics can take.

A good example of live processing is the piece “Lichtbogen” (1986) by Kaija Saariaho which is analyzed with the idea of gesture transformation by O'Callaghan & Eigenfeldt (2010). Saariaho's use of electronics accentuate the movement of the ensemble, and although there is a delay (which is called saturation in her MaxMSP patch) which adds a certain amount of material to the ensemble, the feeling is always that the acoustic instruments are the dominant force in the piece while the electronics add an extra spice to the orchestration.

Although live processing may seem to be simple and/or limited in scope, there are endless possibilities. Even though the idea of processing an acoustic instrument would intrinsically make the relationship tilt towards the importance of the acoustic sources, methods of production and recording today can allow the producer/composer to tilt the balance in any way he or she chooses. The possibility of mangling an instrument until it is not recognizable is a possibility that has been used by several composers, myself included. Live processing's true beauty lies in how the concept is simple and can be combined with many other compositional parameters to create a complex ecosystem that creates something unique.

1.3.3.2 - Fixed Media Playback

This is perhaps the oldest form electronics in music, dating back to the between war era with composers like Ernst Toch, Paul Hindemith and Ottorino Respighi (Katz, 2010 & Ross, 2008). Fixed media playback means that while musicians are playing on acoustic instruments, there is a certain form of media playing. In the early days this was vinyl, although it was incredibly difficult. After the Second World War, the introduction of tape to most of the world made this idea easier to execute. Arne Nordheim's “Epitaffio” (1963) is a good example of a fixed media playback as the orchestra plays, as a tape is also played throughout the piece.

The main problem with this method is the synchronization of the live performers and the fixed media (as will be explored later in section 1.3.4). Even when a composer like Nordheim writes out the tape part in the notation, there is always a possibility of sync problems between the human entities and fixed media to not be together. At the time of tape this was also difficult to fix then and there. As mentioned by Croft (2007), it is now possible to break down sections into smaller samples making it easier to play in sync, however this also removes the idea of the “live” performance as it still is mainly a recording and someone following it.

1.3.3.3 - An Acousmatic Approach

The acousmatic approach can be described as hailing back to the early days of musique concrète in the way that there is no traditional performer on the stage, if there is a performer at all. The acousmatic approach means that the piece is played from a fixed media such as most early electroacoustic pieces, although it is possible to do for example sound diffusion in real-time adding an element of performance as discussed in Normandeau (2002) and Harrison (1998).

Another approach that seems to be rather popular recently is the idea of the hyper-production such as done at the University of West London (for example, Zagorski-Thomas & Bourbon's “La cathédrale engloutie” (2016)). The concept here is to take an already written piece of music, in the example here, being Claude Debussy's “La cathédrale engloutie” (1910) which is part of his book of preludes as a springboard to edit the composition differently, use signal processing and so forth (therefore a combination of some of the different approaches mentioned earlier) and then presenting it as an acousmatic work such as seen by producers informed by today's musical culture (University of West London, 2016). Is this being truthful and sensitive to the original piece? The producer/composer should be sensitive to aspects of both production and composition, while in this example, the tables definitely favor the aspect of the producer giving at best a new interpretation of superficial aspects of the composition used as a springboard. This is perhaps a good example of the producer side taking the upper hand over the composer side. And last but not least, how artistically relevant and groundbreaking is it to be limited to someone else's compositions? Does the listener really gain a new and interesting view on the works of the repertoire?

It is important to remember that these categories are not exclusive. It is completely possible to have fixed media and live processing of an instrument. It is also possible to do live processing over a piece of acousmatic music. The possibilities are basically endless which is part of why mixed

music is such an interesting domain as the only limits are truly one's imagination and programming skills.

1.3.4 - Strategies for Real-Time Implementation of Electronics

In this section we'll look at real-time implementation strategies of the methods named section 1.3.3 such as live electronics, fixed media playback and the acousmatic approach. The reason that real-time is important is so that the electronics become another instrument, another member of the ensemble in many ways. We have seen some methods in the previous section such as fixed media playback and live processing, however in this section we will delve into the subject not of the different possibilities of electronics, but of the advantages of disadvantages of using them in certain ways.

The main disadvantage of a fixed media playback when used in a real-time situation such as a concert is the synchronization between the electronics and the live musicians. If the fixed media is only in one piece, such as a tape for example in Nordheim's "Epitaffio" (1963), if the sync is lost, the piece is doomed. One of the possible solutions then is having the musicians play to a click track which tends to give a rather square performance within contemporary music. In this author's experience, few classical musicians appreciate playing with a metronome. Another solution is inserting a musical click track in the fixed media. For example a loop, or anything that may give rhythmic cues to the musicians. Although this can work in certain situations, it ties the composer's hands as to what the fixed media must include and it might not work for every type of composition. Not to mention that if the fixed media is not somehow re-arranged in the hall, and is completely finished, it might not suit the room it is played in or the PA system.

Contrarily to Emmerson (2007), Croft (2007) frowns upon a static playback saying that it is not a truly "live" experience. Although I agree with Croft, I also believe that combining static playback with other live electronics can be a solution that is still very much "live". The main aspect of a live performance, to this author at least, is the fact that no performance will be the same when it comes to the electronics (and by default anything played by a human). The possibility of these differences is in many ways an extension of how an instrumental musician would for example interpret a sonata by Beethoven. Daniel Barenboim and Paul Lewis have played many of the same Beethoven pieces, but they sound different; this is the richness of the Classical cannon. The implementation of electronics in contemporary music should be done in a way that interpretation and differences are a welcome addition to achieve our own form of interpretation into a new cannon of music. This is why this author tends to avoid using only fixed media. For example, the

composition “Suspended Mirrors” (discussed in section 2.4) has certain elements of fixed media by using a few single note samples, but it is still controlled by score following and also live electronics.

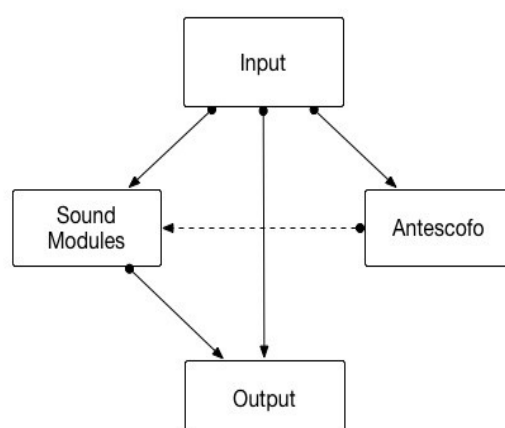
The second strategy is having one person doing all of the electronics in real-time, for example live processing. This is definitely a good solution that can work for many compositions. However, it is vital that the person doing all of the electronics is not on the stage. In the last few years, this author has been surprised by the amount of musicians that want to do the processing while on stage yet it is far from being optimal. The monitoring between the stage and where the public is sitting or standing is completely different, and one should be able to hear the same sound as the public when working with electroacoustic music. It is of primordial importance that one has very good monitoring and at this point, this author does not believe there is a way to circumvent this. The ideal place to be is right where the in-house technician is (if there is one) as that is most probably the most neutral listening position in the concert hall. This allows the person doing the electronics to truly listen to what is going on, as well as have good contact with the technician which can be useful if something goes wrong. However, this author also understands that if the technician will also be playing an instrument him/herself or that there must be a tightness in synchronization between both which cannot be attained from a distance, then a compromise must be made.

Having one person being responsible for the electronics is a method which is still widely used even by well known composers such as Kaija Saariaho. When this author did two concerts with her during the Trondheim Chamber Music Festival in 2014 this was the method used. The processing was done on a computer with MaxMSP patches although clearly original done with hardware units such as written into the notation of “Lichtbogen” (1986). Saariaho had devised a system in which either the person responsible for the electronics or a musician would use a MIDI piano sustain pedal to trigger different “scenes” which would help along for what the settings of the different modules in the MaxMSP patches should be. This was one of the early methods used in some of the author's own compositions such as described in section 2.1 & 2.2.

The final method is score-following, meaning a computer that listens to what is being played and then reacts to it according to a set score. Puckette & Lippe (1992) mention that that the first time this idea was presented was at the 1984 ICMC by Barry Vercoe and Roger Dannenburg and had become an important research field at the IRCAM in France. This has definitely become a field of interest in that environment as can be seen from Philippe Manoury's different compositions and work relationships with different teams to have a score follower (also discussed in Manoury, 2012).

In 2007, Arshia Cont would start working on a new system which would then be called Antescofo and can be used as a module within MaxMSP. One of the main principles of this module is that unlike most programming languages, lines one after another will be synchronous with each other instead of being iterative which can allow the composer certain freedoms (Cont, 2012). Another important aspect of Antescofo is that it can anticipate notes and events allowing for a tighter synchronization than most other methods, although how this is achieved is beyond the scope of this thesis (more information can be read and watched from Cont, 2008 and IRCAM, 2011). Antescofo has become used by many different composers around the world and features many different possibilities for non-linear compositions as well. In its most simple form, a composition with Antescofo would look like this:

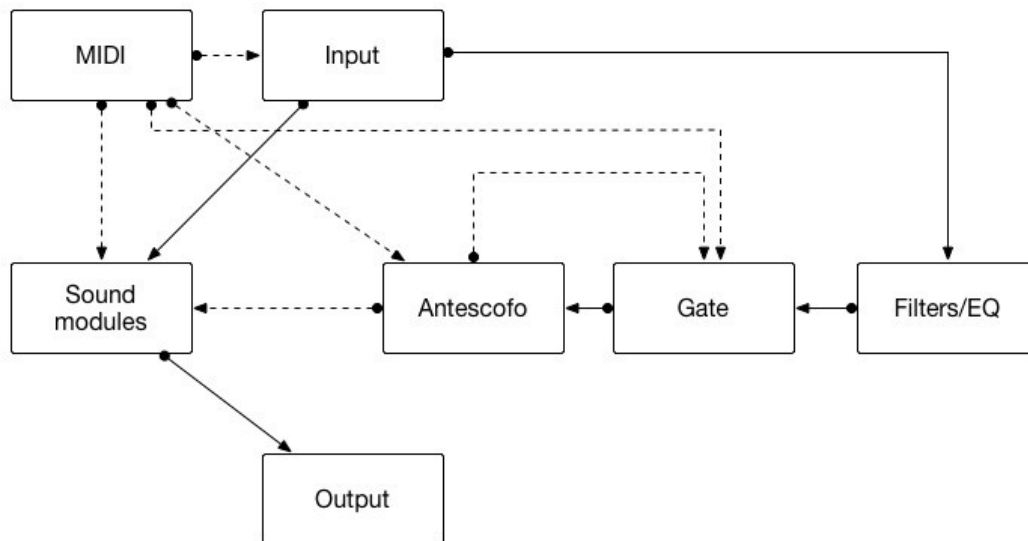
Figure 1.3.2 – A basic example of using Antescofo. The input sound is sent to Antescofo and the sound modules as well as the output. Antescofo can then affect certain parameters and variables of the sound module.



What the sound modules are is irrelevant and can range from reverb to distortion to anything one can think of. The point is that many different parameters can be altered in real-time as a reaction to what the musician is playing on the stage. A combination of Antescofo and live electronics is to this author the most viable solution to the use of real-time electronics in this context for several reasons. Firstly, the use of Antescofo creates a basic template of values at different points in the composition, as it can often be daunting to read notation, do live electronics and listen at the same time. It helps free the technician to be more creative and have a better flow (a problem

that this author also had before, as described in section 2.2.2 & 2.2.3). Secondly, with a human present also changing parameters we can definitely have an interpretation of a composition as discussed earlier in this section. It is doubtful that the whole point of Antescofo was to replace a human doing the electronics, it is a supplementary tool that streamlines the whole process. Thirdly, since it is a module inside MaxMSP, it can be used very freely. A composer is free to create remote surrogacies (as defined in Smalley, 1996) and have a way to combine them with proper sync in the piece. For example, Philippe Manoury's MaxMSP and Antescofo patches for “Partita I” (2006) uses Antescofo only to trace where one is in the score. Everything related to variables and parameters can be handled natively in MaxMSP. After examining several of Manoury's patches as well as discussing with several other composers on the Antescofo forum, this author has come to a specific set-up within MaxMSP that is solid and allows quite a bit of leeway for interpretation as can be seen here:

Figure 1.3.3 – An example of a slightly more complex use of Antescofo as this author tends to use it



In this author's experience, filtering can be necessary to make Antescofo properly detect the played pitch every time. Sometimes it can just be filtering away anything under the instruments lowest note. The module will use both pitch detection and temporal cues to know and anticipate what is going on therefore reducing the possibility of mistakes. The gate is used to filter away any extra noise that may come from the concert hall. It can also be used in improvisation sections by freezing Antescofo while the musician is improvising, only to be resumed by a physical or sound cue which is then triggered by the technician. In a situation with Antescofo, the way the performer

is placed compared to the PA is incredibly important and the research of Tremblay & McLaughlin (2009) as mentioned earlier. A MIDI controller can then be used to additionally affect parameter values over what Antescofo has set to make it more site-specific as well as tailored to that single performance (and therefore become an interpretation as mentioned earlier]. Additionally many people – this author included – prefer having some tactile interface to work with during a performance instead of just using a keyboard and mouse.

To conclude, there are three different synchronization techniques that can be used between acoustic and electroacoustic sound sources within notated compositions. The most recent and perhaps most sophisticated method is the score follower such as Antescofo. This new technology does not render fixed media playback and live electronics obsolete, in many ways it only helps to augment the synchronization between the performance and the electronics in any way the producer/composer wishes. As Cont says himself (2012) Antescofo can allow electronics to gain the richness of instrumental writing and interpretation. As you will see in the Apollonian Compositions section of this thesis, this author has used all three of these methods oftentimes in the exact same composition such as “Studie II” (in section 2.2).

1.3.5 - Spatialization as a Compositional Parameter

Space has been an important aspect of musical performance and style such as explored in Howard & Moretti (2009). However, as Ouzounian (2007) notes, it became a central compositional parameter after the Second World War especially with the arrival of musique concrète. But what is space? Smalley (1996, p. 91) describes it as:

“A musical space is not empty and cannot be separated from its sounding content. Thus it is the relational structure of spatial content, the connectedness of space, which is important.”

Chion (1988) rightly states that from then on there were two types of space in electroacoustic and/or acousmatic music: the space in the composition and the space of the concert hall in which the piece is played. Other scholars such as Smalley (2007), Harley (1994), Henriksen (2002) and Lossius (2007) have discussed space within contemporary and electroacoustic music at length. In other words, space has become a new compositional parameter which has been extensively used especially since the rise of cheaper home electronics such as the laptop and MaxMSP as it makes it much easier to use this parameter. This also historically ties in nicely with the will of composers such as Boulez (1987) and Saariaho (1987) who wished to distance themselves from traditional compositional parameters.

Barrett (2002) defines four areas in which space can be used as a compositional parameter:

1. *“Illusion of a space or a spatial location of an object*
2. *Allusion to a space or a spatial location of an object*
3. *Simulation of three-dimensional (3D) sound field*
4. *Spatial possibilities contingent upon temporal development”* (p. 314)

And she explains further how to develop these different methods. The use of digital technology allows a producer/composer to quickly change many spatial aspects of composition through the use of for example reverb, panning, changing depth, etc. These are all valuable tools that should be used carefully as an extra compositional parameter. It is important to note that many spatial techniques described in articles such as Barrett (2002, 2010), Smalley (1997, 2007) and Henriksen (2002) are meant for the world of acousmatic music where there is no traditional performer within the room. However, many of these techniques can still be used although they can quickly create a dissonance between the physical space the performer is in, and the one the audience hears although this could once again be used as a musical gesture in itself. For example, in my composition “Studie II” there is a spectral delay at different points (explained in section 2.2.2). It is physically impossible that the performer's cello could create such a sound, however as there is a clear physical gesture connected to what the audience hears it is accepted. In effect, the spectral delay helps “smear” the sound around the stereo image and therefore working with spatial aspects as a compositional gesture.

There have been many tools to work with space ranging from simulation of sound-fields and reverbs. The democratization of technology since the late 90's has also made it possible for most of us to be able to afford these tools. Since there has not been any standardization of formats and software, there exist many possibilities which are sadly not always compatible with each other such as explored in Pottier (2012). This author has come to use the IRCAM-supported SPAT system which is based on Jot's (1992) research. Much like Antescofo, it can be used inside MaxMSP making it very useful and easy to use with many different modules. The SPAT modules can be used to do everything from panning, to creating a room as well encoding/decoding signals for many different types of panning including 3D panning with ambisonics.

Because of its availability within an open world such as MaxMSP, it is possible to link parameters to anything one wishes, therefore opening up new compositional possibilities. For example, it would be possible to map the panning and spatial placement of a sound source depending on what note it plays, or where it is in the frequency spectrum. One can have completely

different rooms for different sound sources as well as change these in real-time. In many ways creating a spatial gesture such as described in Barrett (2015) which also incidentally brings the music closer to the centripetal model of Ciciliani (2014). This is a rather new phenomenon and it will most probably develop into a fully fledged compositional language in its own right in the near future.

1.3.6 - Final Thoughts

To this author, the producer/composer plays a central role in contemporary music as he/she truly signals the emancipation of many of the paradigms of both roles. He/she works in sound and time much more than just within traditional notation. This opens up a new world not only within interpretation but for the composition of new works, as well as the production and recording of new and older works. Even without the use of electronics, the new hybrid role shows a new way to think about compositional techniques, and sound in general. When one then adds the aspect of electronics, the possibilities become endless. There are of course certain difficulties such as sync between electronics and a physical performer. However this author would also dare say that these difficulties, new possibilities and the new tools are what makes mixed music one of the most exciting areas of contemporary music. When cheaper digital technology finally arrived in the late 80's and early 90's, electroacoustic composers were raving and claiming they could now do anything and were much freer than their more traditional acoustic peers. However, I would suggest that they were indeed wrong and that the most emancipated place is indeed between both, reaping the benefits and difficulties of both.

Many of the composers that have pioneered this way of thinking seem to do less and less programming themselves (such as Manoury and Saariaho) and this is understandable as things between the 90's and today have changed at an incredible pace perhaps even the fastest in the history of mankind. The new generations of composers and producers born in the late 80's and early 90's have however grown up with this technology. Therefore, the hybrid role of the producer/composer already is becoming more commonplace and will become the standard. This author believes that this is the new music of our generation.

Part II: Apollonian Compositions



This second part presents seven compositions by this author as well as a pre-composed piece as examples of the work of a producer/composer in different ways with music ranging from mixed music to acoustic music. This portfolio will describe my own exploration into the advantages and the new paradigm of the producer/composer role. Several of these compositions have been modified with time, or their programming has been drastically changed in which case I try to explain the changes between the different versions. The compositions will be presented in the following order in the text as well as on the DVD with this project. A full listing of the DVD's content can be found in Appendix A. Notation for every piece described here except Alexander Scriabin's piece is also included in Appendix C.

- 2.1 - Studie I: Dissolving Time – Solo piano & electronics
- 2.2 - Studie II: Nyctalope – Solo cello & electronics
- 2.3 - Studie III: S'effondre – Solo cello & electronics
- 2.4 - Suspended Mirrors – Solo oboe & electronics (8 channels)
- 2.5 - Solace – Mixed choir & electronics (8 channels)
- 2.6 - In Sleep – Solo piano
- 2.7 - Entre les nephilim et les gargouilles – Solo piano
- 2.8 - Alexander Scriabin's Sonata-Fantasy No. 2, Op. 19 Mvt 1 – Solo piano

The first three compositions form a series called “Studie” which as its name implies is a series based on research and to try out new creative aspects which are explained in their respective sections. These pieces are for a soloist with electronics. “Suspended Mirrors” and “Solace” are both slightly larger works which set some of the practices I've learned from the Studie in a larger form context, with many more musicians in the case of “Solace”. There are also two acoustic pieces for solo piano called “In Sleep” and “Entre les nephilim et les gargouilles” to show a different aspect of the hybrid role. Additionally, a composition by Scriabin was included as an example of how the producer/composer works while recording music that is not his/her own. This section should be taken as a pool of examples of how a producer/composer works with different instruments and compositional ideas, and they represent the result (and trials) of my research over the last two years.

Most of these compositions use several different techniques to use electronics such as covered in the third chapter of *Dionysian Theory*. Most of my compositions are also closer to the centripetal model (Ciciliani, 2014) meaning that there is a clear relationship between the performer

and the sound that comes out. There is a predominance of mixed music as it is my personal favorite type of contemporary music, and I do believe it shows many different sides of the producer/composer hybrid role. Mixed music is in many ways the greatest challenge within contemporary music because of how it assumes the problems of electronic music as well as those from acoustic music. The blending of both sound worlds such as explained in section 1.2.3 also make it a difficult genre within contemporary music.

All of the compositions were recorded, mixed and mastered by myself. All compositions except “Suspended Mirrors” were recorded at NTNU, often times in the Kammersalen which is a small hall used for chamber music. Because of its parallel walls flutter echoes can be a problem and the hall has a relatively long reverb time considering its size. Another problem with this hall is that it shares a common wall with the smaller commercial concert hall of Olavshallen (one of Norway's biggest commercial concert halls). Even though there is sound isolation between both halls, acoustic bleeding can be a serious issue. However, I still chose to use Kammersalen as it is the best hall in NTNU with a decent acoustic piano, even compared to the several studios around the campus. Most of the time close micing was used either way to have a better control of the aesthetics of the production afterwards, much as Manfred Eicher and Jan Erik Kongshaug would do. Every record has also been time aligned as explained in chapter two unless noted otherwise. If a piece has live electronics they were done with MaxMSP, the signal processing is also time aligned in the recording as there is by definition a slight delay inserted by any sound processing. It is safe to assume that for every module I have inserted some form of EQ or EQ-ed the electronics separately. Additionally there is sometimes some extra compression and/or recording busses between MaxMSP and my main DAW. For the sake for making everything understandable, these will not be discussed or shown in the diagrams for each composition.

“Music is purely an art of time, and the musician – with or without the composer – builds and regulates the experience of the speed of time passing. Time becomes matter in music; therefore composing is exploring time as matter in all its forms: regular, irregular. Composing is capturing time and giving it a form.” (Kaija Saariaho, 2000 quoted in Rofe, 2011).

“Musical composition is to bring into co.being elements paradoxical by nature, to bring into one situation elements that can be and ought to be agreed upon, that is Law elements – together with elements that cannot and ought not to be agreed upon – that is, Freedom elements – these two ornamented by other elements, which may lend support to one or the other of the two fundamental and opposed elements, the whole forming thereby an organic entity.” (John Cage, quoted in Griffiths, 2010. p. 23)

2.1 - Studie I: Dissolving Time

2.1.1 - Concept & Composition

This piano composition is based on four different concepts which use several basic points of the producer/composer in how the composition is inherently connected to the electronics. The first concept was using overtones on a single note to form a scale. When I wrote this piece, I had just started reading on spectralism as defined by Fineberg (2000b) and I therefore set off to try it out. Unlike Grisey and Murail, I did not analyze acoustic phenomena. I looked at the overtones of an A440, made a scale derived from them and then I note possible non-harmonic notes to use. The composition also progresses in that over time I've added more notes that do not exactly fit in the overtone series of A440.

The second concept in the piece is the use of other musical parameters to organize the structure of the piece instead of just harmony and especially functional harmony. Boulez (1987), Jodblowski (2006) and Saariaho (2013) have written extensively about this. There is no functional harmony because of the use of the overtones which forced me to use other means of tension and release to structure the piece. This varies from using notes that don't completely fit in the overtones to having quicker or slower changes in what is done in the electronics.

The third concept is the idea of perceptual feedback. I wanted the musician to react to what the electronics are doing, at the same time as the electronics would react to what the musician is played. The musician is going to play the score reacting to the electronics coming out (of the previous section in the piece). The electronics in many ways provide the background for the pianist, weaving a harmonic tapestry that he/she plays over. Everything that the pianist plays will then be a part of the electronics.

The fourth and final concept is having macro and micro structures in the piece which is heavily inspired by the writings of Roads (2004). The macro structure is the actual composition while the micro are the recorded buffers which are played back at a much slower speed. What was interesting about these recordings is also how different an instrument like the piano sounds when it is slowed down over ten times times with a sampling rate of 44.1 kHz. A vibrating piano string can start almost sounding like a violin playing a very slow glissando. The textures that come out of it are incredibly interesting and they give another dimension to the solo instrument. The idea was to make the listener more aware of all the different components of a piano's sound, instead of thinking of it as “the sound from a piano”.

This piece is perhaps the one I have written which is closest to the centrifugal model (Cicialiani, 2014) meaning that the relationship between what is played and what is heard might not be heard at first. However, for the listener that is more curious and attentive the reaction between what is played and heard gives in an added depth. This is perhaps also one of the piece's strengths as it also lets the audience just listen and be transported to another world (or at least that is the aesthetic goal), the same way that I feel while listening to Harold Budd, Daniel Lanois and Brian Eno's "The Pearl" (1984). Both are relatively easy piano peaces with calm and sprawling electronics in the background which hopefully bring the listener to another world.

2.1.2 - The MaxMSP components

Programming the piece was definitely one of the bigger challenges with this composition. At this point I had done a static playback and a bit of live processing, but this was in many ways more difficult and involved that what I had done before in my bachelor compositions which was very simple live electronics with a static playback. Since the piece was arranged clearly as having part one, two, three, etc I decided to adopt the system that Kaija Saariaho uses in pieces like "Lichtbogen" (1987) and "NoaNoa" (1992) which are two pieces that I've helped form live with the composer present. She uses so-called "scenes" which are moments where certain parameters have to change. These are triggered by the musician himself/herself with the use of a MIDI piano sustain pedal.

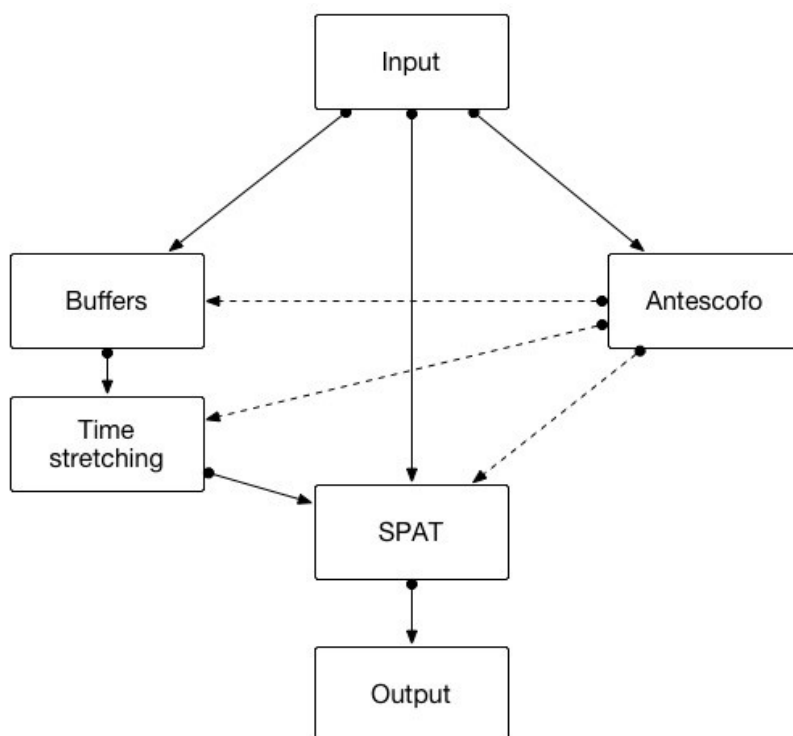
This system works relatively well but there were often large time differences between when the pianist would push the pedal and play the next section which also added extra silence in the buffers that were going to be stretched. It had often happened in rehearsals and sometimes in concerts that the pianist had pushed the pedal too many or too few times. As I am already busy mixing out everything sounds on the PA, it becomes a bit much to monitor, and even if there is a mistake, it became complicated to "rewind" with this system. In early 2016 I started switching the composition over to Antescofo which makes it much more stable.

The rest of the patch is rather straightforward. Once the musician starts a new system a buffer is either recorded or played or both later on in the piece. When a buffer is not being used, it is then cleared to be ready for the next time it has to be recorded. Everything is then sent to SPAT which is here used mainly as a reverb tool which also helps blend the acoustic instrument better with the electronics.

The piano is either recorded in stereo or in mono. I prefer stereo as it makes each speaker

have a bigger decorrelation which sounds better, but I created a mono version which works better for upright pianos and/or if there is very little time for a soundcheck as well as using less CPU if it has to be done on an older computer. The signal chain of the final version looks like this:

Figure 2.1.1 – The schematics of the Max patch for “Studie I”



2.1.3 - First Concert: Blank Vol. 1 April 2015

For this concert the piece was played by Øystein Hansen Marker and it was part of a 1:30 hour concert with only new contemporary music written by students of NTNU which I had organized. The concert was in the Orgelsalen which is a small room with a rather high ceiling and it has a long reverb time. The extra reverb in the room helped blend the electronics with the acoustic piano as well. The PA system was placed slightly in front of the piano, and at a wider angle such as proposed by (Tremblay & McLaughlin, 2009).

Sadly, my computer had a complete crash close to the end of the composition (as can be

heard by the sudden drop in volume and electronics in the recording). However, it is interesting to note that once the electronics weren't there, the piece did not sound complete at all. The notes by themselves had very little meaning and needed the electronics. This is a sign that the electronics in “Studie I” are inherently needed within the composition, and that therefore that I had reached my goal as a producer/composer for this composition.

Recording of the concert for documentation purposes is included on the second DVD as explained in Appendix A. Played by Øystein Hansen Marker, recorded with two DPA4009 microphones about 7 meters further away in the room. The microphones in the piano were AKG C414s rather close to the strings.

2.1.4 - First Recording: April 2015

The first recording was also done with Øystein Hansen Marker as soon as I had my laptop fixed after the first concert. I recorded the piece in Orgelsalen just like the concert. The session was plagued by the sound of traffic of a Friday evening, as well as other students always come up to check if we were finished recorded so that they could use the room.

Thinking of having more control, I also did not install a PA system in the room, leaving the electronics on headphones for Øystein to listen to. Although this gave me much more freedom in the post-production, it felt a bit more difficult to blend the two worlds. I could play much more with reverbs and how things are together, but they never completely gelled together.

I used the electronics from several different takes that we had done and cross-faded them together as if they were parts of the takes. Although this is “performance correct”, it didn't feel like it helped the whole performance once it was edited. The session in general was not the best, and therefore could not give a perfect recording either way.

2.1.5 - Second Concert: DaFX Lunch Concert, December 2015

The second concert was at the start of December close to the cantina in the Realfagbygget of Gløshaugen for the DaFX conference and it was played by the classical pianist Maren Barlien. Because of the location, we had to use an upright piano, so I had reprogrammed everything to work in mono with only one microphone (a DPA4006). The biggest challenge for this concert was for Maren to understand the music. She has never had any contact with contemporary music before, her education and interests stopping around Schoenberg. We had one rehearsal about two days before

the concert, and at first she was at a complete loss as to how to play the piece, clearly feeling uncomfortable that she had to react to electronics, as well as the unusual harmonic structure. Most of the rehearsal was spent talking together, and after playing the piece one last time, I could see she understood it, and at the end she just said “Now I understand, I actually need to really listen to the electronics and react to them.” For her, reacting to something else happening seemed completely alien, and she explained how it was never part of what they were taught in the classical section of NTNU.

Right before the concert, we had the chance to rehearse for about fifteen minutes. The cantina of the Realfagbygget is a very noisy area, but the piece worked perfectly. The PA formed a small equidistant triangle in front of the upright piano. The electronics sounded very full, and at several points sounded like a violin glissando. I believe that this happens when she hits some of the keys a bit harder and the microphone picks up the strings' vibrations. The blending between the electronics and the upright piano worked fine during the rehearsal.

2.1.6 - Second Recording

The second recording was done with Maren Barlien, in NTNU's Kammersalen in April. The piano was miced up with an spaced pair of Ehrlund EHR-M microphones, as well as the Røde NT4 which is in XY. Both microphones were placed inside the grand piano, although the Ehrlund microphones were slightly more distant to get less of the hammers for the actual production. The Røde NT4 was placed closer and had more of the piano's hammer sounds which I find pleasant to hear with the electronics. Additionally a Soundfield microphone was placed about 1.5 meters from the piano to get a slightly wider stereo picture that I could mix in. With the use of the packaged software called SurroundZone2 (n.d.), I was able to synthesize the different capsules in the microphone to be like an ORTF cardoid pair towards the piano, therefore cutting out more room sound as the Kammersalen does not have the best acoustics.

Picture 2.1.1 – The positioning of the microphones for the second recording of Studie I. A Soundfield microphone 1.5 meters from the piano, while there are two Ehrlund EHR-M relatively close to the strings, and a Røde NT4 even closer.



To help with the room's acoustics I paced acoustic panels around the room as well as several music stands to help with diffraction as the room suffers from severe flutter echoes especially towards the edge of the stage where the seats start. With a few acoustic panels to spare, I put them around the Soundfield microphone to minimize reflections at the back of the microphone. I also moved the drapes on the side of the room to have surfaces that would absorb more of the sound as well. These measures together helped the room be a bit more dry, but it is still far from being an optimal room.

The recording went well and Maren reacted to the electronics which were done in real-time. Although I had recorded all of the electronics from the session, after several rounds, I found out that I prefer the sound of a new performance for the electronics over the composite take. Although this makes the recording not be an exact performance, I do find it to be more aesthetically pleasing, making the electronics more stable and meaningful within the context of the full performance. It makes the recording more comprehensive and sculpted to be a specific interpretation of the work. In this sense, the approach is much closer to Manfred Eicher's ideals as discussed earlier in section 1.1.2. I did not time align the electronics and the piano so that the electronics always sound slightly farther away than the piano as explained in the research of Snapper (2014).

2.1.7 - Final Thoughts

One of the more interesting aspects of the final recording session was that this was the first time Maren played the composition without controlling the electronics with the use of the MIDI pedal. Although this made her role much easier, she admitted to missing the tactile control over the electronics. Perhaps a composition that is so directly influenced by the performer in a one-on-one relationship should still be controlled fully with the older system? I personally feel that the Antescofo version is much tighter against what the musician is playing, but at the same time, if the musician is more comfortable controlling it himself or herself, perhaps that is the better route.

In many ways, “Studie I” proves that a very simple signal chain and concept can form an interesting and multi-faceted work that is both pleasing to listeners, the composer and the musicians that have played it. Time stretching a single instrument as main spectromorphological gesture is an interesting technique as well as something that can easily be exploited in different contexts. It's a piece that could not be written by anyone else than a producer/composer even though the programming is very simple. Because of the piece's centrifugal elements, synchronizing the acoustic instrument with the electronics is also not an issue.

2.2 - Studie II: Nyctalope

2.2.1 - Composition/Concept

“Studie II” is for solo cello and electronics and the piece was written during the summer of 2015 and revised in late 2015. The piece is more virtuosic than “Studie I”, and the performer is in the role of a traditional soloist. The first concept for this composition was to use a tone as an anchor for the piece. At first the tone is a G, and then a melody comes along being played as double stops physically by the cellist. Later on in the piece, the tones that are presented in new sections will then be played by the electronics as they're not necessarily possible to play as a double stop. The point with this was to set a physical gesture as a compositional point as explained by Jodblowski (2006). When the same concept returns it is played by the electronics but the listener should still have that picture of a single physical gesture giving it meaning as well as bringing the piece closer to the centripetal model (Ciciliani, 2014) meaning that there is a clear causal relationship.

The electronics here play a much more active and almost contrapuntal role than in “Studie I”. In addition to the electronic notes, the electronics include a spectral delay and distortion. These electronic processes and the use of bow overpressure are the main elements that contribute a narrative form with tension/release instead of functional harmony. Originally, I had thought of using saturation instead of distortion, but I found out by practicing with cellists that the output of the saturation plug-ins was often still too clean, and not noisy enough for what I imagined.

The electronics were also meant to be much more actively used although this idea was later abandoned as explained in the first concert section. One of the more interesting aspects of this piece is that the electronics are partly fixed media (the tones that are played), yet there is also a lot of live processing. The electronics' role varies throughout the piece sometimes being coequal, causal or an extension of the instrument (Fregel, 2010). Because of how tightly synced and connected the acoustics and electroacoustics are, I believe that this piece is perhaps the one where the blend between both worlds is best approached.

The scalar and thematic material is once again taken from overtones of several notes, but the writing is far from being anything close to spectralism, and was just used to have an abnormal scale. Extended techniques such as flautando, bow overpressure and changes between sul ponticello and sul tasto were also first tested in this piece. These techniques became a mainstay of my writing for string instruments after this composition. The inspiration of these techniques comes primarily from the solo cello piece “Petals” (1988) by Kaija Saariaho which I had analyzed over the summer as

well as Brian Ferneyhough's writings (Boros & Toop, 1995) which I had read during the summer vacation.

2.2.2 - MaxMSP & Antescofo Components

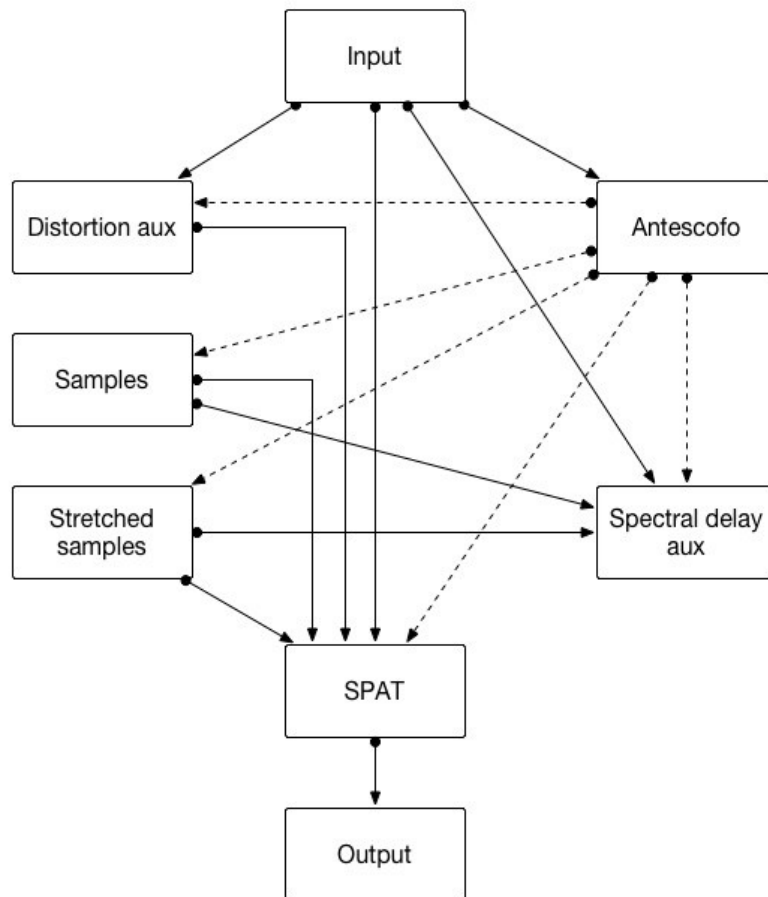
The first incarnation of the MaxMSP patch was based on the scene system meaning that there were different scenes for different sections in the work which would then be triggered by the performer by using a MIDI piano sustain pedal. The thought was originally that the live technician should not only make sure the sound functions, properly blending the acoustic and electronics, but should also take an active role with the delay and distortion. I had included a possibility to use MIDI controllers letting the technician use his/her hands instead of a mouse, which can often feel much more natural and also permits one to change several parameters at the same time instead of just one with a mouse. Because of the larger amount of parameters and several things happening at the same time, the scene system had to be much more intricate for this composition. Because of the amount of different parameters, the possibility for error is also much bigger. After the problems of the first concert (described in section 2.2.3), this concept of the scene system would be completely abandoned and Antescofo would be the primary choice for most compositions.

The Antescofo version of the patch is much more stable and now the delay and distortion is set in Antescofo, although the technician can still quickly limit them or exaggerate them a bit, but it removes enough pressure on the technician to make the piece easily playable. Another change in this version is the delay which has become a spectral delay. The main reason for the change is a normal delay was slightly too boring and I therefore set out to find a more exciting alternative. Kim-Boyle's (2004) paper, John Gibson's "Spectral Delay" (n.d.) and MaxMSP's examples were springboards of inspiration. The idea is the same as a traditional delay except that the signal is separated into different slices (done in the frequency domain) by using an FFT (fast Fourier transform). The delay acts as a tool to "smear" the instrument around in the stereo field. Although it is a completely unrealistic sound for an instrument, and is far from anything that we would normally accept, as it is directly connected to a gesture, it is accepted by the listener. It radically changes the spectromorphological aspects of the instrument and uses that as a main gesture.

The distortion on the other hand is based on several distortion algorithms which were posted on the Cycling 74 message boards by a user named STKR (2012). I adopted some of his algorithms and changed them around so that they were noisy, yet would integrate seamlessly with the sound of the cello instead of being on/off which is typical of distortion for electric guitars with pedals. Something that was seamless sounded better, flowing with the composition and forming gestures of

its own. The distortion replaced the saturation effect after the first concert as described in 2.2.3. The signal chain of the final MaxMSP patch can be seen here:

Figure 2.2.1 – The schematics of the Max patch for “Studie II”.



2.2.3 - First Concert: Blank Vol. 2

The first concert had problems before it had even started. The piece was played by my good friend Amund Ulvestad and we were both plagued by lack of time to rehearse before the concert. We had the chance to rehearse for about two hours before the evening of the concert. Our main problem was being synchronized in the order of the events in the score. During the concert, Amund forgot a few of the parts where he had to switch scenes with a MIDI piano sustain pedal and I would use the delay too soon or too late. The piece still sounded relatively good, mostly due to Amund playing amazingly on the cello, but it wasn't exactly what was intended in the notation. Trying to be

in the right scene would also often take away my attention of what effect I should be changing at that time.

The concert was once again in Orgelsalen and played on the same PA system. I found that the PA system did not blend as well when it came to the senza vibrato notes. This is perhaps due to the radiation of the speaker system, which is a problem that has been identified as well by Manoury (2012). The radiation patterns of the cello acoustically (such as documented in Meyer, 2009) are completely different than the radiance pattern of any PA system. This problem is perhaps aggravated as well by the need for the dry signal of the cello in the PA system when using the saturation effect. This is something that isn't a problem in a recording situation, but it is definitely problematic for live situations.

It is important to note that Amund had also advised me of several sections which were incredibly difficult to play mostly because of the speed of switching between a normal technique to harmonics and vice-versa. These mistakes and others were correct because of my direct contact with an instrumentalist. This also facilitated the composition of later cello compositions as it gave me extra knowledge about the instrument.

Documentation recording was done with two DPA4009s, as well as a NeumanTLM103 as a solo mic. The dry signal from the TLM103 is also delayed to have the transients of that mic and the DPAs coincide, such as discussed earlier in section 1.2.2. This recording is included on the DVD as explained in Appendix A.

2.2.4 - Recording

The recording was done with the classical cellist Astri Hoffmann-Tollaas who studies in the classical section at the Department of music NTNU. She is not used to play any type of contemporary music. In fact, she had just discovered Ligeti a few weeks prior to when we had our first rehearsal, having to study and learn his "Cello Sonata" (1948-53). She felt clearly uncomfortable listening to electronics with monitor, and especially having to improvise. This caused her to have a bit of trouble understanding the phrasing, even though she could play every single note technically without any problems.

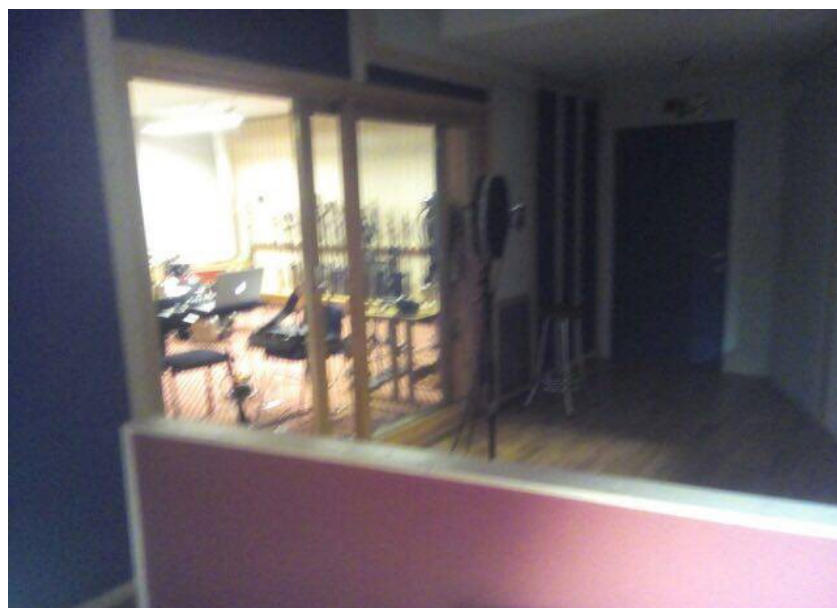
The recording was done in NTNU's studio in Olavskvartalet as the room is rather dry which is good for a solo cello recording of this type. A main array of two microphones composed of a DPA4009 and an Ehrlund EHR-M about 45 cm from the instrument. Both microphones have a very

low amount of self-noise which is important in a composition in which the duality of noise/tonality is a major point. The DPA is omni and the Ehrlund is cardoid allowing me to tweak the cello source and how much reflections are in the signal. It's a very flexible mic array which is why it is used in both "Studie II" and later, "Studie III". I also added a stereo array about three meters from the performer with two DPA4090 with a Jecklin disc (as defined by Jecklin, 1981) in between to get ambience if wanted as well as a larger stereo picture than the array by the instrument.

Picture 2.2.1 – The positioning of the Ehrlund EHR-M and the DPA4090 together about 45 cm from the cello. The carpet is there to prevent additional floor reflections.



Picture 2.2.2 – A Jecklin disc with two DPA4090 further away in the room.



Much like “Studie I”, I recorded the electronics but felt that doing another performance over the composite take was a much better idea. The editing of the piece was difficult because of Astri's discomfort during the improvisational section. I therefore opted to create them from many different takes, much like Teo Macero created Bitches Brew in 1969 (Tingen, 2001). This left me with a considerable amount of control the production although I was still limited by the material she played during those sessions.

2.2.5 - Final Thoughts

In its first version, “Studie II” definitely did not work as a live piece because it required too much between the instrumentalist and technician, which made it difficult to predict and too chaotic. The introduction of Antescofo allowed the piece to be more predictable, yet still a different interpretation every single time. It also allowed me as the technician to really listen to what is going on, and focus on how things sound instead of having to use a lot of attention as to where we currently are, what has to be done, etc.

How good the piece would work at a concert is still open for debate as I have not had the chance to try it out yet. The shift from saturation to distortion helps with the PA issue though, as I still don't need to send any completely dry signal through. I do however feel that the gestures of the piece are very clear and this makes the piece fit within the classical tradition even though the harmonic language, form and electronics definitely pin it down as contemporary music.

Another interesting aspect of this piece is how its interpretation is open. Although the piece was slightly different between both recordings submitted, the phrasing differences and interpretations are still miles away from each other. Amund is not as technically gifted on the cello as Astri, but he makes up for it in his aggression which suits the piece as well as his very loose and flowing phrasing. Astri on the other hand plays a much more serene version which shows another aspect of the composition. While we were recording the piece, she was saying that this is the most aggressive she has played on her instrument. This also opens up the debate for how much I should influence the interpretation of a musician considering the role of the producer/composer contra the traditional role of the producer as described in section 1.3.1.

2.3 - Studie III: S'effondre

2.3.1 - Composition & Concept

“Studie III” is a composition once again for solo cello and for electronics. It was written a very short period after “Studie II” in the summer of 2015 and it is a continuation of my evolution in writing more virtuosic pieces for a specific instrument. The conceptual aspect of this piece was to look closely at the small pitch discrepancies between notes during several glissandi. Throughout the piece there are often several glissandi at the same time (mostly electronic but sometimes electronic against acoustic) and what interests me is what is between every note, how clusters are formed. Some of the glissandi are also slowed down, so the aspect of microsounds (as defined by Roads, 2004) also comes into play, although on a much smaller scale than in “Studie I”.

Ligeti has used a similar concept in “Atmosphères” (1961) as well as Penderecki in his “Threnody for the Victims of Hiroshima” (1960). However, I had actually gotten the idea from an analysis of Saariaho's “Nymphéas” (1987) which appears in Rofe (2011). At the start of the piece which is focused on the tone A, the inner parts start to play D# which forms a symmetrical tritone above and below the initial A. This sparked my interest in how it would sound with glissandi shifting from one tone, to two tones a tritone apart from the first one, and then back again.

The writing is even more virtuosic than in “Studie II”, and the presence of extended techniques such as bow overpressure once again plays a role. The overpressure is used here mostly to accentuate the narrative of the first half of the piece, and it also plays in into the aspect of tonal sounds against noise. At what point do the glissandi and bowing sounds stop being tonal and are pure noise? What is between what some would consider noise and tonal sounds is what was interesting to me during the composition of the piece.

During the writing of the piece I had also thought of including a delay but I was unsure of how well it would fit. However, during a slight re-writing in early 2016 before recordings and rehearsals, I thought that the spectral delay I had designed for “Studie II” could be a starting point, modifying it slightly and adding a traditional delay system with feedback and crosstalk between two channels.

The glissandi which are played back electronically are not meant to sound as an acoustic cello would. The electronics here are meant to sound different than the cello. However, because of the start of the piece (in a concert situation at least), the audience can clearly see the gesture of the

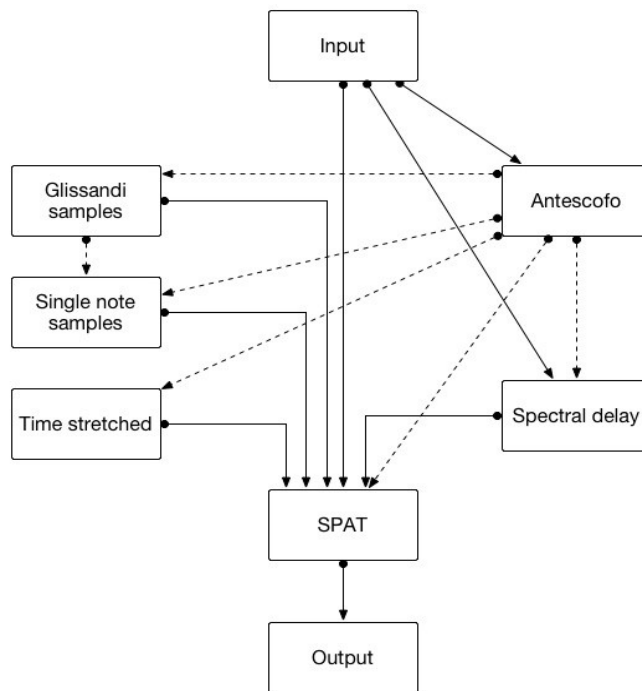
glissando which will then be repeated in several different ways during the piece, allowing them to make a connection between what was played and what is heard throughout the piece and also making the piece closer to the centripetal model (Ciciliani, 2014). The glissandi part sound mostly like a backdrop (as defined in (Croft, 2007) but the delay and reverb function mainly as a possible extension or accentuation (Ibid. & Frenkel, 2010).

2.3.2 - MaxMSP & Programming

As mentioned in the earlier section, several aspects of this composition are similar to “Studie I” and “Studie II” although implemented in different ways as well as being used in a very different context. The spectral delay is slightly modified as mentioned and includes a normal delay system before the FFT. The use of the delay is a bit more sporadic and not a central theme in the composition unlike “Studie II”.

In this composition the samples (time stretched and not) are played together which required a tighter integration between them. All of them are EQed to give place to each other. Once a glissando is finished, it also triggers a single note sample of the target note (ie, a glissando from Eb to A triggers an additional A sample as it ends). In this sense, the electronics implementation is much tighter as a single unit than some of the earlier compositions where each processing element could be seen as a different module not necessarily directly related to each other. The schematics of the MaxMSP patch look like this:

Figure 2.3.1 – The schematics of the Max patch for “Studie III”



2.3.3 - Recording

The recording of “Studie III” was done with the exact same set-up as “Studie II” although not on the same day. This time Astri had a lot more difficulty because of how technically difficult the piece is. At first the recording session was not going very well as she struggled to listen to the electronics as well as play the piece technically correct. This caused me to try and have her play the piece acoustically without any electronics and for some reason she seemed to play better when not having to listen at the same time. I therefore opted to record the piece acoustically and do a performance of the electronics afterwards. Although this is not an ideal situation, a producer knows that the most important aspect is to get the proper performance out of a musician.

It should also be noted that Astri was not able to play through the whole composition, and we had to therefore record it section for section. I find that this has negatively affected the flow of the piece, as well as her phrasing. Ideally, the performer should be well known with the piece and be able to play it without any problems before being recorded, but that is sadly not always the case when using other students. This has caused a problem in the production as it ties my hands to how good she manages to play the composition. I have still tried to sculpt and produce as an auteur within the composition, but this has taken considerably more editing than most of the other compositions.

2.3.4 - Final Thoughts

In many ways I view “Studie II” and “Studie III” as twin pieces. They research completely different concepts, but are written for the same solo instrument and the virtuosic writing is relatively similar between both. However, because of the differences in concepts the way the electronics are used between both pieces are completely different and I do believe that this helps shows the multifaceted possibilities of electronics even when based on many of the same sound modules. This reinforces the point that which electronics one uses does not shape the piece, what shapes the piece is the writing and how the electronics are used. They are as multi-faceted and flexible as acoustic instruments when used by someone that understands them such as the producer/composer.

Unfortunately, I have not had the chance to test this piece in a concert situation which I would definitely like to do. Although the piece and the electronics are the same whether it's a recording or concert, I feel that the approach to the situation feels very different, and therefore influences the interpretation of the piece then and there.

2.4 - Suspended Mirrors

2.4.1 - Concept & Composition

Suspended Mirrors is a piece for solo oboe and electronics with an octagonal speaker set-up which was commissioned by Veronica Isabelle Stubberud for her bachelor's examination in Aarhus. I had come up with an idea of what a soloist plays being sent around the public by using an eight speaker array. This was the basic premise of the composition, and I was lucky enough to have had some experience with an eight speaker set-ups, once in a school concert with Natasha Barrett at Rockheim in November 2014, and another concert with Nils Henrik Asheim and a few other musicians in Klæbu Kirke in March 2015. These two concerts had given me enough experience using SPAT for spatialization that I understood what was possible creatively.

After discussing this idea with Veronica, she found it very interesting. I then asked her more about her strengths and weaknesses. She mentioned that she has practiced multiphonics and circular breathing. I had to do research about which multiphonics are possible on the oboe and came to study all of the sources I could find (Cleve, 2014, Redgate, n.d.) as well as Berio's "Sequenza VII" (1969). Therefore, the main compositional material for the piece was to be based on these three elements: multiphonics, circular breathing (ie long notes) and space. As the oboist plays notes in most sections, the note (and all previous notes as part of that harmony) are repeated and move around the speaker array, exploring the space surrounding the musician as well as harmonically accompanying what the oboist is playing. By doing this the electronics play the role of accompaniment, addition and transformation (Fregel, 2010) at the same time that it anchors the piece in its form and harmony while adding something new that could not be achieved by the solo musician (exploring the space). Although the electronics play perhaps the biggest part of the poetics of the piece, it is still clearly within the centripetal model (Ciciliani, 2014) as it is still the performer that is the center of attention and everything in the electronics is done in relation to how the performer is playing.

Since the piece was to explore space and how it relates to the performer, it only seemed natural to use ambisonics as it allows for more envelopment and a clear 3D sound such as described in Barrett (2010). If the piece had been in stereo or other more "locked" multichannel encodings, then I do not think the piece would have worked as well. The encoding was done inside of SPAT and uses HOA2D of the third order (limited by $2n+2$ for a horizontal array where n represents the order, Ibid.). The use of the HOA2D encoding made it easier for me to also give the illusion of a space, as well as play with temporality such as defined in Barrett (2002).

The composition of the piece was done during christmas break in 2015. Having an idea of the technical aspects and knowing how the piece should sound in a room, I had to find material to write with. I had a very clear imagine in my mind about how the piece should sound, but I was unsure of how to organize it structurally and harmonically. The main idea was that it should be very atmospheric, and that certain notes would move around the octagon of speakers. I then found a short harmonic progression which would form the basis of the piece (although it is suspended until the final bars), and the multiphonics I would use were around this progression, having certain tones which could augment or decrease tension.

In this piece, it felt important to go away from traditional bar notation with a time signature. There are no bars, only a few ticks to notate where harmony changes, and when section changes. The soloist is free to take his or her time as he or she sees fit to create the proper atmosphere. The writing is also far from being the typical virtuosic instrumentation that a final examination concert would normally have, but performing all of these multiphonics one after the other is actually incredibly taxing on the performer. As the composer Hans Peter Stubbe Teglbjærg remarked after hearing the piece at the premier, it is in many ways a study on the use of space in a room around a musician.

2.4.2 - MaxMSP & Programming

During the writing of the composition, I started programming and exploring how I would do the electronics. At first I expected using the same scene system, and it would have worked quite well since the writing isn't virtuosic. However, during the christmas break I had discovered the program Antescofo made at IRCAM. This made me rethink the whole way that I could program the piece, and it also influenced the writing as I could have more going on at the same time with less chance of human error.

Within my original composition sketches, I had imagined that the notes played by the electronics would repeat themselves and move around the room as they played, making a clear gesture. However, in practice while testing this out (described in section 2.4.3) it did not work as planned. Instead the electronic notes are played after the performer has played a note, one note being added as the performer plays all the notes of every section. It is a bit more subtle, and it allows the different spatialization to have a bit more impact than if every note was always looped and moving around; the audience now has the time to really listen to where everything is. It also reinforces the harmonic thinking of the piece, making the electronics and the composition

inherently connected to each other in another way. The spatial trajectories of the original piece with a circle around the audience is shown in figure 2.4.3 while the trajectories for a square set-up such as delivered with this project (and explained in Appendix A) can be seen in figure 2.4.4

The main elements of processing within the piece are spatialization of sound and some extra colouring through the use of a short delay. The delay is a stereo delay called Timeless 2 by FabFilter which is connected to pairs of the output speakers, all of the pairs being processed exactly the same way. Although this should negatively affect the spatial organization of the pieces, while testing it out I found it to be a very pleasing sound. The eight speakers are completely decorrelated, using the delay in small portions created an interesting parallel movement throughout the array giving a new breath to the work. In many ways, the delay destroys part of the spatialization done within SPAT, but as Lossius (2007) notes, it is possible to have very interesting effects and still have a better resolution than just normal stereo while damaging the spatialization that was created. The delay was originally added because of problems faced during the rehearsals which will be explained in the next section. In the final version of the MaxMSP patch as presented in this project, the delay system is made by myself and uses small delay time differences between the speakers to create additional movement within the composition. The schematics of the MaxMSP patch can be seen here, as well as the ideal setting of the performer and technician:

Figure 2.4.1 – The schematics of the Max patch for “Suspended Mirrors” at the time of the concert in Aarhus

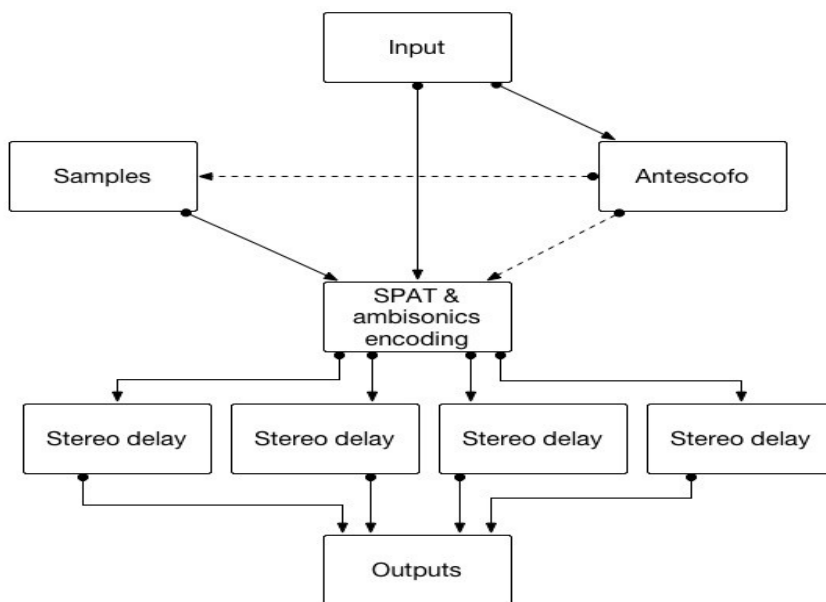


Figure 2.4.2 – A bird's eye view of how the speaker array, performer and technician should be placed at the time of the Aarhus concert and during the conception of “Suspended Mirrors”.

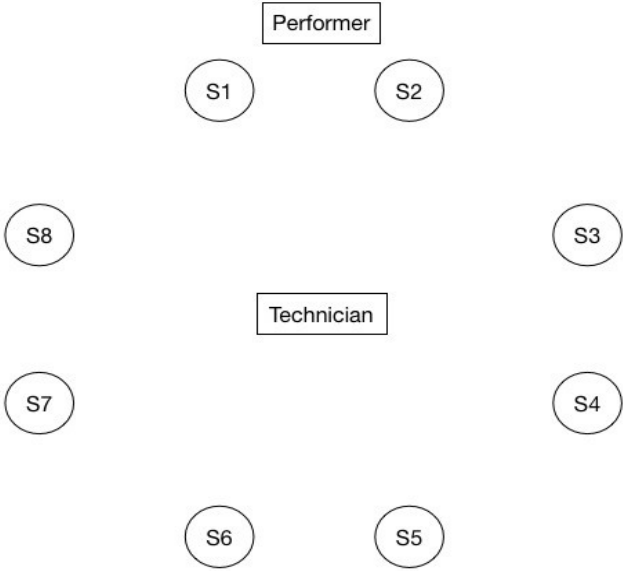


Figure 2.4.3 – A figure of the spatial trajectories of “Suspended Mirrors” with the circle set-up shown in figure 2.4.2

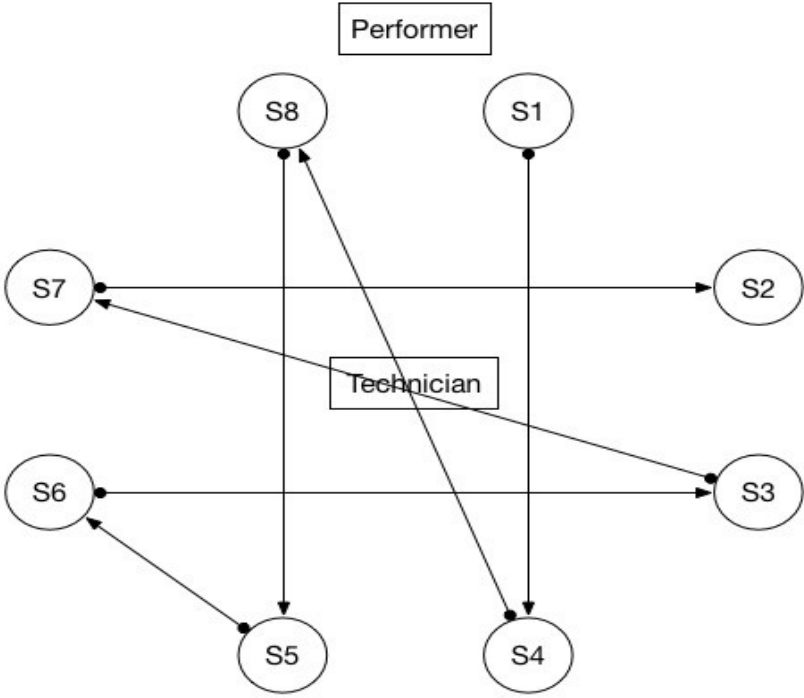
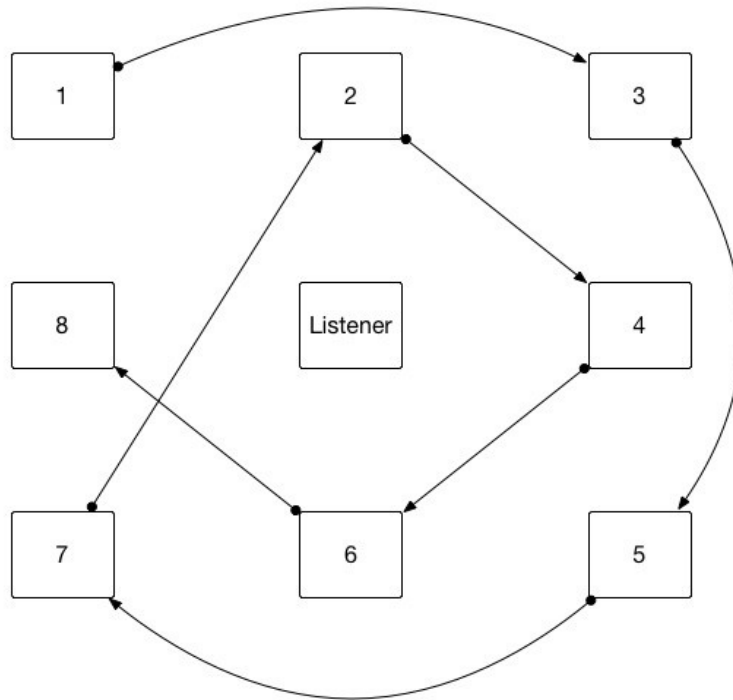


Figure 2.4.4 – The spatial trajectories of “Suspended Mirrors” in the final version handed in as part of this project which uses a square-shaped speaker array



2.4.3 - Rehearsals

Before leaving for Denmark, I had a small rehearsal with the oboist Tuva Hatletid Mortensen in Trondheim to see how well Antescofo would react to an oboe. She was not able to play the multiphonics in the piece, but I was still able to make sure Antescofo could properly follow someone playing the single note sections of the piece. The day that I arrived in Aarhus, Denmark, I already had a first rehearsal with Veronica Isabelle Stubberud. The rehearsal was absolute chaos as she was not able to play most of the multiphonics although she had assured me that she was actually able to play them. Because she wasn't able to hit the proper overtones in the multiphonics, Antescofo also became unstable. After discussing the situation with my thesis advisor Trond Engum, he advised me to try to re-do some of the electronics so as to take a bit of weight off of Veronica. This is when I started implementing the delay thinking that it could be an interesting effect making a parallel electronic sound between all of the speaker channels which were already very decorrelated, therefore giving a new symmetry to the piece.

It was also at this point that I added quotes in the E section of the work from old philosophers. This had been planned at the conception of *Suspended Mirrors* but I had abandoned the idea, thinking that it wouldn't fit the poetics of the work. These quotes were recorded late at night in a small apartment in Aarhus so that there would be less noise from outside. The microphone used was the only one available which was a DPA4099 microphone, placed slightly off axis to help with plosives. Editing was done in Izotope's RX to minimize plosives and outside noise as well. These quotes are placed far away on the spatial field, different parts of the audience hearing different quotes all of them being about time and futility.

The following rehearsals went a bit better, but it was still difficult as we only had about one hour of rehearsals in the same room as the concert with eight speakers, so most rehearsals were done with headphones with a binaural encoding to have a slightly better resolution of the spatialization than a normal stereo signal would allow. During the rehearsals I also had to slightly modify the score in Antescofo, adding small pauses in parts to help the tracker in Antescofo wait for more information. Most multiphonics which had been notated as chordal events had to be changed to trills since the temporal order of the multiphonics could easily vary depending on how they were played by the performer. For each rehearsal, I recorded the direct input from Veronica's playing, allowing me to then test my MaxMSP patch with what she had played later in the day. I used the whole time that I was in Denmark to work around the patch making it as stable as possible and also creating strategies in Antescofo that would follow her either way. A MIDI mapping for an AKAI LPD8 was also created, letting me move forwards and backwards in the score, as well as adjust levels quickly, and more importantly control the delay.

2.4.4 - Performance on the 9th of March, at the Royal Conservatory of Aarhus, Denmark

The concert hall in which we had the concert could accommodate about one hundred people in the audience. Because of the schedule for the hall earlier during the day, it was not possible for me to have a soundcheck, and I could only check if I had sound in the speakers about five minutes before the composition was to be played. I had worked non-stop for the last few days polishing my MaxMSP patch and Antescofo so that it could not crash, and it worked without any problems. At the concert Veronica managed to play all the multiphonics without any problems and the concert was a definite success. I had not had the chance to truly test how well the delay would work in the concert, except by using some recordings I had of the earlier rehearsals. The symmetry of movement caused in the eight speakers by the delay sounded absolutely wonderful and added a new source of change and interpretation over what Veronica could already do.

The use of ambisonics definitely helped with the envelopment of the music and a listener could feel and hear as if he or she was inside the music giving it a slightly surreal feeling.

The recording presented is a stereo recording done by the conservatory with two microphones in the ceiling which seemed to be Neumann KSM-models, placed in an ORTF position.

2.4.5 - Acousmatic Version for a concert in June at Dokkhuset in Trondheim, Norway

Because of the lack of availability of an oboist that can play multiphonics in Norway I have therefore thought of doing an acousmatic version of the work by using some of the recordings I have done of Veronica in Aarhus. This is definitely not an optimal set-up, but it presents the work in a different light and it is at least performable.

The idea for the acousmatic version is to add one extra speaker that will only play the direct sound of the recordings done with Veronica, thus simulating a bit better the position of where she would normally stand. The extra speaker will not in any way be connected to the SPAT-system, instead only being a discrete channel only for the oboe being close to an idea that Frengel (2010) mentions. The rest of the work will not be changed in any way. The Antescofo score will still be triggered in real-time from the discrete channel, therefore making it a performance instead of just a playback as it is sadly so common in electroacoustic concerts.

2.4.6 - Concluding Thoughts

The most valuable part of this composition has been the first adoption of the Antescofo system as a central structuring module for my works. Assuming the role of the producer/composer has also been vital for everything from the composition to the performance. The form of the piece is intrinsically linked with not only the material, but the use of electronics in the piece. The oboe part alone has absolutely no meaning, and neither do the electronics. Both are dependent on each other, and form a whole that is more than the sum of its parts. Even with the acousmatic version of the work, I do not think that the piece will be much close to the centrifugal model (Ciciliani, 2014) although by definition there will not be a visible performer.

An interesting aspect of the piece is also that it uses all of the strategies for real-time synchronization seen at the end of chapter two since the samples are fixed media, the delay and SPAT are part of live electronics and there is also a score follower. In many ways I see “Suspended

Mirrors” as being a perfect example of how a producer/composer can be explored. The synthesis of the notes and electronics are vital to the piece and one cannot exist without the other. The writing of the piece was also inherently related to the electronics and evolved together as an organic idea.

2.5 - Solace

2.5.1 - Composition & Concept

“Solace” is a piece that was inspired by a section of John Adams' (2008) biography in which he mentions making a concert of surround choir music based on Renaissance chants with some of his early students. This was the original inspiration for the piece, although I also wanted to write something with very contemporary harmony and I therefore started sketching a composition. I had mentioned this idea to Geir Døhlie Gjerdsjø who is an earlier music technology student as well as an important part of the Kammerkoret Aurum, a prize-winning amateur choir from Trondheim. The choir was interested and I therefore set to write the music during the summer of 2015. The piece would be for a pre-recorded choir, electronics and played on an eight channel ambisonics set-up just like “Suspended Mirrors”. The reason for using a pre-recorded choir were three-fold. Firstly spatializing a choir standing in front of a crowd would be rather difficult and quickly create spatial dissonance which is not what I want. Secondly, if I was to place the choir around the room, it would require a relatively bigger room than the one in which I knew it was going to be presented (Dokkhuset). Thirdly the scheduling and economic situation with the Kammerkoret Aurum would never have even given me the chance to have a live concert with them.

After finding several poems by Quebec's Émile Nelligan (1879-1841)¹, I started writing. The first movement is a nudge to the original inspiration by Adams. The piece starts almost like Renaissance chant before quickly becoming very polyphonic and line based, and using contemporary harmony, especially the concept of vagrant chords as defined by Schoenberg (2010). As I was writing the piece I had also planned that the electronics would first be subtle and become more and more present especially in the B section of the piece. Towards the end the harmony would become once again more traditional and resemble Renaissance chant.

The second movement was to be much more experimental and was separated into a second movement, and an addendum. The addendum was to be recorded separately and then used in the background of the second movement, time-stretched to make a harmonic blanket of sound which was tuned to the harmony of each section in the movement. The harmonies are once again derived from the spectrum of certain notes, and the harmony is very tight often arriving chords based on seconds. Originally the second movement was much longer, but I had cut it down to be more accommodating for the choir. The pauses in the notation of the choir also allow a certain leeway for

¹ For those interested, the first movement uses lines from “C'était l'automne... et les feuilles tombaient toujours” (1896), the second movement uses “Tristesse blanche” (1897) and the third movement uses “Quelqu'un pleure dans le silence” (1897).

improvisation with the electronics creating an interpretation.

The third movement was based more on the intervals within the lines than any specific type of harmony. Some of Schoenberg's atonal techniques are also used on something that is in the far reaches of tonality.

Once completed in October, I had sent all of the notation to the choir and we had agreed to start working in January/February which would sadly not happen. We started at the end of February with an eight hour session, and only got to continue in mid-April. The third movement was eventually also abandoned because of lack of time to record the choir, and I believed that the two first movements were artistically and technically more important.

2.5.2 - First Recording Session

The first recording session was done in Trondheim in the concert hall of Rockheim (thank you to Eirik Havnes for arranging this) to have a very dry room so that I could work with spatialization afterwards as a compositional parameter. The choir was recorded group by group as they had not rehearsed as a full choir and did not have a conductor available for the sessions. At first I saw this as nothing negative as having each group individually would give me more control in the mix and processing stages as well as being able to concentrate on the performance of each group. The session was done using two microphones: a DPA4006 close to the group singing (often of two or three singers) as well as a Soundfield microphone about five meter back to have a slightly larger stereo picture.

It was quickly evident that many members of the choir had not rehearsed the material much if at all, and we did not even have time to finish the first movement, even though the choir had expected to be finished with the whole composition in one, maximum two sessions of eight hours (where each group has two hours). I had also miscalculated how much more difficult the use of the French language made it for the choir. I had thought they would simply learn it phonetically and not be bothered by the texts meaning and that it wouldn't influence how difficult the piece is. However, having to pronounce words in French was an extra difficulty. I had purposefully written easy rhythms but challenging harmony expecting it to be fine, but it proved to be a real challenge for the choir, even though I had already checked many times before with Geir Døhlie Gjerdsjø if it was too difficult. I had also consulted the Ph.D candidate Hilmar Thordarson who has worked extensively with choir music. Both had assured me that the French and the harmony should not be a problem, although the first recording session proved otherwise.

During this session I was assisted by the undergraduate student Sondre Christoffersen who was the technician, pressing record and making sure the equipment I had set-up worked properly as I concentrated myself on the choir's performance.

2.5.3 - Final Recording Sessions

I was finally able to schedule extra recording sessions with the choir in April. We would record the rest of the first movement as well as the second movement in three different sessions, three days in a row. This time they did not wish to record in Rockheim and therefore Kammersalen at NTNU was chosen as it is the biggest available room, minimizing side reflections which would have too present if recorded in the Olavskvartalet studio. I had placed many acoustic panels and material in Kammersalen to help with the reflections and flutter echoes as well.

Another problem was that scheduling conflicts as well as sickness in the choir changed the size of the groups. During the first session I had three sopranos, three altos, two tenors and two basses. In the end I had only two sopranos, one alto, two tenors and one bass which would make it impossible to have a seamless transition between both sessions. This causes an unwanted unevenness in the final mixes either way, which is a regrettable situation. It also caused some problems with some divisi sections as the piece was written for four people per group.

To make matters worse, in some of the recording session, a marching band was playing in Lillesalen in Olavshallen, which is right besides the Kammersalen. Even with the sound proof walls between us, the marching band's fortissimo could be heard in some of the recordings. The use of Izotope RX was therefore primordial to be able to edit out sounds not made by the choir.

The session was recorded with the same equipment and microphone set-up as in Rockheim, and I was once again aided by Sondre Christoffersen

2.5.4 - Mixing & Production

Since this piece is to be presented only as an acousmatic piece, the process of editing and its production is perhaps more important than in many of the other pieces presented. Since the choir was completely unable to record a full phrase at a time, every single section was recorded only a few bars at a time, meaning that much of the editing is done according to how well the phrasing can become with different takes. Every voice group was painstakingly created from splicing many

different takes.

Because of the different recording situations, each different session has to be edited in Izotope's RX separately so that I can properly de-noise each section. I have managed to de-noise quite a bit, even when the marching band was playing next door, but there is still some extraneous noise that should not be on the recordings. The delay between the main microphone and Soundfield microphone was also done for each session as there might have been differences in the exact distance between the two. Because of the change in spatial qualities between the recording spaces, some compromises had to be made. For example, the alto voice that was recorded in a fourth session with only one vocalist has a different spatial characteristic which is emphasized especially since there are two recordings of the same vocalist. There is therefore the room twice in the recordings. Even with careful editing in RX, this could not be completely reversed. Additionally, the textural and temporal effect of having one vocalist multi-tracked instead of a group of vocalists together can be heard. It sounds very different and almost sounds like a spectral smear compared to a group of vocalists. To counter this effect, I have worked around the formants of one of the takes, slightly shifting them and making the vocalist sound slightly darker on one of the tracks, therefore helping a bit. This was done by using IRCAM's Trax system by Flux Audio. This is far from ideal but is better than both tracks sounding like they are the same person singing.

Since Antescofo was going to be the center of the MaxMSP patch for this composition as well, I did have to use auto-tune as in many sections in every take, the choir has severe pitch issues ranging from singing too sharp/flat or severe pitch modulation. This was done also because after using over six months to write the piece, I find it important that it has its proper aesthetics goals even though the recording sessions were challenging to say the least. The amount of auto-tuning is limited since it would otherwise be clearly heard. I tried first making the singers sing in tune, and afterwards when possible adjusting their vibrato and pitch modulation throughout a note to make them more stable. It still is far from perfect, especially in for example the tenor voices where they are so insecure singing the music that every note has a considerable amount of pitch modulation and vibrato. However, it still sounds much better than if I had not auto-tuned the composition.

In the second movement when the electronics take over, it is done with processing samples of classical instruments and synths. The main reason for not including such VSTs inside the MaxMSP patch (which will be described in depth in the next section) is that it was already very CPU heavy so going light on the amount of VSTs is wise. Secondly, MaxMSP sometimes has

trouble being stable when using sample libraries and synths in the VST object. At least this is what this author has experienced while trying to use several sample libraries and soft synths.

2.5.5 - MaxMSP Patch & Antescofo

The MaxMSP patch for Solace is the same for all of the movements and works on the same principles as the other patches in this project. Antescofo is used as the brain that controls the composition with a technician listening to the performance controlling many of the aspects as well as refining them. The spectral delay comes back in this composition as well although it is modified to take in a stereo source and therefore has eight outputs instead of four, but they are panned at different points in the speaker array. There is also several possible movements of the spectral delays which are used at different points in the composition giving the listener the impression that the delays are moving towards a specific goal (programmed as being any one of the corner speakers).

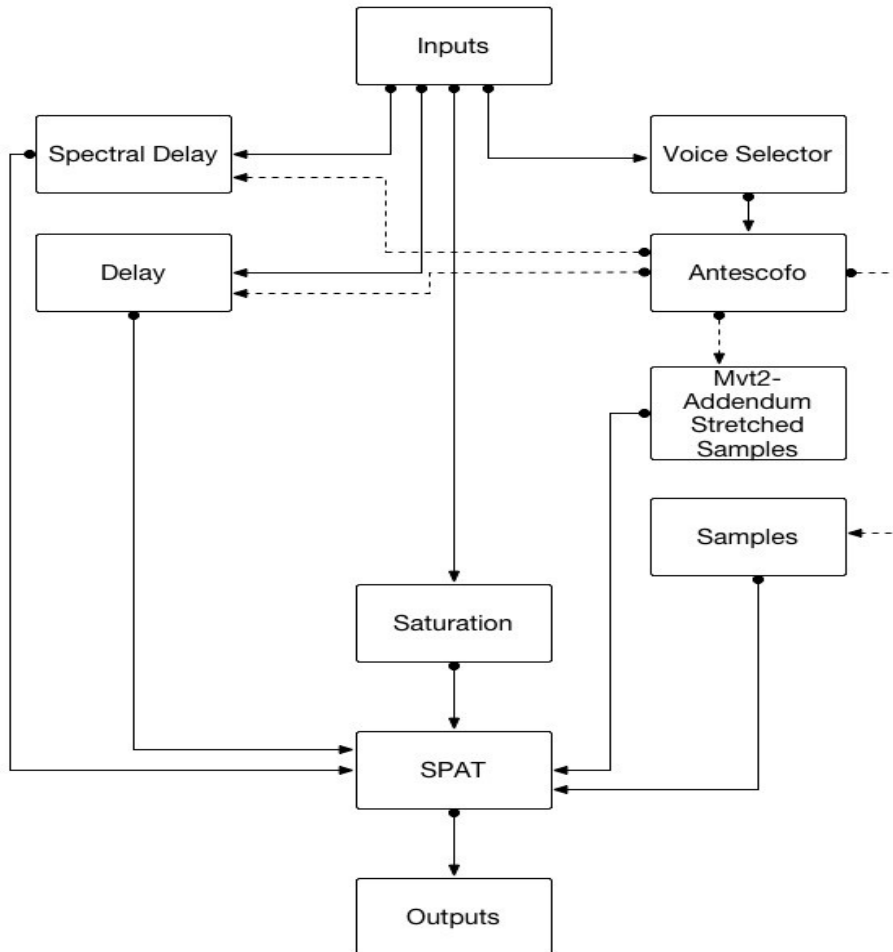
The patch also a more traditional delay system with delay. The reason for including both types of delay is textural. The spectral delay has a grainy texture which is closer to granular synthesis, however that's not always what I want in a delay especially when working with the voice. The system is also programmed so that there is movement between the speakers, where the delay starts at one speaker (which has a shorter delay value) and then the subsequent speakers have a long and longer value.

There is also a small sample playing system such as in "Suspended Mirrors" for the second movement. In this part of the patch very little is done differently than in earlier compositions. There is once again the idea of saturation in this composition (such as in "Studie II"). In this case I did actually use saturation instead of digital distortion, the reason being simply that the latter does not sound very good on the human voice and texturally does not fit in a choral composition. I used a VST which although is not the optimal thing to use, it is difficult to attain a pleasant tape saturation when programming it oneself. It would have taken me too many hours for too little return, so I therefore chose to use the PSPAudio MixSaturator2.

One of the problems with the programming of this piece is that Antescofo can have so pretty severe problems when it comes to polyphony. It seems possible to have some polyphony, especially if the instruments have a very different spectral profile, but that is not the case with a choir. Therefore I created a system that shifts throughout both compositions which voice it follows,

therefore basing all of the electronics on where one voice group is in the composition at a given time. I had to therefore decide in every part of the composition, which voice is the most important when it comes to synchronization. The schematics of the Max patch can be seen here:

Figure 2.5.1 – The schematics of the Max patch for the first and second movement of Solace.



2.5.6 - Performance

The performance of this piece will happen at Dokkhuset at the same time as Suspended Mirrors using the same speaker array, except for the additional lone speaker used in the solo oboe piece. Although the piece will be acousmatic, the processing and electronics will still be happening in real-time to have the possibility of performance and interpretation as mentioned earlier.

2.5.7 - Final Thoughts

Solace is a piece that truly shows the possibilities of the producer/composer as it is a marriage of electroacoustic and classical music. The different movements show many different possibilities while still retaining similar textures and compositional techniques making the composition sound as a whole. The production aspects are tightly integrated into the composition and vice-versa. I also found the idea of recording an acoustic ensemble in the goal of replaying it as an acousmatic piece to be very interesting. This opens up many different temporal and spatial possibilities which would be very difficult to reproduce physically. In this case, the original idea was to perform the piece acoustically. However early on in the compositional process it was clear that this would not be an acoustic or economic possibility for both parties which therefore freed my writing in many ways, and allowed me to explore facets of the medium which would otherwise be very difficult.

The recording of the piece has also been an eye opener. Most things that could go wrong did indeed go wrong. I do however feel that the music still speaks for itself, even though the recording is of subpar quality in my opinion. It has also clearly taught me the importance of being able to rehearse with the full choir much more and make sure that they will actually have the time to truly rehearse and understand the piece. In sections such as bar 31 to 35 in the first movement should become more and more aggressive (and then reflected in the Schoenbergian harmony of bar 35). However, the choir not understanding the piece because of lack of time, did not understand this and in the end it sounds too “beautiful”.

This composition is included both as a binaural file and as a multi-channel file meant to be played on NTNU's sixteen channel system even though it only uses eight channels.

2.6 - In Sleep

2.6.1 - Concept & Composition

“In Sleep” is a composition I wrote as a student of Ståle Kleiberg. It is a piece for solo acoustic piano and based on the use of two hexachords to use all twelve tones in the chromatic scale. In this case, the two hexachords are based on the two whole-tone scales which are often quickly changed through the composition.

How is this acoustic composition related to the concept of the producer/composer one may ask? In many ways, as I was writing the compositions I was writing it for specific effects which can't necessarily be only done acoustically. The writing is meant to invoke the idea of sleep, and even though there are several quick figures they are meant to be recorded a bit more distant than normally (although still inside the piano lid) to have a specific foggy sound which can't be replicated by only using a dense reverb. Also, although some of the intervals played (such as in A) are quite dissonant, they are meant to be played in a smooth way which softens the tone. Both being perfect examples of thinking in “sound” instead of just “notes” as mentioned in the third chapter.

2.6.2 - Recording

This recording was done again with Maren Barlien in Kammersalen at NTNU. Unlike other sessions, since this was completely acoustic, I recorded it in 24 bit/ 96 kHz instead of 44.1 kHz as that sampling rate would use too much CPU with electronics. The recording was done with two Ehrlund EHR-M placed about a meter from the hammers, yet still inside the piano lid, causing more reflections from the lid as well, and making a lovely foggy sound as was intended. I also used the Soundfield microphone about 2 meters from the grand piano synthesized as a large ORTF pair.

The session went very smoothly, and after explaining to Maren how I wanted things to sound by using metaphors and pictures, she played it exactly as I was imagining. The mixing of the piece was rather simple as it was mostly already done in how I had placed the microphones in and around the instrument. The main editing was to create a composite take, as well as edit some pedal noise as the grand piano in the Kammersalen has a very noisy pedal which fits perfectly in a piece like “Studie I”, but destroys the narrative in a piece like “In Sleep”. I did not completely remove them, as they do add a sense of a human is actually playing this, but the pedal on this particular grand piano is especially and notoriously loud.

The Ehrlund pair is delayed as well to have the proper transient information. A slight reverb

was added to accentuate the fogginess of the composition, but not too much as otherwise the whole mix would become muddy. The piece also has a bit of compression and quite a bit of automation to help the dynamic levels of the composite take, and help with the dream-like feeling of the piece. The Soundfield microphone has a bit more self-noise, as well as picked up the ventilation system of Kammersalen, and therefore I also had to edit out the extraneous noise by using Izotope's RX.

2.6.3 - Final Thoughts

I am very satisfied with the final mix of the piece, the original sound idea I had while writing it worked perfectly in the production. That is one of the important points of the producer/composer, being able to image the actual sound, not just the notes that should be played and interpreted. This seemingly mundane idea influences everything in how one writes. It is taking the idea of tone colour of the Romantics to a whole new level and opens up many possibilities. It also makes the composition be inherently tied to its recording or performance (depending on the situation).

2.7 - *Entre les nephilim et les gargouilles*

2.7.1 - Concept & Compositional

“Entre les nephilim et les gargouilles” is another solo piano composition I have written while studying under Ståle Kleiberg. The composition is based on the concept of having a small kernel that is then developed into something that becomes longer over time. In many ways the piece is quite similar to Brian Eno's idea of ambient music (as he describes it in Roberts, 2010) and Erik Satie's furniture music (as defined in Orledge, 1990). However, unlike their music there is a strong rhythmical ostinato in the bass which is to be played loudly so that it sounds as if someone else is playing it, in many ways a dialogue between the mythic nephilim and gargoyles.

2.7.2 - Recording

The recording was done in the same session as “In Sleep” with Maren Barlien in NTNU's Kammersalen. For this composition I had moved the microphones slightly farther away from the piano to get a more distant sound fitting the composition, I have also added more reverb as the sound picture of this composition is very different than “In Sleep”. To enhance the otherness of the rhythmic ostinato on the Cs, these notes have a different reverb than the rest of piano which only accents their sounding as a bell that rings to symbolize death as Maren herself said.

2.7.3 - Final Thoughts

Much like “In Sleep”, I feel that this piece could not have happened without the hybridization of the producer/composer role. The way the piece is written is intrinsically related to how it would be produced sound-wise. In this case for example, the extra reverb on the Cs is something that would never be done in conventional classical music recordings as it would not be “truthful” to how it would sound in a concert room. However, it helps show the poetry of the piece and helps the counterpoint between what is happening in the upper frequencies with that in the loower frequencies (in effect, the nephilim and the gargoyles).

2.8 - Alexander Scriabin's Sonata-Fantasy No. 2 Mvt. 1

2.8.1 Conception & Planning

Scriabin's "Piano Sonata-Fantasy No. 2" (1898) is a well known piano repertoire piece that Maren Barlien wanted to be recorded played in exchange that she had played my "Studie I" at the DaFX concert in December. The reason that I am including someone else's composition in this portfolio section is to show how the producer/composer can approach the production of a piece he/she has not produced and still use the hybrid role.

The most important aspect while recording another piece for the producer/composer is to actually be well known with it, just like a conductor would know and write up his score before a performance with an orchestra. I analyzed the piece and marked difficult sections as well as sections that would be easy to have splices in. I find this part to be very important that I get to know the notation before I listen to any other interpretations of the work, so that I can form my own idea. Afterwards, I will listen to other interpretations. In this case I listened mainly to Valentina Lisitsa (2013), Vladimir Ashkenazy (1997) and Sviatoslav Richter (2000). In my mind, I envisioned the piece as closest to Lisitsa's version, except perhaps moodier especially in the lyrical sections and perhaps a bit darker in tone. The sensitivity to the composition, its meaning and possibilities is of importance to the producer/composer.

2.8.2 Recording & Mixing

When the day of the recording came, before setting up any microphones to a permanent position, I asked Maren to play through the piece. Firstly she could warm up, but that also caused I could listen to how she interprets the piece and then we could discuss it. After listening to her I placed two Ehrlund EHR-M closer to the hammers than I usually would do, as this gives a more intimate feeling with the proper mix. I also added a Soundfield microphone right where the grand piano's tail starts to curve. This helped with the feeling of envelopment in the mix even though it's only in stereo. I quickly recorded Maren practicing, and then let her listen to herself playing to see what she thought of the sound, and after listening to it, she did play slightly more intimately. However, I do not know if this was conscious or unconscious. The recording session was sadly cut short because of the jazz student having to rig up before a concert, but I had still four different full takes of the first movement, as well as several takes of the more difficult sections which I had marked before hand, which were the parts that Maren also found the most difficult.

When the recording is done in an interpretive way such as a producer/composer should do it, the mix happens very quickly. I had the proper characteristics I wanted in the recording already, so the main work was creating a composite take which functions as a performance. After that I just edited away some extraneous noises, did some slight EQ adjustments, volume automation to enhance certain interpretive parts, as well as create my spatial image of intimacy. To do this one uses a smaller reverb than would typically be used for such a recording, and it should be slightly louder than traditionally. The Soundfield recordings were then synthesized as a very large stereo pair with omni microphones, enhancing the feeling of Maren playing for the listener.

2.8.2 Final Thoughts

The producer/composer is not only someone that is involved with composition, his role can also be a great asset when recording music. This recording is an example of that. The importance of being musically savvy and understanding the repertoire can never be overstated. By using the tools and skills of both traditionally separate roles it is possible to form the performance/recording and/or respond to it in a much better way. If Maren had interpreted the piece in a completely different way, the placement of the microphones and the whole production would be different. The way the piece is interpreted and how it is recorded, which is an interpretation in its own right, should fit together as a whole.

Many classical music engineers would probably insist that the microphones were much too close to the hammers. In fact, one engineer I've showed this mix too insisted that Scriabin now sounded closer to a movie soundtrack which was an interesting comment in its own right. However this idea by engineers (as discussed in chapter one) that the recording should have been done exactly as it sounded in the room would have ruined her interpretation as that would still not be a neutral recording. The act of recording can never (and should never) be neutral. This is an important aspect of the work of the producer/composer. He/she works with sound in time, and how best to approach the recording at hand.

Conclusion

Since the start of the music recording business in the late 19th century, composition and production have been kept strictly separate. The producers and technicians originally had their white coats and were most probably considered closer to scientists than to anything artistic. Once the Second World War was over the recording business became a more artistic venture generally speaking. As music technology advanced, so did the artistic possibilities. The arrival of *musique concrète* and *elektronische musik* in the late 40's and early 50's would forever change the backdrop of musical composition, even after the paradigm shattering arrival of serialism with Schoenberg's theories earlier in the century. A rush of composers would start experimenting with the studio and a new compositional paradigm called electroacoustic music would take place. However, in the wider music world, not much had changed. *Musique concrète* had not brought the emancipation of sound as first imagined.

In this thesis we have looked at the hybrid role of the producer/composer which in some ways harkens back to the thoughts of the *musique concrète* composers, but is much more firmly entrenched within the contemporary tradition. The producer/composer is someone that assumes parts of both traditionally separate roles and therefore gaining from both worlds. The producer/composer works with composition as sound, instead of notes. This fundamental principle is of extreme importance to understand the hybrid role. Understanding music as sound gives him/her many new sonic possibilities whether he/she is composing or producing music. This thesis has also explored several aspects of sonic possibilities that are related to the hybrid role such as the use of electronics in mixed music, how to sync them with a performer and how to use space as a compositional parameter. The emphasis on mixed music was mainly to show the ethos of the producer/composer in, without a doubt, the most challenging type of contemporary music.

Aspects of traditional art music production, as well as the paradigms of two trailblazing producers were shown as starting points of how a producer/composer can think. Acoustics and their influence on music recording and production was also explored as it greatly affects the possibilities of a producer/composer, and as we went through the third chapter, space can be used as a compositional parameter making acoustics an even more important aspect than traditionally thought of. All of these different facets and subject area represent the background that the producer/composer should use when writing or recording music. It serves as the basic toolkit to a new world of possibilities.

The second part of this thesis gave examples of several compositions and a mix that can be used as a start point of how a producer/composer works. For example how the composition is intrinsically linked to the composition in “Studie I” and “Solace” or the use of electronics to extend the performer's gestures in “Studie II” and “Studie III” or how the electronics can allow a composition to explore spatial territories which are not necessarily possible with only acoustic instruments such as in “Suspended Mirrors” and “Solace”. Even the idea of how a composition should sonically sound can influence how a piece is written such as shown in “In Sleep” and “Entre les nephilim et les gargouilles”. Every composition uses different aspects of what was discussed within the first section. The idea of composing with sound, although it is notated as notes was of extreme importance throughout this project.

While working on this project there was one aspect which was challenging and unexpected: performers. For all that I could wish, and work on the piece before hand, in the end the producer/composer is at the mercy of his performers. A piece like “Solace” cannot work when the performance is subpar. The dependance of a producer/composer on his or her performers is not to be overseen as well as how they can interpret and therefore change a composition. Certain things can be fixed in the studio as every producer knows, but your hands are truly tied when it comes to the overall performance. It also raises the point that finding like minded musicians that understand this paradigm to be of primordial importance to be able to move forward. However, it is also important to note the crucial role that these performers also play. Amund, Astri and Maren have all taught me possible interpretations and directions of my music, several of them which I had never thought of beforehand. This can open up a dialogue on interpretation and meaning within a composition which is crucial and incredibly interesting. The symbiotic relationship between the composer and performer is not to be overseen and can (and should) be mutually beneficial.

If there is one thing to remember it is that thinking in sound instead of notes and harmony (although never forgetting them) is a huge emancipation and opens new possibilities. The producer/composer is especially equipped to be able to work with mixed music, which is definitely the music of our generation. The technological possibilities and ways to blend acoustic instruments and electronics will only get better as more and more people raised with computers, production and music do the same. The producer/composer is the viable way of working within contemporary art music for the 21st century. He/she is an eternal student that will forevermore wish to master his/her art and experiment with new possibilities in composition and production.

Further Work & Research

As I continue to move forward with this hybrid role, I will not ignore the problems, issues and possibilities discussed throughout this project. I am already planning my next piece which will be an homage to the wonderful Pierre Boulez whom sadly died earlier this year, for string quartet and electronics. My work methods with the material will continue as it already has, in fact much of the material is already in sketch form and I already know how Antescofo, MaxMSP, transducers and speakers will be used (similarly to Arroyo, 2015). Having three different types of sound sources (speakers, transducers on acoustic instruments, and acoustic instruments) seems like an interesting paradigm with many possibilities. An electronic sound could for example start from the instrument and then be transferred to the speakers and spatialized around the audience.

The aspect of programming within MaxMSP and Antescofo is also something I would to concentrate more on. Being able to have open ended compositional structures which function properly in Antescofo would be an interesting possibility. Perhaps being able to deduce parts of the score by using Markov chains for example. The idea of not being forced to have a linear composition will be something I will have to explore when it comes to score-following.

It will be of incredible importance that I take contact with a string quartet that I can include in the writing early on, and especially have the chance to rehearse with them as the composition is a work in progress. This is something which I have not always had the chance to do, especially with Solace, and it has been a definite problem. The inclusion of artists early on can also definitely help shape the form, but it can also help the composer know how difficult the piece should be specifically for those performers. For example, I know that Veronica could play “Suspended Mirrors”, but it is difficult for me to expect any classical oboist to be able to play such multiphonics.

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As well as hundreds of recordings, forum posts and technical discussions with fellow composers
and technicians online and in person during the last two years.

Appendix A: Included Files & Data

There are two DVDs included with this thesis.

The DVD “Compositions” includes the final version of all of the compositions and mixes of Part II which demonstrate in practice the role of the producer/composer. The DVD includes:

1. *Studie I: Dissolving Time – Solo piano & electronics – played by Maren Barlien*
2. *Studie II: Nyctalope – Solo cello & electronics – played by Astri Hoffmann-Tollaas*
3. *Studie III: S'effondre – Solo cello & electronics – played by Astri Hoffmann-Tollaas*
4. *Suspended Mirrors – Solo oboe & electronics (8 channel multi-channel file) – played by Veronica Isabelle Stubberud*
5. *Suspended Mirrors – Solo Oboe & electronics (binaural mix) – played by Veronica Isabelle Stubberud*
6. *Solace – Mixed choir & electronics (8 channel multi-channel file) – played by Kammerkoret Aurum*
7. *Solace – Mixed choir & electronics (binaural mix) – played by Kammerkoret Aurum*
8. *In Sleep – Solo piano – played by Maren Barlien*
9. *Entre les nephilim et les gargouilles – Solo piano – played by Maren Barlien*
10. *Alexander Scriabin's Sonata-Fantasy No. 2, Op. 19 Mvt 1 – Solo piano – played by Maren Barlien*

All of these files are in .wav format in 24 bit, 44.1 kHz sampling rate. The multi-channel files have a speaker arrangement such as the one in the 16 channel room at NTNU also showed in figure 2.4.4.

The second DVD titled “Artistic Research” includes the following folders:

The folder “Additional Recordings” includes non-final recordings of several of the compositions:

1. *Studie I: Dissolving Time – Solo piano & electronics – played by Øystein Hansen Marker, live recording from Blank Vol. 1 when the computer crashed during the composition*
2. *Studie I: Dissolving Time – Solo piano & electronics – played by Øystein Hansen Marker*
3. *Studie II: Nyctalope – Solo cello & electronics – played by Amund Ulvestad, live recording from Blank Vol. 2*
4. *Suspended Mirrors – Solo oboe & live electronics – played by Veronica Isabelle Stubberud, live recording from her bachelor examination in Aarhus. Recording done only in stereo close to the performer by Alex Mørch*
5. *Solace – Mixed choir & electronics – played by Kammerkoret Aurum, excerpt without electronics where the choir is not auto-tuned.*
6. *Solace – Mixed choir & electronics – played by Kammerkoret Aurum, except without electronics where the choir is auto-tuned*

With the exception of the second recording on this list, the others are not a final mix by this author. All recordings in 24 bit, 44.1 kHz sampling rate except the fourth recording which is in 16/44.1

The folder “Example Recordings” includes the excerpts used in section 1.2.2 when discussing time alignment. The recordings do not have any other form of processing except the inclusion of the

delay(s) as well as volume automation.

The folder “Electronics” includes all of the MaxMSP patches for the compositions with electronics. Some of the compositions also have earlier versions of the Max patch in a folder appropriately named “Old Version”. Some of the Max patches have extra folders called “Buffers” which are needed for the patch to run. Please note that the Max patches may NOT work on your computer as they require several external modules such as SPAT, Antescofo, VB.stretch, etc. The patches are included to show the insides of the electronics and to offer a better understanding of them.

The folder “Notation” includes the notation of all the compositions discussed in Part II except Scriabin's composition, just like in Appendix C.

The folder “Figures & Pictures” includes all of the pictures and diagrams used in this thesis.

The folder “Video” includes a video of the performance of Suspended Mirrors in Aarhus recorded by Alex Mørch.

This document is also included on the DVD.

Appendix B: Full List of Plug-ins and Software Used

DAW: Reaper

Equalizers: Flux Audio Epure, Sonalksis SV-517Mk2, PSPAudio NobleQ

Dynamic processors: Flux Audio Syrah, Flux Audio Solera, Flux Audio Alchemist, Flux Audio Bittersweet

Limiter: Flux Audio Elixir

Reverb: IRCAM SPAT, Flux Audio Verb, 2Caudio Aether

Others: Izotope RX, Izotope Ozone 5, Celemony Melodyne, FabFilter Timeless 2, Flux Audio Stereo Tool, PSPAudio Saturator2, Antescofo, MaxMSP, Soundflower, Flux Audio Trax, VB.stretch, SPAT.

Appendix C: Sheet Music

Mathieu Lacroix

Studie I: Dissolving Time

For Solo Piano & Electronics

Instructions: This piece is to be played with a grand piano with two microphones placed near the hammers. The sound is then sent directly to the patch made in MaxMSP. The numbers above certain bars represents the "scene" number inside the patch which is what controls the brain of the application. The chordal bars will be time stretched. Certain harmonics will be accentuated within the time stretched drones. All of the melodic material is taken from the harmonic sequence of a note. Certain liberties had to be taken due to our equal temperament system which doesn't completely follow the harmonic series.

The piece has no precise tempo, except that it should be very slow. The melodic parts can be repeated as many times as the performer wishes. Some dynamics are written into the piece, but the performer should feel free to improvise around these to explore new timbral and dynamic possibilities within the form.

The amount of reverb for any of the sounds should be set to be optimal for the room in which the piece is played. It should slightly caress the sound of the piano enveloping it and spread its spectral qualities over a few seconds. There should not be any dry sound from the piano in the PA system.

Equipment needed:

One computer running OSX

The MaxMSP patch

An extra controller for the sound technician is recommended

A grand piano or any other polyphonic instrument

Approximate duration: 8 minutes

Studie I: Dissolving Time

Mathieu Lacroix

Free Time / Flowing

1 2 3 4

Piano

f *pp* *p* *pp*

8 5 6

Pno.

p

15 7 8 9

Pno.

mp

22 10 11 12 / Slight emphasis

Pno.

p *mp* *p*

29 13 14

Pno.

mp *p*

36 15 16

Pno.

mp *p*

Pno.

42 17 18

mp *mp*

Pno.

47 19

mf

Pno.

51 20 21

Pno.

55 22

mp

Pno.

59 23

mf

Pno.

62 24 25 - let resonate

mp

Mathieu Lacroix

Studie II - Nyctalope
For Solo Cello & Electronics

This composition is for solo cello & a sound engineer working on the electronics. Both performers have their own system that should be interpreted in their own way. The tempo of the piece should be slow and free. There should generally speaking not be a very fixed pulse as in the standard music of the classical repertoire. The no-time sections mean that the performer should not view each bar as a set time, but as a system to play around and improvise.

The cello should be amplified using a clip-on condenser microphone such as the DPA4099. The PA system should be slightly in front of the performer to avoid feedback, and the two speakers with the performer should form an almost equidistant triangle. There should be no dry cello sound in the PA.

The electronics and the cello should blend together in a pleasing manner that suits the room. The piece should always be performed with an adequate sound technician that can read music and follow a score as well as be a performer of the electronics. The effects used in this piece are a spectral delay and a digital distortion, both within the MaxMSP patch

Equipment needed:

- This score
- The MaxMSP patch included with this score
- A good condenser clip-on microphone
- Two good quality speakers
- A good computer that runs OSX (for the max patch)
- A good soundcard with at least one pre-amp and two outputs

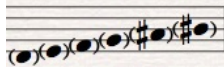
Symbol Legend:



This means the amount of overpressure on the bow of the cello. In the absence of this symbol, the amount of pressure should be to the discretion of the performer.



This symbol means a non-pitched sound on the cello, normally done by either using too much or too little bow pressure



This is used in the context of improvisation, and it shows which notes can be used. The written pitches are not octave dependant

A $\text{♩} = 59$ **Rubato & flowing**

Violoncello *sul G*
mp
light delay

7 *S.T.* \dashrightarrow *N* *S.P.*
Vc. *gliss.* *gliss.* *gliss.* *mf*
Elec distortion

12 *S.T.* *S.P.* *S.T.*
Vc. *gliss.*
Elec delay

17 *S.P.* **B**
Vc. *3* *flaut.* *mp* *senza vibrato*
Elec delay + distortion distortion

23
Vc. *mp* *mp*
Elec G is slowed down

28

S.T.

Vc. *gliss.* *f* *distortion*

Elec.

33

C

S.P. Overpressure

Vc. *flaut.* *distortion + delay* *G & B are slowed down* *delay*

Elec.

D **Improvise**

play pizz

39

-----> *flaut*

Vc. *fff* *mp* *Delay rings out*

Elec.

44

Vc. *mf*

Elec.

E **Rubato & flowing**

arco S.P.

46

Vc. *gliss.* *ff*

Elec.

F

51 *senza vibrato*

Vc. *mp* *S.P.* 3

Elec G & B are slowed down

58 4 *N* *S.T.* *N* -----> *S.P.* *S.P.*

Vc. *mf* *gliss.* 3

Elec distortion

G

63 *mf* *gliss.* *flaut* *mp* *senza vibrato*

Elec delay

69 *S.T.* *S.P.* *S.T.* *8va-* *f <*

Elec All notes are slowed down except A

74 (8) *S.P.* 3

Vc. 3

Elec

77 *S.P.*

Vc. *gliss*



Elec



81

H **Improvise**

non-pitched sounds

improvise between pitched and non-pitched

Vc. *flaut*



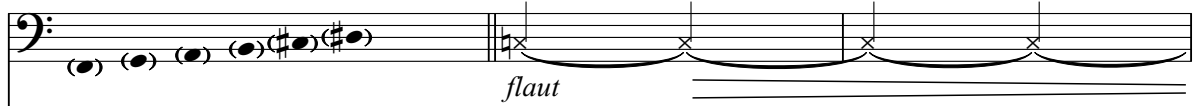
Notes are not slowed down

Elec



86

Vc. *flaut*



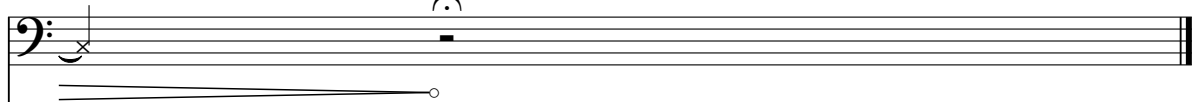
Elec



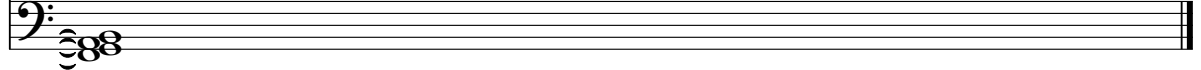
89

Let resonate until everything is silent

Vc.



Elec



Mathieu Lacroix

Studie III
S'effondre

For solo cello & electronics

Information

This composition is based on the gesture of a glissando going either up or down a tritone forming a perfect structure. The glissandi once packed over each form many different clusters and the differences between the intonations becomes a major compositional gesture. There is also a duality between the melodic aspects of the composition and the glissandi which are technical. The piece is written in a way that the performer may add his/her own inflections into the music. The different possibilities of performance are inherent in the composition and there is no wrong way to perform it. There should be no exact pulse throughout the piece, except where written.

This score comes with a MaxMSP patch which is required for the performance of the piece. The performer should also be given a sustain pedal which is used to control the MaxMSP patch. A sound engineer should also be present to balance the sounds within the room. A good microphone that is close to the instrument such as a DPA4099 is recommended. The optimal placement of the performer versus the PA system should be an equilateral triangle although this can vary from room to room. There should be no dry cello sound in the PA system

Symbol explanation:

The black markings represent overpressure on the bow.

Articulation symbols such as *sul ponticello* with an arrow mean a gradual transition between different forms of articulation.

Notes in parentheses are the allowed tones (not octave dependant) that can be played in the improvisation sections. Ornaments and embellishments are allowed but should be tasteful.

Studie III - S'effondre

Mathieu Lacroix

A Only for live performance, otherwise start at B

Cello *mp*

Electronics

9 **B** Calm, controlled and rubato

Vc. *senza vibrato*

Elec.

C **Improvise / Building up 7 bars**

15 *sul ponticello* ----- *sul tasto*

Vc. *ff*

Elec. *gliss. gliss.*

D **Free flowing**

23 S.P. -> S.T. S.P. -> S.T. S.P. S.P. S.T.

Vc. *mp mf subito p senza vibrato mp*

Elec. *Delay Delay stops Delay*

E

28 S.P. -> S.T. S.P. -> S.T. 3

Vc. *mf mp mf mp < mf*

Elec. *ff Delay stops gliss. gliss.*

F Slowly more excited

33 S.T. -----
Improvise 4 bars -----> S.P.

Vc. *senza vibrato*

Elec. *gliss.*
gliss.

G

Fast

41 N

Vc. *mf* *ff*

Elec. Delay

H Playfully

46 mp S.P.

Vc. *mp* 3 3 3

Elec. Delay stops

49 S.P. S.T. S.P. S.T. S.P. S.T. S.P. S.T. S.P. S.T. S.P. S.T. S.P. S.T.

Vc. 3 3 3 3 5 5 3

Elec. Delay

51 *S.P.*

Vc.

Elec.

Furiously

53 *S.P. S.T.* *S.P.S.T.* *S.P.S.T.* *S.P. S.T.*

Vc.

Elec.

54 *S.P.* *S.T.* *N*

Vc.

Elec.

I Calming down

57 *sul tasto*

Vc.

Elec.

J Improv, slightly relaxed 4 bars

64

Vc.

Elec.

69

Vc.

Elec

K accel. **With gusto**
sul ponticello

77

Vc.

Elec

L Relax

82

Vc.

Elec

8va

gliss.

gliss.

gliss.

fff sul tasto

Delay

gliss.

gliss.

M Calmly
♩ = 70

88

Vc.

Elec

mf

3

3

Delay off

92 **accel.** **A tempo** **rit.** **With fragility** 6

Vc. *subito mf* *mp* 3 3 3

Elec Delay Delay stops

95 **A tempo** **With fragility**

Vc. *subito mf* S.P. ---> S.T. 3 S.P. ---> S.T. 3

Elec Delay Delay stops

98 **N** Improv using double stops, harmonics and gliss. Slowly calming down and becoming ethereal. 5 Bars

Vc. (b-s) (s) (s) (s) (s) (s) (s) (s) (s)

Elec *gliss.* *gliss.*

103 **O** Ethereal & relaxed

Vc. *Sul G-D* *Sul A* *N* *flaut.*

Elec

Mathieu Lacroix

Suspended Mirrors

For solo oboe & electronics

- 2 Suspended Mirrors is a piece for solo oboe and electronics which is based on a few concepts. The first one being the idea of "mirroring" in music, except not in the theme development way which has been used in music for hundreds of years from Beethoven to Schönberg. Here the mirroring is a bit more literal, as the sound that the oboist plays will be mirrored in different positions around the crowd. The second aspect is that of cycles which can be seen in how the notes played by the oboist are reflected around the room, but also within the written notes and the longterm structure of the piece. Sound is also cycles, everything we hear in music is a certain amount of cycles per second. The technique of multiphonics can be seen as a mirror and affecting different cycles at the same time. And the technique of the multiphonic stands at the heart of this piece. The use of the electronics also force the musician to truly listen to what is going around him or her, which is something many classical musicians forget studying their notes. The Maxpatch and the musician will play through perceptual feedback, feeding and mirroring each other in different ways throughout the piece. Together as one, they form the music at the same time.

Technical information:

- One oboist that is comfortable with multiphonics
- One clip-on microphone such as the DPA4099
- An array of at least 8 identical speakers placed around the audience. More information is included in the stage plot.
- A sound technician that is comfortable with live electronics and classical music
- The MaxPatch which is included with the notated music.

Notation explanation:

A circled X means a non-pitched tone

Notes in parentheses means possible notes when improvising

Multiphonic fingering suggestions are included in the notation

Two harmonic circles above notes means a double harmonic

Notated notes are not to be taken literally. There is no set beat to the performance but it is recommended to count each full note as 4 bars. The soloist is free to have a rest between sections where there is an apostrophe.

Electronics explanation: The microphone is used to amplify the oboe player, but it is also used to let the MaxMSP patch analyze what is being played and therefore be able to follow the score which has been directly programmed. Sounds will move around the 8 speakers making spatialization a musical and structural parameter for the composition.

Section explanations:

Section A - play unpitched sounds through the oboe. This section is written in as 24 bars in the electronics. The non-pitched sounds should go from long sustained tones to shorter ones, and the cycle is repeated twice.

Section B - The played notes will move around the speaker array. Use circular breathing if necessary.

Section C - Improvise using the tones in parentheses. Each group of notes should be improvised on for about 4 bars, making a total of 16 bars. Some melodic fragments will be played around the speaker array.

Section D - The notes are once again played around the speaker array.

Section E - Samples of dialogues will start to move around in the array, as well as some crowd noises. Everything becomes much more dense.

Section F - As section D

Section G - As section C

Section H - As section B

Section I - As section A

Section J - The electronics will gently support the player

Length of a performance: Between 18 and 22 minutes

For any additional question, e-mail the composer at lacroix@stud.ntnu.no

Suspended Mirrors

Mathieu Lacroix

A Ethereal ♩ = 40

Oboe

pp

B Relax, use circular breathing

Ob.

8

mp *p* *p* *mp* *mp*

15

Ob.

p *mp* *mp* *mp* *p*

20

Ob.

mp *mp* *mp* *p* *mp* *mp* *mp*

C Improvisation

Ob.

27

mp

melodic fragments are played in the speaker array

D

Dialogue samples move around the array

31 **Pulsating**

Ob.

mp *p* *mp* *p* *mp* *mp*

39

Ob.

mf *p* *mf* *mp* *mf* *mp* *mf* *ff*

E

Dense & aggressive

poco accel.

47

Ob.

p *f* *mp* *f*

A Tempo

52

Ob.

ff *mp*

55 **poco accel.**

Ob.

mf

61 **A Tempo** , **accel.**

Ob.

ff *mp* *f* 3 3

67 **A Tempo** ,

Ob.

mp

71 **poco accel.**

Ob.

f

76 **A Tempo** ,

Ob.

fff

F Pulsating

80

Ob.

subito mp *mf* *mp* *mf* *mp* *mf*

88

Ob.

p *mp* *p* *mp* *p* *mp* *p* *mp*

G

96 Improvisation

Ob.

mf

Melodic fragments moving around the array

H

100 Relax, use circular breathing

Ob.

mp *p* *mp* *p* *mp* *p* *mp* *p*

108

Ob.

mp *p* *mp* *p* *mp* *p* *mp* *p*

I

116

Ob.

p *mp*

124

6 Ob.

J Gently

pp *mp* *pp*

129

Ob.

mp *pp* *mp* *pp* *mp*

Mathieu Lacroix

Solace in Three Movements

For Mixed Choir, Electronics & Eight Speakers

On Three Texts by Émile Nelligan

Solace is a piece for a mixed choir with at least 4 singers per part. The piece is meant to be played back acoustically as issues of being able to move the choir around would be too difficult to do physically as well as the issues of the acoustics of the hall used. The eight speakers should be set up around the public either in a square or circle formation. For additional technical information please contact the composer.

Needed for a performance:

- Stereo recordings of all the parts. When soprano is divisi, it should be separated into two files.
- The MaxMSP patch which should be included with this file
- A powerful computer running OSX
- A soundcard with at least eight outputs

The addendum to movement number two is used within the electronics and should not be used separately. The additional line for electronics may give the performers an idea of what would happen, but there is much more going on under the hood of the MaxMSP program. The composer has still not found a standard of notation which can make electronics clear and concise for performers, technicians and the composer himself.

Solace Mvt. 1

Mathieu Lacroix

A ♩ = 50 Solo

Soprano
p la mè(re)ne pleu-re pas comme Ma - rie au pi-ed du cal.vai - re la mè(re)ne pleu-re *mp* ^{à 4}

Alto
 Solo
p la mè(re)ne pleu-re pas comme Ma - rie au pi-ed du cal.vai - re la mè(re)ne pleu-re *mp* ^{à 4}

Tenor
 8
p la

Bass

Technology, etc
 Line used to indicate amount of saturation, etc

7

S.
mp pas comme Ma - rie au pi-ed du cal.vai - re la mè - re ne pleu(re) pas

A.
 pas comme Ma - rie au pi ed du cal.vai - re el-le ne pleu - re pas

T.
 8 mè(re) ne pleu-re pas comme Ma - rie la mè - re ne

B.

Spectral + Saturation

4

11

S. *mf* *p*
com(me)Ma-rie au pied du cal- vai- re elle em- bra- sse sa croix sou-ffre et

A. *p* *mp* *p*
com(me) Ma-rie au pi- ed du cal- vai- re el- le em- bra- sse sa croix- sou-ffre

T. *mp*
pleu- (re) pas elle em- bra- sse sa- croix sou-

B. *mp*
pi- ed du cal- vai- re elle em- bra- sse sa croix sou-

16

S. *mf* *ppp* *poco rit.*
fait gé- né- reu- se- ment son sa- cri- fi- ce sa- cri- fi- ce

A. *mp* *p* *mf*
et fait gé- né- reu- se- ment son sa- cri- fi- ce sa- cri- fi- ce

T. *p*
ffre et fait gé- né- reu- se- ment son sa- cri- fi- ce son sa- cri- fi-

B. *mp* *a 4*
ffre et fait gé- né- reu- se- ment son sa- cri- fi- ce son sa- cri-

Alto voice starts to move around when repeating son sa

B

$\text{♩} = 55$

22

S. *mf*
Ce- pen- dant les feui- lles tom- bent tom- bent les feui- lles tom- bent

A. *mf*
ce

T. *a 2* *solo*
fice - ce

B. *Saturation*
infinite verb on last T-B notes

ppp *mf*

27

Glissandi move around

S. jon - ché
tom - - bent ces pré -

A. tom-bent tom-bent tom-bent tom-bent tom-bent tou-jours! le sol est jon-ché de ces pré-
mp

T. le sol est

B.

Saturation

31

S. la fois tris - tes_ le si - len - ce si - len-- ce
sa_ ges tris - tes la chau mi è(re) le_ si - len - ce si - len-ce_

A. sa-ges à la fois tris-tes et lu-gu-bres dans la chau-mi-è-re le_ si-len-ce est so-le-nne-el la lam-pe

T. jon_ ché jon - ché tris - tes dans la chau -mi-è (re) le si_ len - ce

B.

Saturation

ff *ppp*

36

S. mor - - tu - - ai - re fu - nè(bre) sur la
dans l'a - ppar - te_ ment_ mor - tu - ai(re) fu - nè - bre se pro-je_ te

A. jet - te dans l'a-ppar-te-ment mor - tu-ai-re un-e lu-eur fu - nè-bre qui se pro-je-tte sur la fi-gu

T. l'a - - ppar-te - ment mor - tu - ai_ re fu - nè - brepro - je - tte sur la_

B. la fi -

Saturation

Saturation

f *ppp ppp* *f* *ppp*

mp *ff* *mp* *mp*

ppp *ff* *ppp ppp*

40

fi - gu(re) blan - che à pei(ne) *rit.* *gliss.* *pp* *ppp* **C** à 4 *mp*

S. *port.*
sur la fi gu-re blan - che à pei - ne froid que

A. *f*
re blan-che du ca - da-vre à pei-ne froid ca - da - vre à pei - ne froid à pei-ne froid que *mp*

T. *mf* *3* *f* *mf* *3* *mp*
fi - gu re blan che à pei - ne. froid

B. *mf* *port.* *port.* *div.* *p*
gu - - re blan - che du ca - da - vre

fff *ppp*

44

S. *mf* *mp*
la na tu - re les bois les ar_bres la va llée pa_rai_ssaient tris - tes ce jour

A. *mp* *mf*
la na tu - re les bois les ar - bres la va - llée pa - rai_ssaient tris - tes ce

T. *mp* *f*
la na - tu - re les bois les ar - bres la va llée pa - rai_ssaient tris

B. *mp*
la na - tu(re) les bois les ar - bres la va - llé pa - rai - ssaient tris

49

S. *ffp*
la ce jour là car c'é tait ce jour là c'é - tait

A. *mp* *ffp* *ffp*
jour la ce jour là car c'é - tait ce jour là c'é - tait

T. *mf* *ffp*
tes ce jour là ce jour là car c'é tait ce jour là

B. *mp* *ffp*
tes ce jour là ce jour là car c'é tait ce jour là

Saturation Spectral Spectral

55

S. *mp* *ff* *p* *mf* *ff*
car c'é-tait l'au tom(ne) ce jour la c'é - tait l'au-tom-ne

A. *mp* *ff* *p* *mf*
c'é - tait l'au-tom(ne) et les feuilles tom baient toujours les

T. *mp* *ff* *mf*
car c'é - tait l'au-tom(ne) c'é-tait l'au - tom-ne

B. *mp* *ff* *p* *mf* *mp*
car c'é tait l'au-tom(ne) ce jour la car c'é - tait l'au tom ne et les feui-lles

Spectral

61

S. *p*
la na tu-re pa-rai-ssaient

A. *p*
feui - lles tom baient tou jours

T. *p*
tom baient tom baient tou jours na tu(re) pa rai ssaient

B. *p*
tom baient tom baient tou jours na tu(re) pa rai ssaient

8

with fragility
poco rit.

66

S. tris - tes ce jour là car c'é - tait l'au - tom(ne) les feui - lles tom - baient

A. tom - baient tou - jours

T. tom - baient tou - jours

B. tris - te ce jour là car c'é - tait l'au - tom(ne) les feui - lles tom - baient

Let everything resonate

Solace Mvt. 2

Mathieu Lacroix

A With pain ♩ = 80

Soprano

Alto

Tenor

Bass

Electronics

et nos coeurs sont pro fons et vi-des com(me) un gou-ffre tu sou

ma chère a llons nous en je

solo p *mf* *p* *à 4 mf* *solo mp* *mf*

9 **B** Electronics take over

S.

A.

T.

B.

Elec

nous sou ffrons

ffres fuy ons vers le cas tel de nos

sou ffre fuy ons vers le cas tel le cas-tel de nos i-dé-

mf *mf* *mp* *mf* *p*

A tempo

19 *mp* **poco rit.** electronics take over **C**

S. *mp* blancs

A. *mp* blancs electronics take over

T. *mf* blancs *sfz* oui! fuy-ons la ma-ti-è-re aux yeux en-sor-ce-lants aux

B. *sfz* als blancs oui! fuy-ons la ma-ti-è(re) au yeux en-sor-ce-lants *ppp*

Elec

29

S.

A. *mp* son

T. pla-ges deThu-lé vers l'i(le)desmen-son-ges fuy- ons.com(me)des

B. *mp* (ges)vers l'i(le)desmen-son-ges sur la nef des vintans fuy-ons com(me)des

Elec

36 electronics **D**

S.

A. electronics ges

T. son-ges electronics *mp* il est un pay-ys d'or plein de li-eds et d'oiseaux nous

B. son ges electronics *mf* d'orplein de li-eds d'oi-seaux nous dor-

Elec

46

S. *electronics* **E**

A. *mf* *electronics*

T. *mf* *electronics* *mp*

B. *f* *electronics* *mp*

Elec

des ro-seaux nous nous re-po-se-rons

dor - mi - ronstous deux aux frais lits des ro-seaux nous nous re-po-se-rons

mi-rons tous deux aux frais lits des ro-seaux re-po-se-rons

54

S.

A.

T. des in-ti_mes dé - sas-tres dans les ryt-mes de flû te à la val - se des as_tres des as_tres

B. des in - ti - mes dé - sas - tres dans les ryt - mes de flû te à la val - se des as - tres as - tres

Elec

62

S. *electronics* **F**

A. *electronics*

T. *electronics* *mp* *mf* *f*

B. *electronics* *mp* *mf*

Elec

fuy_ ons_ vers le châ_ teau de nos i-dé-als blancs_ oh! fuy-

fuy_ ons_ vers le châ - teau_ de nos i - dé - als blancs oh! fuy

70

S. *mp* *mf* electronics **G**

A. *mp* *mf* electronics *p*

T. *p* solo *mp* à 4

B. electronics *mp*

Elec

aux yeux en - sor - ce lants
 aux yeux en - sor - ce lants
 ons la ma - ti - è - re aux yeux en - sor - ce lants
 — ons la ma - ti - è (re) aux yeux en sor - ce lants

dis - moi et
 veux tu mou - rir? et
 tu sou

80

S.

A. *mp*

T.

B.

Elec

nous sou ffrons
 je sou - ffre et nos coeurs sont pro fonds com(me)
 ffres et nos co - eurs sont pro - fonds com (me)un

85

S. *mp* Electronics to the end

A. *mp* Electronics to the end

T. *p* *mf* Electronics to the end

B. Electronics to the end

Elec

pro - fonds com(me) un gou ffre
 com(me) un gou ffre
 un un gou ffre
 gou - ffre un gou ffre

Solace Mvt. 2 Addendum

Mathieu Lacroix

A Free pulse, ethereal like deep waves

Soprano
je sou ffre tu sou

Alto
tu sou ffres je sou

Tenor
je sou ffre tu sou

Bass
comme un gou - ffre comme un

B

S.
ffres oui fuy ons

A.
ffre oui fuy ons

T.
ffres oui fuy ons

B.
gou - ffre en - ce - lants

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16 *pp* *p* **C**

S. ma ti ère aux pla ges de Thu -
 A. ma ti ère aux pla ges
 T. ma ti ère aux pla ges
 B. i - dé - als blancs des men - son -

le des men - son - ges

24 *p* **D**

S. lé vers l'i -
 des son ges dor
 A. des son ges dor -
 T. des son ges dor -
 B. ges comme des son - ges un

est un pay - ys d'or plein tous deux aux frais lits des ro -

32 *mp*

S. - mi - rons des ro - seaux
 A. - mi - rons des ro - seaux
 T. - mi - rons des ro - seaux
 B. pay - ys d'or nous dor - mi - rons

E

40 seaux nous nous re - po - se - rons des in - ti - mes dé - sas - tres 3

S. re - po - se - rons dans

A. dé - sas - tre des

T. dé - sas - tre des

B. des in - ti - mes val -

F

47 à la val - se des as - tres fuy - ons vers le châ - teau de

S. des ryth - mes de flû - te oh!

A. ryth - mes le châ - teau

T. ryth - mes i - dé - als

B. se des as - tres fuy - ons la

54 nos i - dé - als blancs fuy - ons la ma - ti - è - re

S. fuy - ons vers le châ - teau

A. la ma - ti - è -

T. aux yeux en - sor -

B. ma - ti - è - re aux yeux

4 aux yeux **G** en sor - ce - lants veux tu mou - rir

S. *f* veux tu mou - - rir

A. re nos coeurs sont

T. ce lants et nous

B. en - - sor - - ce - - lants

64 dis moi mou - rir *p* Hold the notes for as long as possible

S. dis moi

A. pro - - fonds

T. sou - - ffrons

B. mou - - rir

Solace Mvt. 3

Mathieu Lacroix

A Ethereal **A** Calm

p ♩ = 40 *mf* **poco rit.** *mf* *Calm*

Soprano
qu'el-qu'un pleu - re dans le si - len - ce oh ah pleu-

Alto
qu'el-qu'un pleu - re dans le si - len - ce oh ah pleu-

Tenor
qu'el-qu'un pleu - re dans le si - len - ce mor(nes) des nuits d'a - vril

Bass
qu'el-qu'un pleu - re dans le si - len - ce mor(nes) des nuits d'a - vril

A Ethereal **poco rit.** SA spatialized around

Electronics **7/8**

poco accel.

B *p*

6 *f* Let electronics die down

S. re d'a - vril qu'el - qu'un pleu -

A. re d'a - vril qu'el-qu'un pleu

T. mor(nes) - des nuits d'a - vril Let electronics die down qu'el - qu'un pleu -

B. mor(nes) des nuits d'a - vril qu'el - qu'un

poco accel.

B

Tech heavy verb, sat & swirling

11 *mf* *mf* *mp*

S. re la som no len-ce oh ah son ex - il

A. (re) la som no len-ce oh ah son ex - il

T. (re) la som no len-ce lon gue de son ex-il lon gue de

B. pleu(re) la som no len-ce lon gue de son ex - il lon gue

SA spatialized

Tech

poco rit. **poco accel.** **C**

17 *mf* *mp* *p solo* *mp* *mf*

S. son ex-il

A. de son ex il

T. son ex il de mon ex - il qu'elqu'un pleu re sa

B. de son ex - il qu'elqu'un pleu re sa douceurs a

poco rit. **poco accel.** **C**

electronics ring out

Tech

23

poco rit.

p *mf* *mf* *mp* **3**

S. et c'est mon coeur et c'est

A. et c'est mon coeur et

T. dou leur sa dou - leur sa dou leur etc'est mon coeur

B. dou leur sa dou - leur sa dou leur et c'est mon coeur

poco rit.

Tech

28

f *f* *f* *f*

S. mon coeur mon coeur

A. c'est mon coeur mon coeur

T. etc'est mon coeur mon coeur

B. et c'est mon coeur mon coeur

Electronics continue to ring out until a slow fade out

Tech

Mathieu Lacroix

In Sleep
For Solo Piano

In Sleep

Mathieu Lacroix

Softly & rubato

♩ = 60

Piano

measures 1-7. Treble and bass staves. Includes triplets and dynamic markings.

8

mp *Ped.* *mf* ** Ped.* *subito p* *mp* *Ped.*

♩ = 90

Pno.

measures 8-11. Treble and bass staves. Includes triplets and dynamic markings.

12

mf *Ped.* *subito p* *mp* *Ped.*

Pno.

measures 12-14. Treble and bass staves. Includes triplets and dynamic markings.

15

♩ = 60 **poco rit.**

p *3* *3* *p* *3* *3* *p* *3* *3* *p* *3* *3*

Ped.

Pno.

measures 15-21. Treble and bass staves. Includes triplets and dynamic markings.

22

pp *3* *3* *3* *pp* *3* *3*

poco accel.

p *3* *3* *Ped.*

Pno.

measures 22-25. Treble and bass staves. Includes triplets and dynamic markings.

26

Pno.

Musical score for measures 26-28. The treble staff contains two triplet eighth notes per measure, and the bass staff contains two triplet eighth notes per measure. Slurs are placed under each triplet. The key signature has one sharp (F#).

29

Pno.

poco rit.

Musical score for measures 29-31. The treble staff contains two triplet eighth notes per measure, and the bass staff contains two triplet eighth notes per measure. Slurs are placed under each triplet. The tempo marking "poco rit." is above the staff. The key signature has one sharp (F#).

32

Pno.

$\text{♩} = 50$

Musical score for measures 32-34. Measures 32 and 33 feature triplets in both staves. Measure 34 consists of two chords: a triad in the treble and a dyad in the bass. Dynamics markings "p" and "pp" are present. The tempo marking " $\text{♩} = 50$ " is above the staff. The key signature has one sharp (F#).

35

Pno.

Musical score for measures 35-36. Measure 35 contains chords in both staves. Measure 36 features a triplet in the bass staff and a half note in the treble staff. The key signature has one sharp (F#).

Mathieu Lacroix

Entre les nephilim et les gargouilles

For Solo Piano

Entre les nephilim et les gargouilles

Mathieu Lacroix

A Lent et douloureux ♩ = 40

Piano

mf *Ped.* ppp mf *Ped.* pp

B

Pno.

mf pp mf pp

C

Pno.

mp p mp pp mf p mf p

D

Pno.

mf p mf p mf mp

21

Pno.

mf *mp* *p*

25 **E**

Pno.

Let everything resonate

p *p*