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Spectral Music; why create compositions with such a limited palette?

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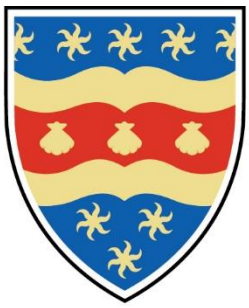

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Spectral Music; why create compositions with such a limited palette?

by
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For Kaija Saariaho Born: 14 October 1952, Died: 2 June 2023, RIP

Author's Declaration

At no time during the registration for the degree of Research Masters has the author been registered for any other University award without prior agreement of the Doctoral College Quality Sub-Committee.

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Abstract

Iain David Mason

Spectral Music: *Why create compositions with such a limited palette*?

The question I am trying to answer is why the composers within the spectral movement of classical music created their compositions with such a limited and challenging palette of sounds.
With the extreme wealth of musical knowledge and a rich tapestry of sounds and movements within the classical and contemporary musical world, why was it that the composers in question who I will be investigating; Gerard Grisey, Kaija Saaraiho, and James Tenney chose to write music with a limited palette of sounds?
The music to generalise is made up from the data of a note that is examined through a spectrogram and the analysis in which we find makes up the harmonic series of those notes/frequencies in question, but also the frequencies that are present but do not make up the harmonic series. Because instruments are complex and built to amplify but also give tone, timbre and sonority of complex sound, the frequencies present within these instruments make up such a complex nature in which music is written and heard.

My challenge is to not only to investigate is to why they chose to write their compositions this way, but also the challenge of writing music within this style and examine my work and contrast with theirs to see, not only the challenges they faced when making their music, but also the challenges I face with using the same methodology and come to some conclusion is to why they chose this unique method of writing music.
I will be using a similar methodology of using software to determine the notes/frequencies that make up my composition as like how they used spectrograms to analysis and produce the data for their compositions. I will also be challenging myself to write with the extended techniques that were employed by these composers and explore the musical boundaries and complex language in which they wrote spectral music.

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Chapter 1

Introduction

The research in this thesis is on the movement of spectral music that arose in the 1970s in Europe and then North America (USA), most significantly from the countries of France, Romania, and the USA.

This chapter describes the circumstances of and the involvement of the music that became spectral music. It outlines, analyses, and interprets the music of three composers and their body of work within spectral music.

It also outlines the overall research aims and objectives for the following chapters as well as giving a brief descriptive background to why I have chosen this topic and what my motivations are in recreating such music.

1.1 The Beginning

The music that formulated in 1970s France was something that had not happened before; it used technology but not to generate the music but to help find what the music was made up of. Here the compositions grew into spectacular music that grew in different directions from different composers. The compositions took the idea of sound and escalated it into a different form of music, but not music that we were used to. This new genre took the idea of sound and frequency and used this for the basis of its compositions. The questions being asked were not in the traditional sense, because these questions had already been answered, and this was not a new step in the modern era of composition; this was a whole new question and whole new form of music that rebelled against the past, that wanted to change within itself, but most of all wanted to push its own musical boundaries into something new,

different, challenging, but also wanted to be free of form, structure and above all what had come before it.

All great Art starts with a sketch and then transforms into vivid colours that are rich in texture and form. From the works of Kandinsky to Picasso, the colours are varied and rich and describe a myriad of emotions that are drawn, painted onto the canvas and sculpted. When we describe great music, the colours again are a rich vibrant sea of notes and phrases that make up the wonderful melodies and symphonic delights that can be heard in the great works of Beethoven and the Beatles to name but a few of the artists that use such colours in their works. We can hear such imagination and expression in the series of notes that grace our ears, we are transported into various worlds that fulfil our greatest dreams and desires and with this we are transported to anywhere we can dream of.

But to access these worlds, musicians use a rich texture of chords and melodies that are made up notes and rhythms and then arrangements; here they have an abundance of harmony and timbre, using all sorts of instruments from the orchestra to a rock band of guitars, bass and drums to an assortment of vocal harmonies and then we have the recording studio that makes up the post-production of the music that can also establish a wide range of sounds and techniques that transform into colours of imagination and diverse wonder.

But this is not where spectral music began. To take the strictest form of spectral music, composers chose the notes that made up the spectra of one note, and within here they used the data that was transposed for them, which normally would make up the harmonic series of one note played by a certain instrument. It is here that the music is diagnosed into certain structures which are harmonic or in-harmonic; these

are the notes that make up the harmonic series which are described as harmonic and then the frequencies that are also present but not as vivid are what we describe as in-harmonic. Then with such data and spectra made up of that one described note we have the analysis that is formed of the spectral composition in question.

1.2 Research Questions and Aims

The intention was to make up the framework of my overall thesis with a series of practical based research activities and then eventually write compositions that would be interpretations of the music that was made during this period in the 1970s. It is here where I intended to formulate my question and find my overall answers in the music that I would create, and this would be through the practical writing of music and compositions in which I would have written manuscripts and then eventual music which would be recorded by myself.

I was given a grant to record a string quartet, and with this I intended to undergo the recording myself which would be the recording and live capture of the string quartet. This would take place at the university. I intended to engineer the session and with good practice take a fully formed recording of the music itself. I also hoped for the chance to capture the performance by video-recording the rehearsals to show the evolvement of the music from written manuscript to fully formed music in the style of the spectral composers. The reason why I chose to work with a string quartet is that I wished to get as close to the idea of the compositions that were formulated by the spectral composers, and this unfortunately was not possible with a large orchestra. However, I was privileged to be able to work with live players, because with limited

software, some of the techniques and also live sound would not be accurately captured or portrayed if it was not for working with live string players themselves.

The intention was to attempt to write spectral music in three different forms much inspired by three composers of this generation: the first would be the French composer who could be considered the originator of the movement, Gerard Grisey. I aimed to take inspiration and knowledge and the methodology, and the spirituality of his music and write a composition based upon his practices as a composer; the second would be based upon the music of female composer Kaija Saariaho who is also part of the teachings of the French movement but is Finnish by origin. Her music involved using computer data and the teachings of the spectralist composers, but she came to her compositions from a different angle and produced some extremely amazing music, with a more technical approach to the art, but nonetheless a radical and emotional approach as well; the third composer, upon my research, was not properly recognised during his lifetime, but made a significant contribution to the spectral music, and this is American James Tenney. His music again is approached from a different angle, but he used some interesting and at times highly experimental ideas inspired by spectral music, and how its experimental ideas contributed to a radical type of musical composition, from using almost harmony, which was frowned upon in this movement, to having a player piano play the music which he composed, an almost generative form of computer/acoustic approach to creating this form of music.

The question I try to answer is: ‘Why did spectral composers write with such a limited palette?’

1.3 Thesis overview

The thesis is composed up into three parts: the written thesis, the manuscripts, and then the music itself. It was hoped to include a fourth part which would have been a video recording but this in the end was not feasible.

My thesis is written into different chapters on how this form of music originated, why composers strongly rebelled against the music that came before them, and why they chose to write in such a particular fashion.

I also wanted to explore what came before these composers and why they rebelled against the music that came before, but a burning question to answer, was also why there are no composers today calling themselves spectral composers. Because the use of spectrograms and analysis are so readily available, why do we not hear of such practises today and would these composers still call themselves spectral composers now?

The intention was to address these questions within my written submission and my written music in manuscript and audible form. Here I challenge myself as a composer of music and engineer of sound, but also as a student and researcher into finding why this movement happened in music and why it is not strongly spoken about in the higher realms of other movements in music.

With my practical writing and recording of the music the intention was to have a fully formed series of music written in the form and practice of the composers in question. I hoped to push myself as a composer and understand the reasons to why the composers chose to write this music, and why they felt so strongly in rebelling against the new forms of music that happened post World War two. With my understandings and written approach to this form of music, I also wanted to understand why this was not seen or talked as much about then the other forms of

music that happened in the 20th century and why with all the series of technology and knowledge, why the modern age of classical music or even contemporary music does not use this term in the music that is created today.

Chapter 2

What is spectral music?

In this chapter I establish what we call spectral music and how it came into being, from the movements that started in France, and which would eventually move across Europe into the USA, I establish the framework in which the music was produced and how what impact it had on the composers in question.

I also call upon the meaning of this music, why the composers in my study made this certain type of music but also why they were reluctant to follow the trends of the time which came about in the post war movements of music.

It will also be of interest to speculate or even understand if the music that came before had an influence on the music that was produced during this movement understood as spectral music.

2.1 What is Spectral Music

Spectral music is a form of composition that involves the use of technology to predetermine the music that is being made, it analyses the use of a single note or frequency and with the knowledge that is made using a spectrogram it gives us the data in which the musical composition is drawn from, this is usually made up from the representation of a sonogram, or mathematical data to draw the musical language in this case frequencies/notes to write the music in question.

Spectral music began in the early 1970s France by Gerard Grisey and Tristan Murail and its movement established itself as one of the most important movements in modern contemporary music at the time, but also went on to serve a purpose

through many forms by defining music and taking the movement into many different genres and practises in modern classical music.

They began taking advantage of using technology and writing music for different and sometimes unusual musical settings and groupings of orchestral musicians and players of the time. This would envisage a new sonority and timbre to the music by having different forms of instruments play against each other, creating a new musical landscape in which to draw new creative aspects to the music that came before them.

*The musical approach is profoundly different from both structuralist (post-serial) approaches and hybrid (neo-romantic or postmodern) aesthetics; however, the pieces remain intimately linked to the interpretive tradition of Western instrumental music. While tape pieces have been written by some 'spectral'composers, their goal is not electro-acoustic music, but rather a new type of instrumental music with different sounds, textures and evolutions (*Fineberg, 2000.pg.2).

The term ‘Spectral Music’ was first coined by the composer and philosopher Hugues Dufourt. However, it would be one of the originators Tristan Murail who would cement the meaning of what spectral music is and how it would define him and the movement,[1] by describing the movement as having an attitude to music and all its aesthetics and would be seen as a sign of rebelling rather than a standardised basket of tricks or techniques that made this form of music. Because the composers within this movement were willing to push themselves as writers and composers, they also set a benchmark for what would happen during and after this period, thus creating a form of ideas and creativity that was not necessarily standard practice but a guide to experimentation and creativity.

[1] Tristan Murail (2000) After-thoughts, Contemporary Music Review, 19:3, 5-9, DOI: 10.1080/07494460000640321

Tristan summed up his feelings in the journal ‘After Thoughts’ by saying:

*Composers should not be satisfied with music that is simply there to please. They should not allow the style of their music to be dictated by fashions, the easy acceptance of institutions, of orchestras, or of the regular concert going audience. These are not sufficient reasons for writing music, for stealing from the life of another. Unfortunately, a number of trends are more and more prevalent in composition today which either ignore the problem of communication, or which -- resting on the ambiguous notion of postmodernism and on pseudo-musicologic or pseudo-philosophic discourses **- -** are in fact not much more than disguised academicism* (Murail, 2000. pg. 2).

It would be sound that would define this musical movement and how the sonority of sound itself plays a crucial part in the defining characteristics of what is seen to be spectral music. Here composers can take the understanding of what is sound and use this to their advantage and thus communicate what they want to express in the goal which would be the composition itself.

Understanding the composer’s intentions and what they are writing can be seen as a sonic message, the data that is derived from the spectral analysis is not necessarily the result of what the composer had but would always be seen as a mutation of what sound is to the audience or the composer, or to the musician who would interpret this form of music. The sonic intentions that are a result from a spectrogram would not be the only characteristic of the composer’s music; here the composer would challenge the idea of sound and create forms of timbre to express the musical atmosphere that would be a result of new textures of sonority.

An end goal of any composer is still the simplest form, which is communication, and this is always shared through the compositional methods which they draw from, but here the colours and timbres are of a certain choice, rather than a certain musical language that the audience would be familiar with, because the aspect of sound and music can not be properly defined into separate categories as the age-old question is what music is and what sound is. The strong link to how we define music and

sound is so minuscule that we couldn't without going into great depth understand the complexities of what we call music.

Joshua Finsberg goes on to describe spectral music as:

The only true constant for all these composers is that they consider music to ultimately be sound and see composition as the sculpting in time of those sounds that a listener will hear. All other shared attributes might change with time, but this attitude towards music and musical perception is the true hallmark of a spectral composer (Fineberg, 2000. pg.4).

Art or music will always have certain characteristics and will develop in many different and unusual ways, so the use of the words like mutation and evolving would be an interesting discourse to the music that developed in France and then the rest of the world, and it is here that spectral music can be portrayed as a certain type of music, but it can also be derived as being a beginning of something new and bold, but how this music has designed itself by having limitations or having a strong set of ascetics can be that of choice or the understanding that what happened during the creation of this music and the performances that entailed is something that is always left to interpretation and what the audience perceives that the music is communicating to them, the ear is complex and taste is hard to define, so we are only left with sonority and timbre and if I can be bold to say taste.

2.2 The Composers

Gerard Grisey was born June 1946 in Belfort and from a young age showed great promise as a musician and composer. He attended different conservatories until he attended Conservatoire National Supérieur de Musique where he studied under the tutorage of Olivier Messiaen (1965-1972); here he gained valuable experience and research in musical composition, and during this time, under Messiaen's guidance, he won prizes for his piano accompaniment and composition. He also studied

electroacoustic music around this time (1969) with the composer and professor Jean-Étienne Marie and at this time studied composition with Stockhausen and Iannis Xenakis and György Ligeti at the Darmstädter Ferienkurse in 1972; it is here where he learnt composition at this German summer school for composition, and we can imagine this fuelled his techniques for modern composition.

During the early 1970s Grisey won a prize where he was able to study in Rome. It was during this period where the foundations would begin for the movement we know as spectral music. During this time his friendship with Tristan Murail began and they would go on to form the musical group Ensemble l'Itinéraire. It is with this group of people that they wrote and evolved the modern musical composition landscape by experimenting and creating music with technology which planted the early seeds of spectral music. Many of the musicians involved went on to work and study at the Paris institute IRCAM which became the place where many of the composers wanted to push themselves and their music began, using technology and new practices in musical language.

Having written a series of compositions during the late 1960s into the 1970s it was the year 1975 that had the most impact for Grisey. It was during this period that he wrote a composition for 18 musicians using the spectra data that was birthed from using a spectrogram of an Eb Trombone that would spark the movement we know as spectral music. Les Espaces Acoustiques – III – Partiels, for 18 musicians (1975) would become the most significant work and really the beginning of this movement.[2]

In Partiels (1975), for example, Gerard Grisey explores the sound of a trombone by

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Hasegawa, R (2011) 'Gerard Grisey and the 'Nature' of Harmony' Music Analysis © 2011 Blackwell Publishing Ltd [online] https://onlinelibrary.wiley.com/doi/epdf/10.1111/j.1468-2249.2011.00294.x?saml_referrer DOI: 10.1111/j.1468-2249.2011.00294.x [15th April 2022]

assigning to different instruments the production of a given partial of the trombone spectrum analyzed with its dynamic temporal evolution. The representation as a short-term Fourier transform is quite general, but it should be noted that there is an inevitable compromise between the temporal resolution (the duration analyzed) and the frequency resolution (the analysis precision). For a high frequency precision, a long analysis duration is needed, and so there is a loss of temporal precision (Pressnitzer & McAdams, 2000.pg.8).

During this period of musical exploration and investigation Grisey was probably at his most adventurist. He dived into his work and compositions creating different and complex music using technology, not as a given state of instrumentation but using his abilities to draw ideas and experiment with what the acoustic instrument was capable of or which ensemble he could use, from large orchestras to smaller chamber ensembles, from the data that was provided for him during his investigations into using spectrograms. Using spectral analysis became a large part of his work during this time. He went on to write two more large works Les Espaces Acoustiques – I – Prologue, for viola and optional live electronics (1976)[3] Les Espaces Acoustiques – IV – Modulations, for orchestra (1976–77)[4]. These compositions again used the diverse nation of the spectrogram, providing data and a rich musical source for his writing and arranging of music for these ensembles. The spectral music movement was born.

An aspect of Griseys work and one that is interesting and probably examines a particular insight into his work was the correlation and relevance of how nature played in his music. It is written and spoken about in certain texts. [5]That the idea of

[3] Belanna111 (2015) Les Espaces Acoustiques – I – Prologue, for viola and optional live electronics (1976) Oct 11th Available at https://youtu.be/3FY0yLd2AB4 (Accessed 15th April 2022)

[4] Invertedninthchord (2021) Gérard Grisey – Modulations Jan14th Available at https://youtu.be/ETxIf8BCN_4 (Accessed 20th April 2022)

[5] Hasegawa, R (2011) 'Gerard Grisey and the 'Nature' of Harmony' Music Analysis © 2011 Blackwell Publishing Ltd [online] https://onlinelibrary.wiley.com/doi/epdf/10.1111/j.1468-2249.2011.00294.x?saml_referrer DOI: 10.1111/j.1468-2249.2011.00294.x [15th April 2022]

evolving, and the movement of nature, had a significant impact on the writing and general composition of Giseys work, the idea of music slowly evolving, and the musical changes would be gradual. Whether this is a true statement or reflection of what the music is saying or is just the interpretation of how we imagine his music is, is not clear. Because there are no strict rules of arrangement or form, writing music in a linear fashion and the slow movements of a note's length, mean we do come to an unusual conclusion.

While such studies can explain how nature is harnessed in Grisey's music, they tend to overlook the equally important role played by nature in a quite different sense: the way our innate mechanisms of aural perception make sense of musical sound (Hasegawa, 2011: pg. 1).

Grisey went on to write more significant works and became the mentor and professor to other composers during his lifetime. He would use technology and explore the vast musical modern landscape by means of musical fascination and investigation and how we would perceive the notion of sound and its context to music, thus creating a relationship to which the audience hears sound or music in the space in which its played. His teachings and findings of composition and his techniques to orchestration have a vast and vital role in modern music today. The use of specific extended string techniques and the use of the instrument not only as a source of sound, but also as a tool to explore what a musician and a composer of sound and music is capable of, is apparent in many aspects of modern music. Jonny Greenwood Popcorn Superhet Receiver uses these extensive techniques in his orchestral works.[6] [7]

[6] Listening in (2021) *How Jonny Greenwood was Influenced by Penderecki* Feb 28th Available at https://www.youtube.com/watch?v=EcibAL3vicY&t=585s (Accessed 20th April 2022)

[7] The Orchestra Now (2021) Jonny Greenwood: "Popcorn Superhet Receiver" | The Orchestra Now 4 September Available at https://www.youtube.com/watch?v=6RuIFx25CZY (Accessed 25th May 2022)

Unfortunately, Grisey passed at the age of 52 by a ruptured aneurism in Paris, but his hugely vast influence cannot be denied, and his work does show this. In later interviews he would denounce the idea of spectral music and didn't want to be seen as a pioneer in this movement of music. Other composers in the same field had similar attitudes and did not see the significance of being spectral composers. However, what cannot be forgotten is the rich diverse musical heritage that Grisey left behind, including the experimentation and eagerness to push the musical boundaries in music and the involvement of sound as a major source of music. Whether a spectral composer or not, the rapid changes in technology gave forth the idea of a new form of music, not in the traditional sense of technology playing a major part in the composition, but in the sense of it fuelling the fire of creativity and allowing the idea of what the imagination is to come bearing new musical fruit that would not be in the same taste as before, but it would have its own sweetness, its own texture and above all its own colour. Even when the colour was not what we were expecting it still served us a different kind of musical fruit.

Kaija Saariaho:

Kaija Anneli Saariaho was born 14 October 1952 and is a Finnish composer based in Paris, France. She studied at the Sibelius Academy under Paavo Heininen. And was taught at the time the strict use of serialism and avant-garde techniques of the time. Then during her time studying composition in Germany at Darmstadt during the summertime she went to a concert by Gerard Grisey and Tristan Murail and here was the first time she discovered spectral music, and this would have a profound and deep lasting impact on her and her compositional work.

In 1982 she went on to study at IRCAM and became deeply involved in the use of computer music and the study of music concrete. It would be here where she would devise her use of spectral ideas and develop her compositions using the analysis of spectrograms and start to compose her own version of what spectral music would become. Kaija's first major work was a slow-moving taped piece that was designed and created using computer technology, the piece Vers le Blanc (1982). It was the use and study of computer technology that would provide inspiration to her further compositions and the use of spectral ideas would stem from these experimentations in computer guided systems at IRCAM.

Over the years Kaija has been extremely prolific and has written not just for ensembles and orchestras, but many solo works, operas, plays, and has covered so much musical ground from electronics to unusual instruments and different sizes of ensembles. But some of her main characteristics in her compositional work are the use of timbre and harmony, and the tension that she derives from using extended string techniques or any extended technique with other instruments where the idea of tension and release could be found.

The notion I designate by the generic term "timbre" is obviously already a synthesis of several elements. Amongst these I would mention the purity of sound (including the idea pure/noisy) and its texture (grainy/smooth) which for me have a particular importance. These parameters are themselves groupings of several distinctive characteristics; the terms that I use in the context of my work are subjective and unconventional, and have actually nothing in common with the usual psychoacoustic terminology (Saariaho,1987: pg.2).

What is prevalent in Kaija's work is the use of dynamism and the use of tension. In many of her solo cello works, there is a heavy use of sound and noise its here that the listener is almost always in a state of musical stress as the music builds to points and then releases, only to be then brought into more musical stress. These acts of

musical phrasing and control make for such interesting and musical impact for the audience.

Kaija Saariaho has defined a sound/noise axis intended to reproduce the harmonic capacity to create tension and relaxation (Verblendungen, 1982-84). Pressnitzer, D. & McAdams, S. (2000)

If we were to analyse her work and contrast it with the notion of spectral music, it is at times hard to see where the layers are, even with direct influence on the ideas, theory and practise of spectral music. She tends to directly or indirectly use the power of dynamics to help shape and control the form and use of the arrangements with the tension and use of techniques to develop her compositions.

For some years now I have a tendency in my music to relate the control of timbre with the control of harmony. Initially I began to use the sound/noise axis to develop both musical phrases and larger forms, and thus to create inner tensions in the music. In an abstract and atonal sense the sound/noise axis may be substituted for the notion of consonance/dissonance. A rough, noisy texture would thus be parallel to dissonance, whilst a smooth, clear texture would correspond to consonance. It is true that noise in the purely physical sense is a form of dissonance pushed to the extreme. At the level of auditory experience, we can compare on the one hand the perception of a tension which is related by the tonic (or by a consonance if the context is not tonal) and, on the other a noisy texture which, while magnifying itself, transforms into pure sounds: one finds a certain analogy here (Saariaho, 1987: pg.3).

What could be said of Kaija's music and the relevance to spectral music is again not the idea of being strict to the rules that are implied by the works of Grisey, but again more of the attitude that was described by Murail, because when listening to her work, even when there is some crossover in terms of sound and choice of notes/frequencies we can hear the use of extended ideas and techniques and how they play a major role. Her clever use of timbre and dynamism are apparent and play

such a vital role in her works, but having researched into her use of computer guided ideas, the question arises to whether her compositions would still be in the same light with the other spectral composers, and whether the use of extended techniques are another tool to use because of the limitations of what data is used in order to write these compositions.

Not all her work is in this fashion of using spectral analysis, but she does use technology to embody a series of her ideas in which she then formulates and uses to push her musical ideas into other directions such as opera. She clearly uses technology to advance her music, but also to advance the notion of advancing ideas and to push the boundaries of what, as a musician and composer, she is capable of.

Of course, to set out on a course of research on hierarchical models in tonal music can — and must, even — be thought of as questionable. Personally, I am bothered by having to mention the subject of tonal harmony so many times in the course of this article, since from another point of view I am absolutely convinced that this is an out-dated approach to the problems posed by the organization of pitch structures. In self-defence I would say that I know how other equally effective means of creating dynamic forms; but then is it really necessary to create dynamic forms? (Saariaho, 1987: pg. 41).

In this quote she perfectly sums up the idea of not being strict to rules and not being part of a system that does not change. Her use of spectral ideas is apparent, and have played a role, but the attitude is more in her work and not allowing or to be governed by set rules, it is here that a truly interesting idea of being a spectral composer lies and here she very much embodies these techniques into her ongoing work.

James Tenney:

James Tenney (August 10, 1934 – August 24, 2006) was born in New Mexico and grew up Colorado; there he went to Denver University and later Julliard school of music and other various universities. He studied piano but also studied composition

under various well-known composers from John Cage to Edgard Varèse. During his lifetime he was very much involved with different forms of music and worked with many successful and influential composers of the time, such as Steve Reich and Harry Patch whom he would perform with.

He also went on to study acoustics and delved deeply into creating electronic music and composition, working on algorithmic music, and using the computer to generate musical ideas and structures. However, Tenney went on to work and study with a myriad of different people and in doing so would create music for these teachers, as a tribute to their studies but almost as a welcoming thank you.

The interesting thing about his output as a composer is the resemblance to spectral music and the relationship to the ideas of what spectral music is. We can hear this right through his life with significant works being directly or indirectly influencing him as a composer. Spectral music has been written about as being a European form of music and indeed the number of musicians involved have been mostly European by chance and literally geographical situation, but there is a series of composers outside of Europe, who have used this form of music and tried something new with it. Again, we can suggest that the music is more about the attitude rather than the strictest form or rules of creating spectral music, but the evidence is there for people to hear and engage with.

The interesting thing about Tenney is how he has used the ideas to create his music. Clearly the influence of the orchestra is there in such pieces like Clang (1972)[8] or

[8] James Tenny (2017) James Tenney - Clang (1972) Nov 14th Available at https://youtu.be/LitiwoXjpC0 (Accessed 15th March 2022)

Spectrum 3 (1995)[9] but he also used tape loops and was very much into experimentation with electronics much like Kaija was with her work. His output was great, and the influence was there, but as Tenney was also a theorist there also seems to be an underlying hint of rebellion, much like what the French movement were doing to the post war music of the time. It could be suggested that the American movement was using the influence of spectral ideas but rebelling against the idea that this movement is merely a European style of music.

Tenney's work is a seminal representative of a broader current of spectral music composition that arose in North America independently of spectralist developments in Europe. It has significant roots, on the one hand, in encounters by artists with a scientific culture whose influence and pervasiveness expanded enormously during the postwar era and, on the other hand, in a quasi-empiricist musical aesthetic inherited principally from John Cage (Wannamaker, 2008: pg. 34)*.*

Tenney's compositional work is an interesting practise of influence and I do believe he wore his influences on his sleeve, because even when we hear the direct influence of spectral music, there is also an underlying influence of other composers, whom he either studied with, or admired, from John Cage to Phillip Glass. It could be said that in some way Tenney was trying to evolve the movement and explore many other musical avenues as a composer, and musician, but also as a theorist. This grew from his musical output, but also as a teacher; he went on to teach many of his compositional approaches and concepts but also the nature of what music is and how sound is a factor which we can use directly as a source or take the idea in a more general practice.

[9] James Tenny (2017) James Tenney - Spectrum 3 (1995) Sept 15th Available at https://youtu.be/WKYUiQlP7tk (Accessed 15th March 2022)

His approach to most of his music does involve a long process of experimentation and accepting the outcome of whatever happens within his compositional ideas and experiments. Again, this attitude to music is primarily influenced by the spectral music, but his composition Clang (1972) was an experiment in using the harmonic series, which is normally the harmonic data from a spectral analysis:

A piece that never gets played. It was a piece for orchestra called Clang. [Laughs.] And I have regretted since that time that I gave it that title because it will inevitably be confusing to people, because that's also a term that I coined in META þ HODOS to mean a Gestalt unit. Here it didn't really mean that because the piece starts with a kind of a clangorous hit on chimes. But then, using the octatonic scale, it builds up a kind of constant cluster texture. And then over a fairly long period of time, pitches start dropping out. The pitches that were available pitches suddenly become unavailable. And this starts in the lowest octave and gradually works up. So, at any point where there are drop-outs, that becomes clearly a segment of a harmonic series on some very low fundamental. And then, when the corresponding notes in the next higher octave drop out, a few more drop out in the bottom octave. So again, now you've got a two-octave segment of the harmonic series. And that process continues, maintaining only the fundamental. It never drops out. So eventually what you have is a bunch of notes at the octave. And then there was a final hit on the chimes (Tenney (02/03/06), cited in Dennehy, 2008: pg.2-3).

What is interesting about this composition was that it some ways predates the movement of spectral music, and the fact it didn't get played as much is just a tragic set of circumstances but there is a question over whether this was just coincidence or something else.

Was there already something in place in the psyche of musicians and composers at this time that wanted to pull away from what had come before or was the musical landscape moving towards this set of circumstances in the first place, in other words the practise of learning and experimenting was already in place. How these individual composers got to this output is interesting but also oddly coincidental as they all approach this series of music from different angles. This study examines the

idea of this in the history leading up to this specific movement and tries to illustrate how this influenced the composers in question.

The question is whether spectral music is a musical movement set by rules governed by the data analysis of an instrument's spectra, or whether it has always been an attitude and rebellious nature to push music forward no matter the underlying circumstances. As I investigate the history leading up to this movement, I also investigate how this movement has had an influence on the current composers of today, and how the notion of music is used and influenced by the spectral music of the past.

2.3 Before there was Spectral.

The history leading up to what would be seen as the beginning of spectral music is a vast and impressive movement of music, that happened in really what could be seen as a short succession of time. The reason why this study starts from post-World War two, is that it is during this period that the music that was being created, was part of the reason why spectral music began to rebel against previous genres, and this period, from roughly late 1940s to the 1970s, was to be seen as huge radical form of musical expression. It is in this section that I give a brief overview of the music that was formulated during this time, and the restrictions and limitations that the spectral composers were rebelling against.

Serialism

The history and beginnings of serialism can be seen starting from the 12-tone technique which began in the early 1920s from Arnold Schoenberg and the second wave of Viennese school of composers, Schoenberg also taught Anton Webern and Alban Berg. This movement of music was again in its way a rebellious movement against the music that came before. What follows is the basic analysis of this music

and I say basic because it can be extremely complicated as it uses techniques used in maths. A composer would set up a series of rows using the notes in the chromatic scale and here they would move through each note taking an emphasis on each one, thus not having a certain key centre. The music would sound disjointed and atonal, and much to the audience's surprise, not very listenable to. This technique would evolve from not just using pitch but also rhythm and dynamics and any other technique of writing music. During this movement of music, composers would become very strict on the use of this technique and would frown upon anyone who would say otherwise. The music progressed into the 1950s with composers such as Pierre Boulez and it would be seen as the only form on music that was of intelligence and only the intellect would understand. To say this put them on a platform of ridicule is extremely apparent. This movement of music would not only disengage the listener from the performance but would out right shun the people who came to listen to these performances.

Music can be a great many things. But there does not seem much point in allowing it to be anything. Our minds use certain cognitive tools to organize sound into music. With practice, we can change the way we listen. But if we frustrate our auditory cognitive mechanisms too far, all we are left with is sound. It seems possible that some forms of total serialism become tolerable to listeners only when they become inured, and not because there is really anything to hear ó nothing except notes and silence, a meandering uniformity with no means of creating tension and release, no ways to begin or to end (Ball, 2011: pg. 17).

This form of music by the 1960s and 1970s had almost ended itself without even realising. Some of the champions of this movement such as Boulez began to see its limitations and because the music was made up of a certain forms and controlled limitations the music started to repeat itself and the audience who may have been looking for something new or at least different, had begun to tire of this musical expression and started looking elsewhere for entertainment. But the movement was

still taught to new composers and this form of composition was still taught as being a 'higher' form of music.[10]

Electronic Music

The use of electronic devices and computers is very evident in spectral music and in some cases there are spectral music compositions using electronic techniques; this is why I think its right to mention the music that happened during this period and leading up to the spectral movement during the 1970s, because it has been cited by some of the composers to have had an influence, or at least shown respect to a particular use of music that perhaps influenced the writings of some of the composers in question.[11]

The music of Karl Heinz Stockhausen is important and his role in the classical/experimental and electronic world are very much important and relevant to the music that happened afterwards. Though schooled in the music of serialism and this can be seen in some of his early works, he would start working on a form of music only using electronic equipment, after working with Pierre Schaeffer. He did not particular like the form of music he was making with Music concrete and decided to start making electronic music from scratch. His music at this time was very much influenced by his teacher Olivier Messiaen and his music was radical for the time, but also the concepts which he worked with, from using the performance space to how he tuned, wrote and manipulated the music to suit his compositional process.

[10] Ball, P. (2011) Schoenberg, serialism and cognition: Whose fault if No one listens?, Interdisciplinary Science Reviews, 36:1, https://doi.org/10.1179/030801811X12941390545645 24-41, DOI:10.1179/030801811X12941390545645 [23rd February 2022]

[11] Julian Anderson (2000) A provisional history of spectral music, Contemporary Music Review, 19:2, 13, DOI: 10.1080/07494460000640231

However, it has been cited that several of his works did have a spectral feel and, in some ways, played a part in how the music progressed:

Stimrnung (1967) for six vocalists is certainly an early example of spectral composition: a single harmonic spectrum on B-flat is filtered by perpetually changing phonetic coloration on the six voices, who also emphasize individual partials by using overtone chanting. Certainly, this is a remarkable instance of applying acoustic research to composition in a thoroughgoing and consistent way: one notes that the large-scale harmonic vocabulary (a single harmonic spectrum) is identical with the small-scale detail (made up of the individual harmonic spectra projected by each of the six voices (Anderson, 2000: pg. 8).

Electronic experimentation cannot be left out when talking of spectral music, because the composers are using technology to analyse the music. This could be seen as being part electronic, because of the use of technology, but Kaija would use electronics extensively in her work and live work; her use of computers and technology are very much evident, and we can find MAX/MSP patches on her website, and clearly the influence of electronic music is in her works.[12] However, I am using this reference lightly as the music of Stockhausen could be seen still in the serialism movement, as he does not differ in his early work from his teachings at the time.

Nonetheless, the overall effect of this movement, and how this music progressed throughout history, can show that the music that evolved would have a characteristic influence on the spectral composers, not only on the music, but the available technology that was at their disposal. We can hear how technology has influenced the music, especially when the composers started to use the computer to make the music for them, using a series of programming and patches.

[12] Saariaho, K. (2015) “Kaija Saariaho” [Online] http://www.petals.org/Saariaho/Electronics.html [05/05/22]

Minimalism:

Music that is made in the minimalist style falls into categories that involve repetitive notes or sequences, the use of drones and patterns, pulses, and the use of technology to create loops of sound or repetitive uses of notes, voices, and patterns. This music rose to prominence in the 1960s through the works of Terry Riley and La Monte Young, using a more experimental use of harmony and ideas to create pieces that not only would last a long time, but would forego the western use of form and arrangement. For instance Terry Riley wrote his piece 'In C'(1965) which was for an ensemble of 35 but fewer people would suffice. The performance was made up of 53 short motifs lasting from half a beat to 32 beats and the musician would perform these in an arbitrary way, and each musician could play the motif as long as they wanted. The idea was each musician would play the 53 motifs in their own time, until all performing musicians were finished. The performance could last for quite a considerable time, and performances have been noted to last for hours.

This was just the introduction to this form of music. The use of technology would become very apparent, and the succession of loops using phrases or sounds, and instruments could be heard, and with this use of experimentation of looping, they would play them back at different speeds and the music would produce phasing sounds, where the sound would become audible, but not necessarily make sense as the sounds would mutate into each other.

This music would evolve and can still be heard today with the composers Phillip Glass, and Steve Reich. Over this time the music has been used in mainstream media and played all around the world. The music was again a rebellious act against the serialists and their approach to music; the music of the minimalist movement is rich in harmony and uses forms, but it is how they use the music. By writing in a

repetitive motif, the music changes with slight variation from tempo shifts, change in the metre, dropping notes or adding notes and also the use of instrumentation. The ensembles would vary depending on what the music needed.

The shift in emphasis from composition to arrangement in minimal art, or from parts to whole, seems to have come about as an attempt to communicate more directly and clearly. One way of doing this was to reduce the number of parts (Bernard, 1993: pg. 15).

This quote sums up the music because the music before was becoming elitist and complicated. The audiences were being turned off by the serialist movement and sought something new and different, and with the music of the minimalist movement, they found something that was more open than previous movements in modern classical music.

One aspect of this movement is the clear use of rhythm and the inclusion of many musical and geographical influences, taking the music from Africa, the middle east and Asia. The music has grown from this influence and taken the music into many different forms and ideas. One of the main composers, Steve Reich, has used the idea and beautiful nuances of rhythm all over his music. Coming from a drumming background, its not hard to see how his music has progressed using rhythm and the tools that he has shared with the world, but what Reich shares with the movement of spectral is the fact he is also a true rebel and he wanted to distance himself from the post war music that surfaced in Europe. His approach has again used technology in his early tape loops works, but also his approach to how music is made, the act of being a composer and the sheer musical approach to his art has a resemblance to spectral music.

Many aspects of Reich's early minimalist period can be viewed as direct rebellions against the various factions of the post-war avant-garde, as reactions against serialism, free atonality, and aleatory. Reich desired an immediate clarity of

structure, and he therefore employed musical/compositional processes that precisely governed the entire course of a composition. Just as the ultra- rationality and total control of post-war serialism led to a Cageian reaction involving improvisation, chance, and formlessness, so Reich has rejected the lack of composer-organized structure in aleatoric music in favor of scores that are meticulously worked out in advance, down to the smallest detail (Schwarz, 1980: pg. 5)

The minimalist movement, from a certain point probably did not have as much an effect on the spectral movement, but I wanted to highlight the music that was happening at the time, and even when there is not much in terms of musical correlation, a clear path to see is the unique rebelliousness in the music against its predecessors and how they did not see the serialist movement as something they wanted to practise in, or at least be a part of.

Resisting what came before, seemed to be the approach from many of the composers during this time, and it is without doubt that the minimalists and spectral movement shared these opinions. Maybe during this movement and the baby boom generation of the time during the 1950s and into the 1960s the need to rebel against what came before, was, and still is, an important factor in growing up, but to rebel the past we must in some ways understand it, and I think these composers did, and maybe with the shine of youth in their eyes, they knew it was the right time to make a change and produce something different.[13]

The outsiders:

I just wanted to add the importance of other composers, who really were not part of movements, but did dabble in other areas, and have been mentioned by the spectral

[13] Bernard, JW. (1993) The Minimalist Aesthetic in the Plastic Arts and in Music Source: Perspectives of New Music , Winter, 1993, Vol. 31, No. 1 https://www.jstor.org/stable/833043 pp. 86- 132 [17th March 2022]

movement and have crossed paths in the lead up to this movement in music. The composers are very different, but have had an impact on this movement, and they are Olivier Messiaen and Gyorgi Ligeti.

Gyorgy Ligeti's texture-based music pieces such as Atmospheres (1961) and Lontano (1967) -- shared with Scelsi's music (unknown to Ligeti at that time) a preoccupation with slow rates of change and dense, continuously evolving textures. This had an obvious effect not merely on Grisey and Murail but later on the music of Kaija Saariaho as well (Anderson, 2000: pg. 7).

These two composers would influence the overall timbre and use of arrangements within the music, especially the canon movement of Ligeti in pieces such as Lontano (1967).[14] It would be the rebellious nature of composers like Ligeti who would have such an effect on the movement during the 1970's. Even when Ligeti was under the influence and did work with the likes of Stockhausen, he only took what information he needed and then would experiment and add to his compositional work similar to what would then happen within the spectral movement. This act of rebellion would be something that Ligeti would perform his whole life; he would always be compared to Bela Bartok, just because they were from the same country, but also because of his early work which showed some signs of influence and have a folk nature to his early compositions. But like Grisey and the spectral movement there was always a search for something new and something that would be their own. Originality is always a difficult concept to achieve in any musical language, but it would be through experimentation and twisting the nerves of sonority that these composers sort to find the new notes in between the notes that had been used in the past.

Not long after his emigration to the West in 1956, Gyorgy Ligeti decided to challenge a well-established compositional trend. Ligeti is known today as one of a relatively small number of composers who in the late 1950s sought viable alternatives to post-

[14] The Vienna Philharmonic Orchestra topic. (2018) Ligeti: Lontano (1967) Dec 18th Available at https://youtu.be/eX7jxO3begc (Accessed 2nd March 2022)

Webernian serialism, and it is no exaggeration to say that, nowadays, when aside from a handful of undisputed masterpieces much of what was written during the serialist era seems hopelessly dated, Ligeti's music from about the same time sounds as fresh and original as ever. His career affords the music analyst the opportunity to study one composer's turning away from serialism: the nature of his objections, their implications for the further development of his technique, and the way in which the methods he arrived at achieve a meaningful organization of musical materials (Bernard, 1987: pg. 2).

The comparison with the structure of Ligeti's work such as Lontano or Atmospheres with the music that evolved with the spectral movement are very apparent; they both move slowly and unfold in a slower pace not just rhythmically but also musically as well. There is not much sudden movement in any of the music or works with Ligeti or the beginning period of the spectral movement. Grisey's Partials, like Ligeti's Atmospheres both used technology to write with but also, they wrote the acoustic version of their work to slowly move and evolve throughout the musical movements, using the orchestra to use timbre and dynamics to create the overall sense of movement and change within their work; this would be either with subtle shifts in musical changes or rhythm. Ligeti would use a cannon esq form to move in-between notes that would evolve whilst Grisey would use the longer forms of spectra which he received from his analysis to use the orchestra on what instruments would have priority over other instruments.[15]

Rebelling against the system that was devised in the early 1930's and wanting to discover their own paths in music was one of the easy comparisons but the interesting aspect is how both got to where they were using different methods. I can see the crossover of both composers, and how their music is a slow building movement of music and sonority and how they changed the idea of structure and the heavy use of timbre to create their work. Either one of these composers could have

[15] Bernard, JW (1994) Voice Leading as a Spatial Function in the Music of Ligeti Vol. 13, No. 2/3, https://www.jstor.org/stable/854260 pp. 227-253 [20th March 2022]

been a part of any movement because they were both searching for something new amongst the noise that came before them. During that period from the late 1950s through to the 1970s the music of both composers evolved and would show signs of great experimentation but because of their willingness to explore and try something new, the music still sounds fresh and alive today. This could be due partly to the fact they were so different for their time that the music is only appreciated in time or that these two minds were ahead of themselves when it came to writing new and interesting music.

Chapter 3

Analysis of spectra

In this chapter, I will be examining and interpreting my form of analysis which would make up the compositions in the form of spectral music, I will be investigating and analysing the data that I got from a spectrogram program called Spear, and how I used the data analysis of the instruments I chose to use, to create and present in the form of musical composition. My compositions will be an interpretation of the composers in question and trying to understand how they got to the conclusion they did while writing and creating their music. I will be using certain techniques that was imposed by said composers, but also using my own skills as a composer and writer and using the methodology and I suppose the essence of the composers to create something that is in the vein of these three composers.

3.1 Analysis and data.

My approach to the data that I needed to create was to find musical data that was easy to understand, but also allow me to start the creating and thinking of the actual composition, and the program that I researched and used was called Spear, this program is used to analyse, edit and resynthesis musical data that is fed into the program.

The spear program (Sinusoidal Partial Editing Analysis and Resynthesis) was developed by Michael Klingbeil, who uses the analysis which is accomplished using a variation of the traditional McAulay-Quatieri technique of peak interpolation and partial tracking of the notes/frequencies in question. The main idea behind the program was to make the use of resynthesis a quicker application to use, the power

of using sinusoidal modelling was that it allowed numerous possibilities of sonic information that allowed the user to predetermine the data that they need for their analysis. Other software developers have made similar programs such as Audio sculpt and Metasynth to name but a few. The clear understanding of the spear program was that it uses a graphical interface that allowed the user to make changes or use data that can be used without having a clear understanding of the main information that goes into the complicated world of spectrogram analysis.

The following goals were kept in mind throughout the design and development phases: editing should be as fast and as easy to understand as in a time domain waveform editor, listening to transformations should be possible with no intermediate synthesis or processing stage, and high-quality analyses should require only a few parameter settings [16]

The details of the analysis that is notated on the graphic score, are notes/frequencies that are made up of different shades, from a strong black dominate colour normally the root note or the harmonics of that note, to shades of grey for either higher less dominate frequencies or the frequencies that are present but not solely made up of the harmonic spectra or series of that one note.
Within the controls of the interface the data and information can be presented whilst hovering over the shaded partial, when doing so the information that is present are represented by the frequency the note and the midi note as well. It would be these

[16] Klingbeil, M. 'Spear' [Online] https://www.klingbeil.com/spear/ [15th May 2022]

values of information that I gathered to be used with the context and writing of my compositions.

A method that was used by the composers in question was using spectrograms that would be used with a formula known as FFT or the Fourier transform, this is a more complex formula that pre-determines the frequencies and transfers them into components that make up time. Within the musical analysis of a note this formula would give us the data that would make up the frequencies present with a note or a chord. Other forms of analysis can be used and other methods of creating and developing notes and frequencies, such as ring modulators.

The spectrum resulting from a ring modulation can be simulated when the frequency of each note of the first spectrum is combined through both addition and subtraction with the frequency of each note of the second spectrum, producing all the possible additive and subtractive combinations of the partials. (fineberg, 2000, pg97)

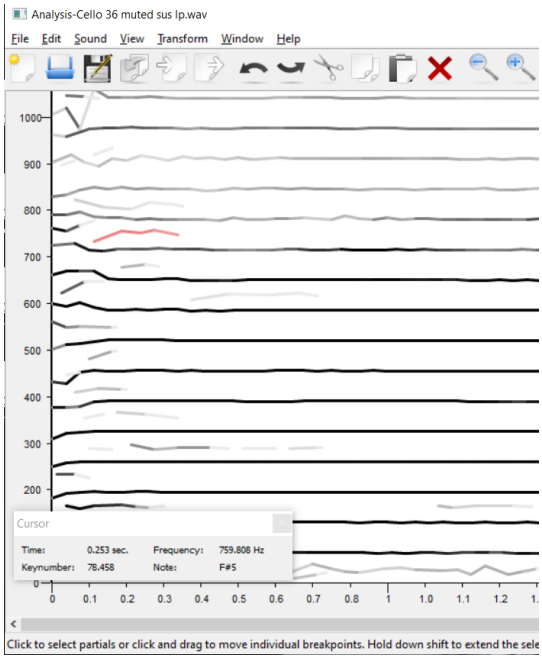
Though this is an interesting use of using an effect to give analysis of a note or give more data and sounds/frequencies to use, I didn't find this particular use of data and information was the right method for me.

With spear the program offers me the result of strong partials, or the sound which is made up of the frequency/note, this information shows me what is within the sample I am using with the harmonic series which is present but also the lesser frequencies which we will call En-harmonic this information is the main data which will then become the focus of my compositions. The resulting notes that are present will be seen as being darker in shade compared to the notes that are lighter. To get the exacting notes/frequencies I need this will be by hovering over the graphical line/note

which will give me such information as musical note, the octave of the note, and also the frequency of the note too. My focus is to get as much information on the specific notes that I need which will make up the data and information that will make the musical language within the compositions.

It is here they highlight the strong musical partials that are present in the chosen note that is analysed which can be seen as darker, these would represent the harmonic partials while the lighter lines would be the in-harmonic partials that are present in the musical spectra of the chosen data. See example 1.

Example 1. Musical data in the spear program.



Within the program, when highlighting certain partials, they would give you the data analysis that would be the note, the frequency, the midi note and the length of the note too, this provided me with enough musical data to start working on the

compositional process and create the music in the spectral form, the methods in the past would normally be using spectrograms and using data to find the frequency and then eventual note to be played, because of my limited knowledge using spectrograms I found this method and software to be very user friendly and allow me the creative freedom to start using the musical data and then transforming what I had in terms of music data, notes, midi, and frequency and then start creating the compositions, which is where the fundamental idea and practise is and should be taking place.

The initial steps that happened was to find enough data to use to create my compositions and what I found with my first draft of a Grisey score was that the data that I collected using one source sound which was a cello sample playing with little vibrato, was not enough, the data had a rich use of sound and when composing the music using certain style techniques that are employed by Grisey, I found that the musical data that I had collected was not enough, and with this in mind I had to research more in-depth techniques of the composer to find a way of creating music, but also having enough material and data to compose more than 16 bars of music. Upon my research I found that Grisey and the other composers would be using more than one source to analyse and use within their research and data collection, and I then employed this idea as well, and started to source more material to use and analyse, I found that certain sounds would be either not suitable and they would fall into the category of treble instruments such as violins, flutes, but also instruments that would be in and around the middle frequency range like guitars, I was hoping to use my initiative and find a sound that would be unique and different and have that as either a starting point or for the full analysis of one particular composition. These

sounds would be field recordings and sounds that weren't necessarily musical, such as car sounds, booming sounds of construction and the sounds that weren't musical but could be used in the musical context. And from my analysis and research I found the sounds to be very confusing in the spectrum of spear, because there was just chaos or so much of a contrast using harmonic and in-harmonic data that the compositional sound would start to resemble a very muddy and almost nonsense composition.

So, with these early experiments with sound and ideas, I decided to visit the drawing board and look at what was available but also what would make musical sense.

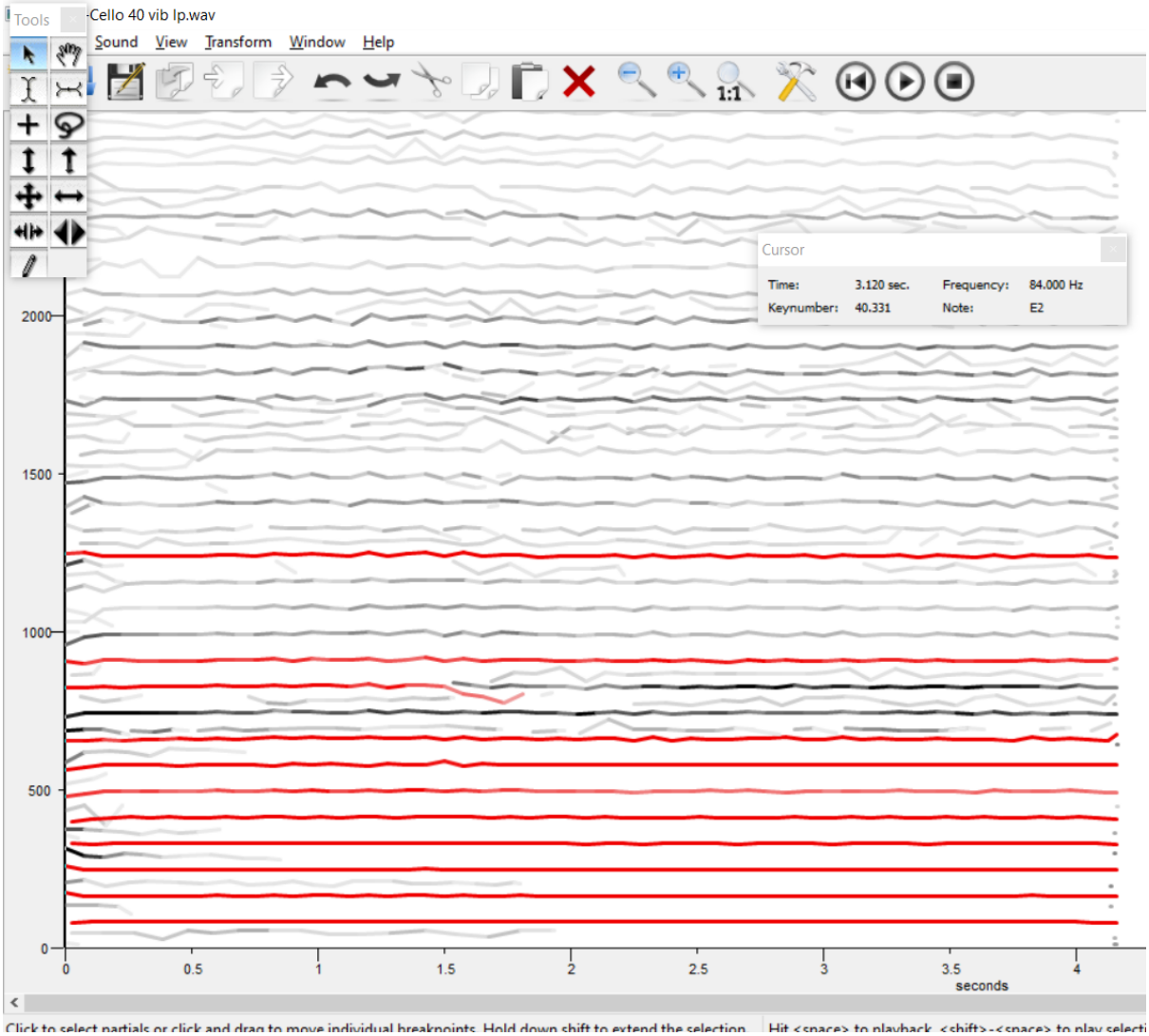
I went with a musical approach and kept the idea more simple, and it would be here that I would use low sounding orchestral instruments, I began using brass, but for my own musical composition ideas I didn't particularly like the data that they had given me, and then I started using a combination of Bass and Cello sounds, but using certain techniques such a vibrato, or being muted, I found within my research these sounds would give me enough analysis, but also would stay within the medium of what I was trying to write and that would be string music in a quartet setting, and because the rich spectra of these instruments gave me enough scope and ideas in music data, I felt confident using these sources to start analysing and adding to my compositional ideas that I wanted to explore. And because the music would be in the musical setting of a string quartet, I felt comfortable knowing that I wouldn't stray to far of the path with my musical goals.

3.2 Writing the Score.

Grisey's Theory:

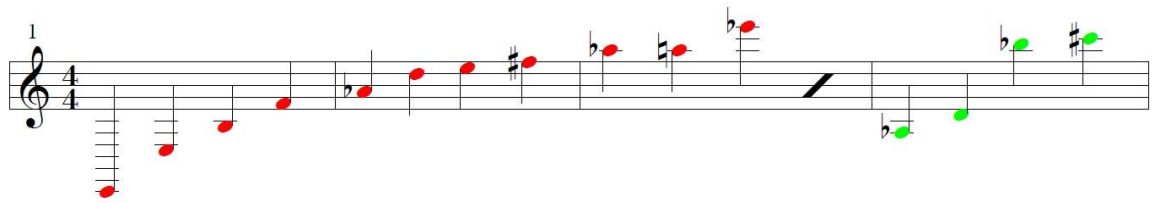
The first set of data that I began to use were for the compositions that were in the style of Gerard Grisey, because he was one of the founding people to create the spectral movement. I tried to give his music and my own enough musical justice to stay within the techniques and ideas that were originally created by Grisey himself. My first set of analyses and score was too short, and I didn't have enough data to fulfil the arrangement of the music, so I tried adding more data into the mix and I analysed the data and spectra of a Cello using vibrato, and the results were very interesting and gave me enough data to work with, to start my composition.

Example 2 Harmonic spectra Grisey Cello Vib.



As you can see in example 2, the data for harmonic notes and data were very strong and gave me enough data and spectra to work with, I then decided to take this data and arrange them into the instruments I would be writing for which was a string quartet.

Example 3 Notation of Cello Analysis



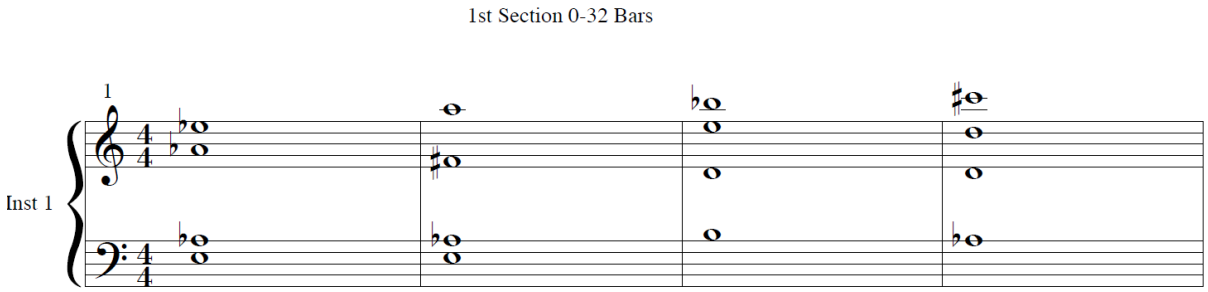
In example 3, I have notated the data from the cello Vib spectra into a chart to show the notes that were used for the composition. The red notes are what would be considered the harmonic notes (notes that do not clash with the harmonic series from the note in the analysis) and the green notes that wouldn't normally be within the notes present in the scale or harmonic series of the note E.

This notated system would make up the first section of my composition, I would take these notes and randomise their structure into a series of notes that would make up a chord, to which I could then start writing my composition.

Instrument	Chord	Chord	Chord	Chord
Violin 1	Eb 6	A5	Bb5	C#5
Violin 2	G#5	F#5	E5	D5
Viola	G#4	E4	D3	
Cello	E2	E3	B3	G#2
Chord type	E maj 7	E9/11	Bm ma7/11	Db5 add 9

The music would be in the traditional arrangements of string quartet, with first Violin on top and Cello at the bottom of order. I took the notes and used a random approach to coming up with the chords till they sounded aesthetically pleasing to my ear, my method was literally taking one of the notes and giving it to each instrument in turn until the made up a pleasing sounding chord that I could use within my composition. I used most of the harmonic notes and few of the enharmonic notes till they made up each individual chord, as I wanted to have an interesting chord voicing movement throughout my composition.

Example 4: notes used for 0-32 bars.



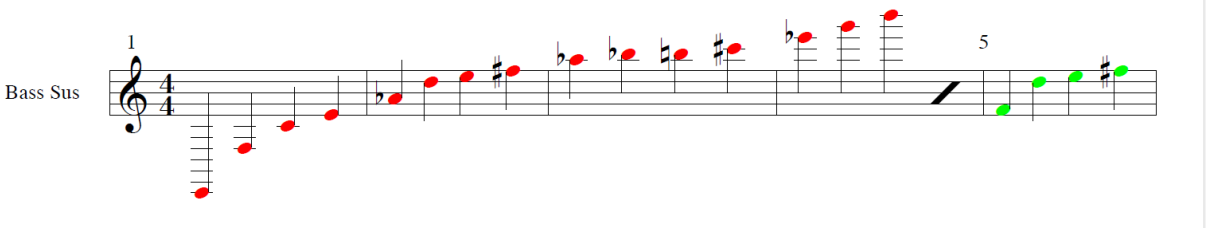
Example 3 shows how I divided the notes into chords and based the harmony on the data that I received from Spear. What was very interesting was the rich use of harmony I extracted from the data. The chords made up some interesting harmony and not what was expected.

1. Chord 1 Emaj7
2. Chord 2 E9/11
3. Chord 3 Bm maj7/11
4. Chord 4 Db5 no3/add9

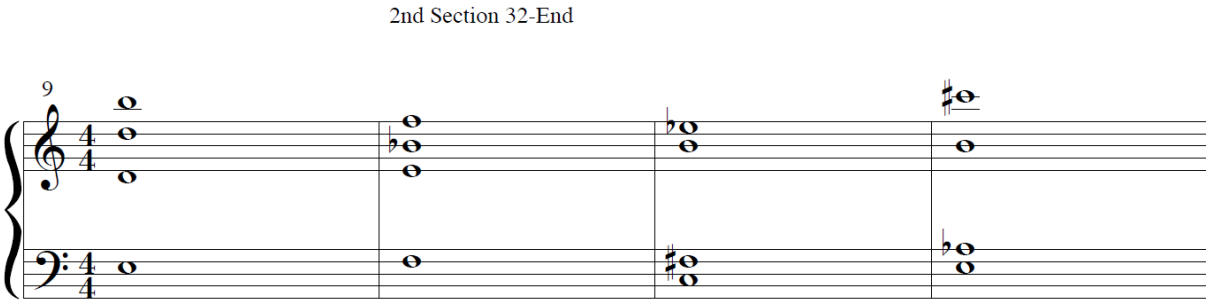
I was expecting to have some dissonance when using these spectra, but the actual harmony was quite interesting and almost has jazz style chord voicings. How I evolved these chords was to use in-harmonic notes to create interest and to also create movement. Because writing for strings takes a rich understanding of harmony theory and understanding, I used a ‘less is more’ approach to writing this music than using structured movement from the past. With the use of in-harmonic notes I used extended techniques and ideas to create interest in the music and to have movement, using such ideas as Glissandos, tremolos, and granular bow pressure. I found the use of these ideas created a sense of movement and flowed from one section to another, and because the strings were in a chamber ensemble, it allowed enough freedom to hear the strings play these notes and create my overall composition.

An important factor which is to be noted is that I didn’t use microtones in the traditional sense of how Grisey used them. These tones would normally be found in the analysis of a spectrogram and be discovered by working out the frequency of each individual note and whenever they would be a certain frequency in-between each note of the relative pitch of standard 440 tuning. I was not sure on how to find these notes on the spear program, but also, I did not know how to write these notes either. So, within my composition I used extended techniques to perform slight movements that would give certain tones in between notes such as glissandos. Because the glissando would slide between notes when moving, you would hear microtones being played, these would be the frequencies that are not normally present within the written composition, but because of the technique being used, you can hear the microtones being performed.

Example 5 Bass Sus notation:



Example 6 2nd section.



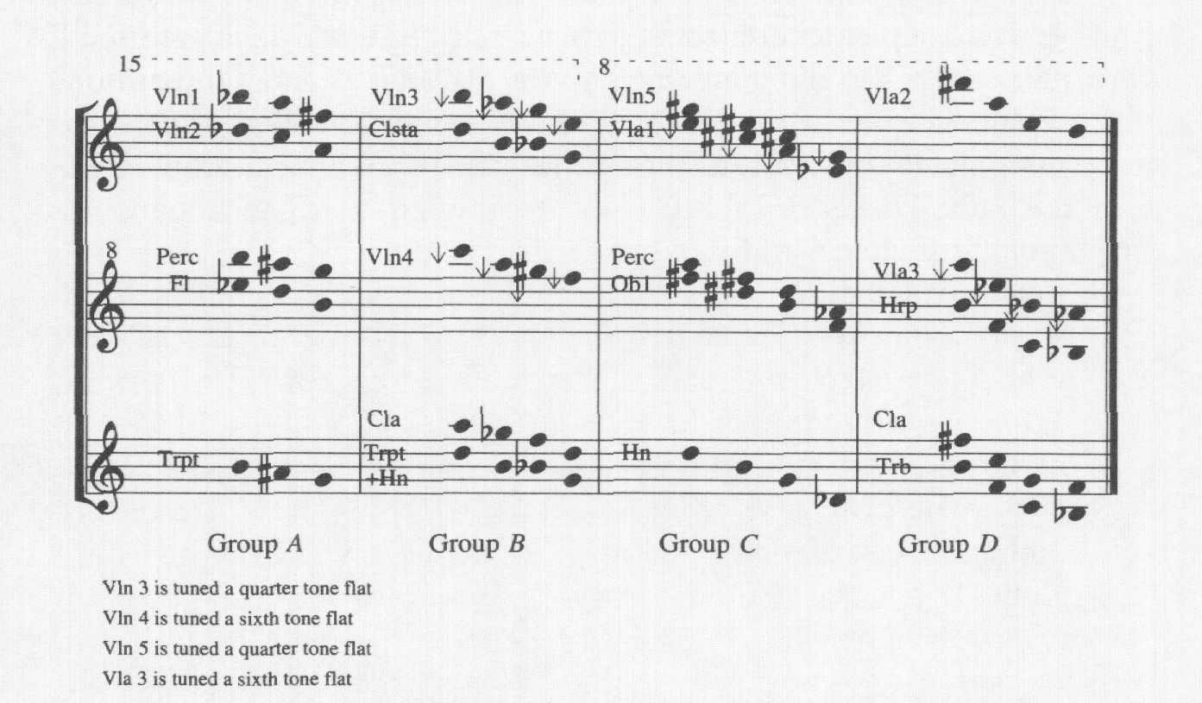
Example 5and 6 shows the notes that I got from a different analysis. I wanted to change the overall harmony and to see what another instrument would give. This spectra was given through the data of double bass, the harmony was a lot larger and the harmonic overtones more vast that expected. Again, they gave way to some interesting voicings.

1. Chord 1 E 6/9
2. Chord 2 F 7/11
3. Chord 3 Cdim-maj7
4. Chord 4 E6

Because these chords had extended harmony using added 9ths and 11 chords, they added a rich texture again to the harmony, also throwing in a diminished chord as well, which was interesting because, once again, I decided to randomise the notes from front to back and they gave me these chords. I do know that Grisey used a generative idea when creating modulations by using electronic equipment such as ring modulations and then using the data to create harmonies in the music.

The spectrum resulting from a ring modulation can be simulated when the frequency of each note of the first spectrum is combined through both addition and subtraction with the frequency of each note of the second spectrum, producing all the possible additive and subtractive combinations of the partials (Fineberg, 2000: pg.18).

He would then group the notes from the analysis and then used these as his harmonic voicings to then write the score to his music. There are still more various and interesting techniques that Grisey employed but with the overall idea of grouping the data into certain key sections of the music and then writing with the data and musical notes/frequencies, he would go on to create the structure and ideas using the data that he got from the spectrogram. Example 7 shows his use of harmony and voicings.



Example 7 Grisey Grouped chord movements for Modulations.

The one remaining factor which I wanted to pursue with the works of Grisey, was to envisage the music as he did. Even when the use of technology is involved in his work in producing data of partials to create the frequencies into notes, his main form of musical writing was still using instrumental or orchestral synthesis; this was the idea that the music would still be written for orchestral music and using the instrumentation that is involved in large grand orchestras. Because the music that I was creating would be a chamber ensemble, the relevance would be there but just on a smaller scale.

The sound complexes built this way are fundamentally different from the models on which they are based, since each component is played by an instrument with its own complex spectrum. Thus, the result is not the original model, but a new, much more complex structure inspired by that model. The sounds created in this way keep something of the coherence and quality that comes from the model while adding numerous dimensions of instrumental and timbral richness and variety (Fineberg, 2000: pg.6).

The rhythmical aspect of the composition was a challenge and something that I do not fully understand in the world of spectral music. The idea of having non-linear music and it to evolve is interesting but the compositions would be longer and longer depending on the data of the analysis. I understand that from the spectrograms and the data that Grisey extracted, he would divide the notes to the length of the analysis, for instance the longer the partial, normally the lower frequency would be played as a longer note and the shorter the frequency/note the shorter the note. How he got to decide upon the rhythmical aspect I am not sure, and because in later readings the idea is subjective to a point, it would be at least some conclusion that the music would be more focused on the partial frequency aspect than the rhythm. So I tried experimenting with different ideas, such as animal noises and calls and using the rhythm they would employ, but I found myself writing a series of rhythms and notes that would not make much sense, especially in a chamber string quartet. Maybe having the chance to flush these ideas into a larger orchestra would be more of an advantage as normally the music can progress.

I have researched and found that some of the composers would use the ideas of accelerating and de-accelerating the notes to give the form of rhythm and employ the idea of the music being divided into musical rhythmic stances; this can work to some extent, but I found within the context of my compositions using such techniques did not work and though I would have loved to use more of these anomalies, I found the use of dynamic structure and using extended techniques to evolve the rhythmical ideas would be far easier to write.[17] Plus, the use of rests and other musical ideas

[17] Fineberg, J. (2000) 'Guide to the basic concepts and techniques of spectral music', Contemporary Music Review [online], 19:2, https://doi.org/10.1080/07494460000640271 81-113, DOI:10.1080/07494460000640271 [15th January 2022]

came into play. This would give the sense of movement and use the ideas of the strings to create the illusion of rhythm, primarily the music contains long sustaining chords, but this would not be interesting without the use of colour and timbre, and I created the idea of timbre and colour by using these techniques and using musical phrasing to create the interest in the music.

Tenney Clang:

Approaching the work of James Tenney, was an interesting one and I found that his work was different in various ways, what he took from the spectral movement, and in some cases preceded what was to happen in the spectral movement.

The selection of pieces addressed below is intended to broadly survey the many facets of Tenney's spectralist output. Clang (1972) and QUINTEXT V (1972) are essential seminal works. Three Harmonic Studies, III (1974) and Spectral CANON for CONLON Nancarrow (1974) demonstrate the adaptation of frequency structures to temporal organization, while Three Indigenous Songs (1979) represents his interest in the instrumental synthesis of speech. (Wannamaker, 2000: pg.3).

What is extremely significant to point out is that four of his works pre-dated the movement of Grisey's work. It was on Partials that the movement was recognised and his work in 1975, and as you can see from the quote Tenney wrote 4 significant works before this said date.

Of all his works that had interesting qualities and such raw beauty in his works, it was Clang (1972) that stood out for me, and with my writing I wanted to homage the work he did in this with my ensemble. The existing overall effect of Tenney's Clang is a very simple one, where there are 3 clangs that start each movement, and the instrumentalists play a series of notes/frequencies until they finish all the notes that are written for them, and then the next clang would set of the next section, and this

would climax to the end with an almighty clang to finish the piece. I found this fascinating and wanted to do something similar.

Klang (2022) I.Mason:

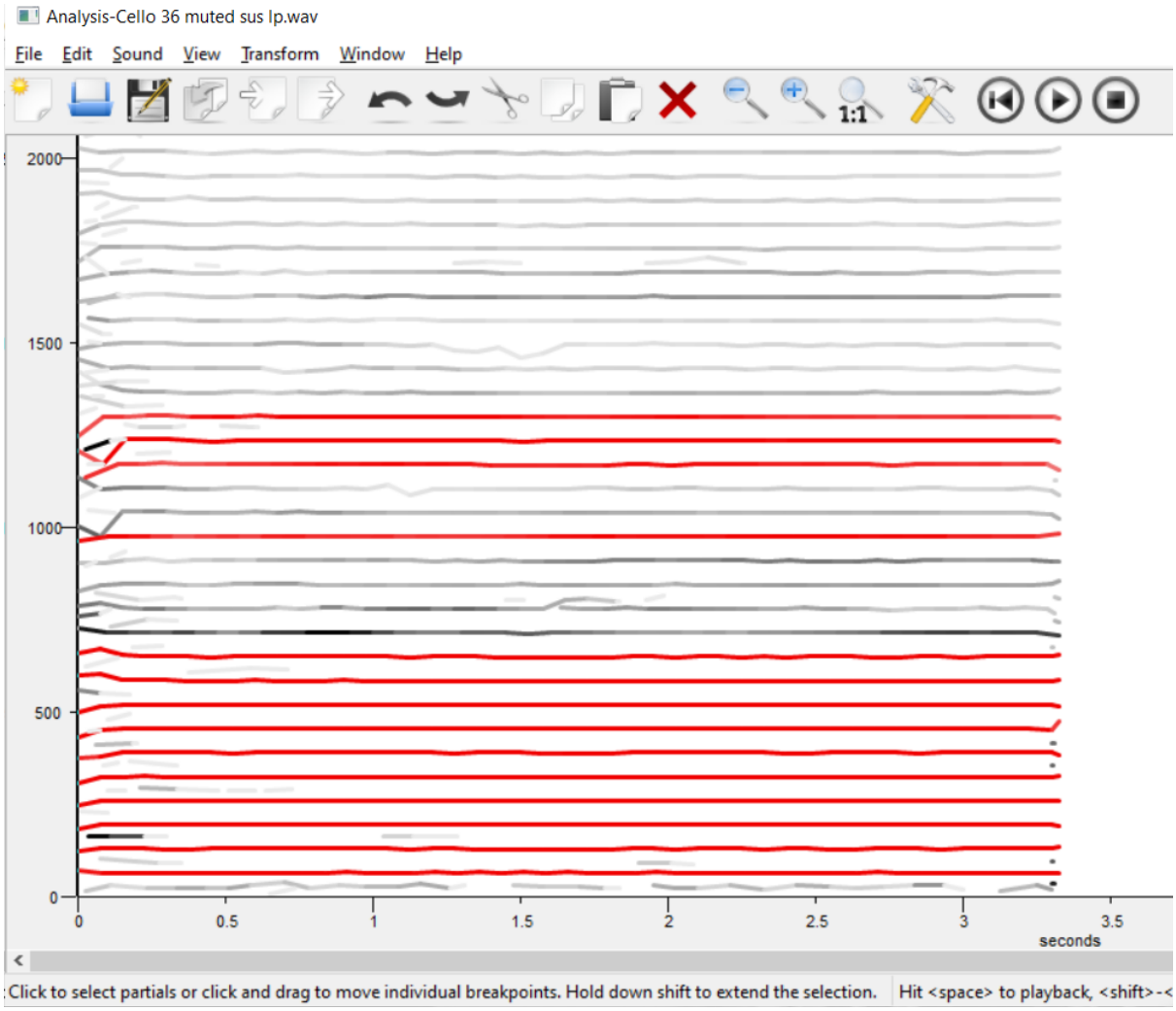
I knew the data that I had to use would be significant in the spectrum of creating and homage the work of Tenney, and I would use significant ideas that he employed in his work and follow the overall direction, but I didn't want to plagiarise him. This is an interesting point as it has been written that his work was always seen to be doing that same instance of writing in the style of his favourite composers or homage.

One of the recurrent themes of James Tenney's highly diverse musical output is an engagement with the work of other composers. From QUIET FAN for ERIK SATIE of 1970 through Spectral CANON for CONLON Nancarrow in 1974, all the way to 'Scend for Scelsi in 1996 and Song'n'Dance for Harry Partch in 1999, Tenney's compositions bear dedications to a wide range of composers whose work he admired. Besides those already mentioned, we find Ives, Vare`se, Cowell, Ruggles, Crawford, Wolpe, Cage, Xenakis, Feldman and many others. This practice manifests a desire on Tenney's part consciously to link his work to tradition: not merely the American experimental tradition, of which his own work forms so significant a part, but to aspects of twentiethcentury European music as well. (Gilmore, 2008: Pg.2)

Where I started with my composition was finding data that would act as a crystal catalyst and give me the musical data that I needed to not only write my composition but to also honour the work of Tenney, and I found once again the data analysis of string instruments to be the most significant in finding a good sense of data that would give me the notes/frequencies to write my composition.

I used a sample of a cello which was muted and took the data that I obtained from Spear to create the first instance of this work:

Example 8: Cello Muted.

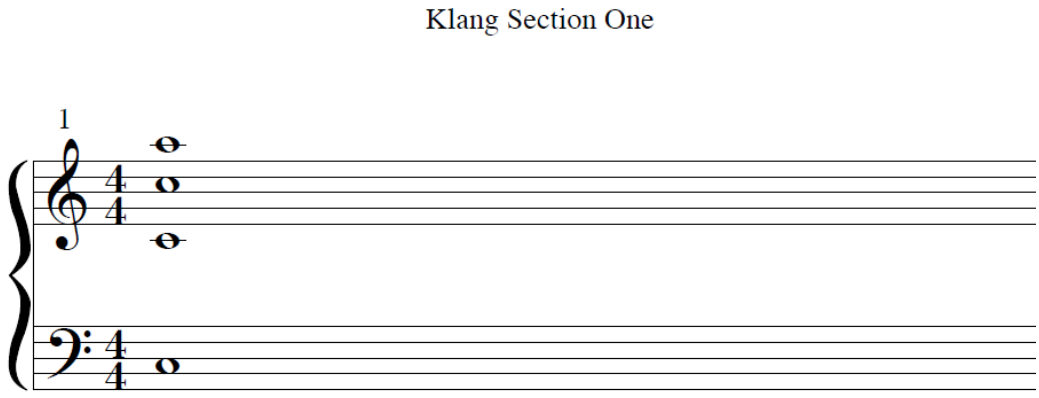


As you can see from the analysis of the cello sample, the data was rich in spectra and gave me enough to work with in terms of musical spectra and notes.

My piece is written in C, but I have not given it a major or minor tonality as the music is more about the overtones rather than a certain key factor in which to describe the music being. The music could be seen in a mode, especially when using the in-harmonic data and how that would change the scale, but also have the effect of dissonance in its overall sound.

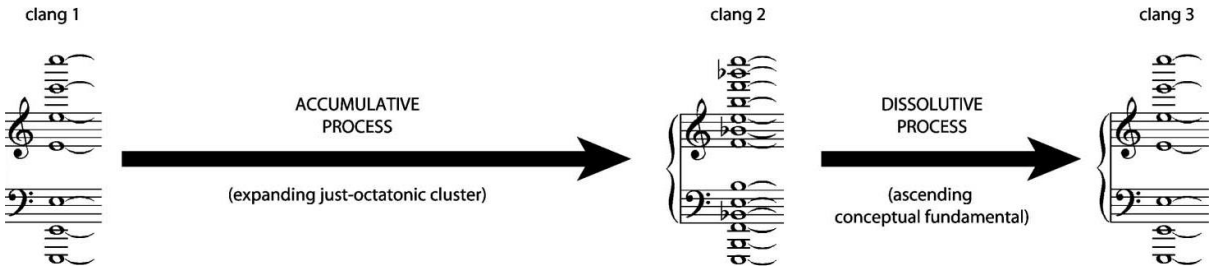
The first section of the piece contains C notes in different ranges and like Tenney the music has a push pull rubato feel to give the sense of direction and movement.

Example 9 C notes for section one.



From the data analysis it is apparent that Tenney made similar use of the same notes in the first clang followed by other notes

Example 10 Tenney chords. (Wannamaker, 2008, pg.5)

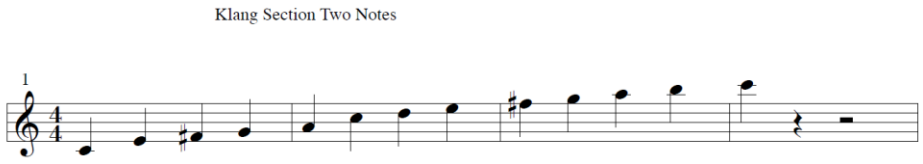


The first clang would be the series of E notes over the octaves that would be played simultaneously by the orchestra until they had played all their notes before the next clang. In my composition I did not use clangs to signify each section but came to a rest before the second section and then into the third section. Within the first section I wrote the strings using Sul tasto to have a delicate sound with the intention that this would be building and swaying into the notes to create the illusion of waves, and build up the tension of the piece, because each player only had one note to play. I

took it upon myself to give dynamics and really give the sense of movement in the music. The idea of holding and sustaining a long note would be tedious and I wanted to add a sense of direction and drama to the strings and make sure that it would not be just a continuous drone sound.

The second section of this used the in-harmonic notes which primarily consisted of just one note F#. Even with the data giving me other information with in-harmonic results, I found that the notes clashed in an odd way, not dissonant but just odd, but the resulting use of the F# made the second section not only dissonant but also have a sense of movement. It was here that I used more notes from the spectral data to give the piece more drama and edge to start building up the tension. As stated above, the sound using the F# would bring a sound of the mode C Lydian; this brought about a more major tonality and a brightness to the sound.

Example 11 C Lydian data from analysis.

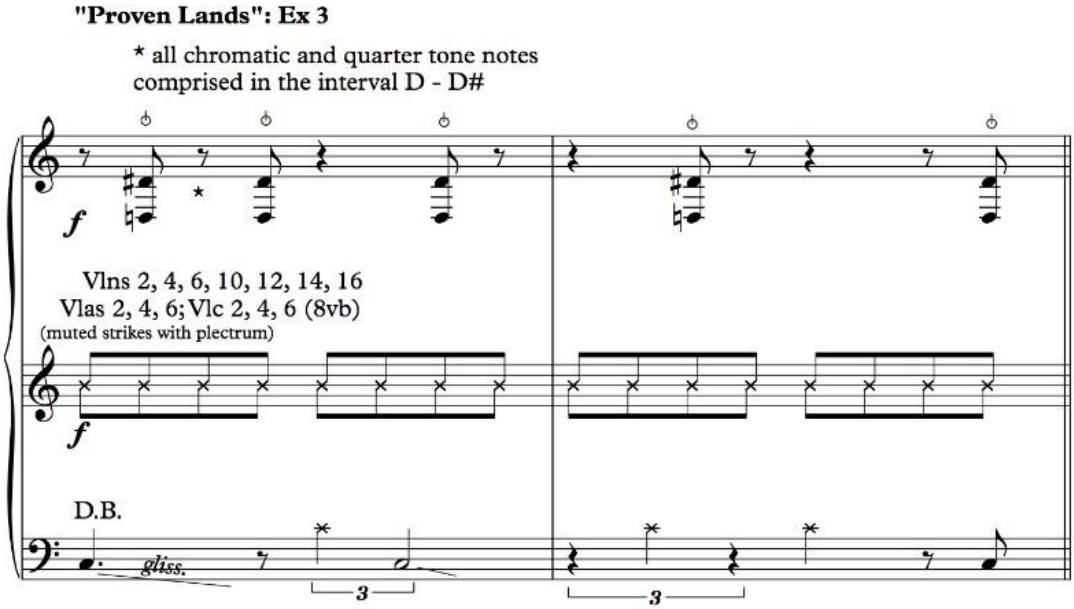


What I have discovered in my research and investigation into the spectral movement is that the composers took risks in order to change their music and try new ideas and techniques that they may have not thought of otherwise, so with this in mind, in the last section I wanted to take the idea of spectral understanding and, like Tenney, experiment with sound and rhythm, so I decided to write the last section of this movement into a percussive drum machine style movement, because the use of

rhythm and the ideas in which they would be perceived are subjective from one movement to another, and more significantly one composer to another. I decided to break up the use of sustaining notes to a pulse moving percussive ending.

This section is my homage to modern composers today and their use of ideas and musical knowledge to try something new, with musical composers such as Jonny Greenwood and his work on film scores[18], and the work of Valgeir Sigurðsson and his work not only with the composers on the Bedroom community label but also with his solo work.

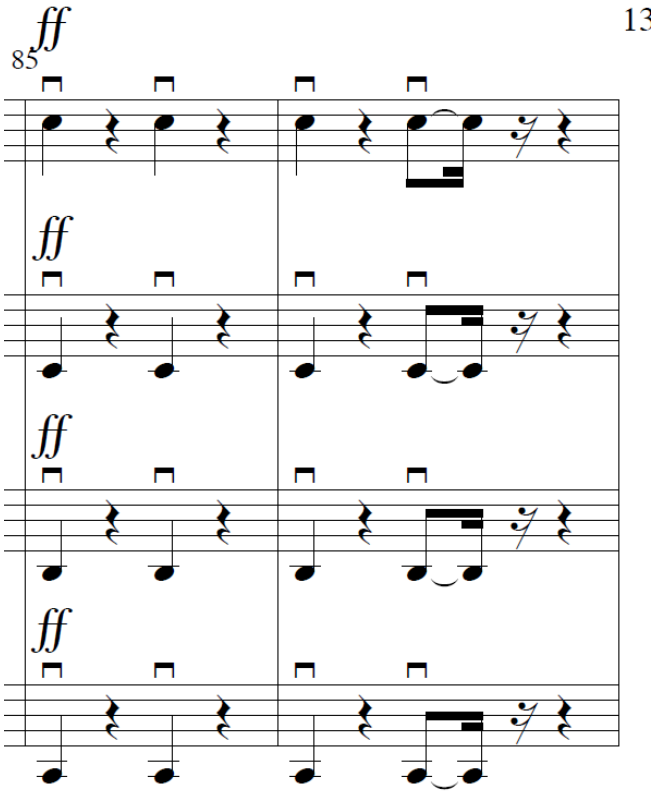
Example 12 Jonny Greenwood score There will be Blood.



[18] Faustini, F. 'How Jonny Greenwood Uses Materiality, Clusters, and Aleatoricism in His Film Music' [online] https://flypaper.soundfly.com/write/jonny-greenwood-uses-materiality-clusters-aleatoricism-film-music/ [23rd April 2023]

What I admire about Tenney was that he left the sense of ego at the door and wrote either similarly to his favourite composers, or gave a huge homage to them, and this is fascinating and something that I wanted to explore here with the last section of the piece. The string instruments now take on the responsibility of being a kick drum in the cello, a snare in the viola, and hi-hats in the violins and other percussive ideas in the other violin. It brings the piece to a climatic ending of down stroke beats that makes this homage to clang by James Tenney embody a more overall sense of respect but also fun. Like his work, they carry the personality of Tenney and I wanted to express this in my music for Tenney.

Example 13 End section of Klang.



Tenney commented: 'For me the ''merit'' that is honored is that of the ''ancestors'' themselves. Who these are should be evident in the numerous dedications in the titles of my pieces . . . .My highest hope right now is that my own enthusiasm might be contagious' (Tenney, 1978). We need have no doubt that, through a body of music filled with family resemblances to 'ancestors' and friends, James Tenney's enthusiasm will reach many generations to come. (Tenney 1978,cited Gilmore, 2008: pg.13)

Kaija Textures:

It is hard to know where to begin with the works of Kaija Saariaho. Her work covers the breadth of the musical landscape in the modern classical style. She is well versed in the use of electronics and acoustic music but also many other forms. Where I explore now is the solo cello works and how I related them into my composition. The main example of Kaijas work when it comes to the solo cello movement is the use of extended techniques and tunings of the cello. This plays a pivotal part to the use of techniques and the harmonics that are present in such works as Sept Papillons for Solo Cello and Spins and Spells.[19] Of all her work, which is extensive, these cello pieces really resonated with me, and I wanted to explore how she arrived at these compositions and how they evolved into the soundscape of extended techniques and at the same time absolute beauty.

One parallel composition technique in Kaijas work is the use of timbre and this plays a pivotal role in her music. The use of timbre and the use of extended techniques become more of an important role that the use of notes or frequencies.

The notion I designate by the generic term "timbre" is obviously already a synthesis of several elements. Amongst these I would mention the purity of sound (including the idea pure/noisy) and its texture (grainy/smooth) which for me have a particular importance. These parameters are themselves groupings of several distinctive characteristics; the terms that I use in the context of my work are subjective and unconventional, and have actually nothing in common with the usual psychoacoustic terminology (Saariaho,1987: pg. 2).

When approaching her work, I knew it would be with an educated mind and the use of theory would play a pivotal role in my practice as the use of extended techniques would have to be applied with various amounts of intelligence and several techniques to make the music work as a whole. Because I was working with a

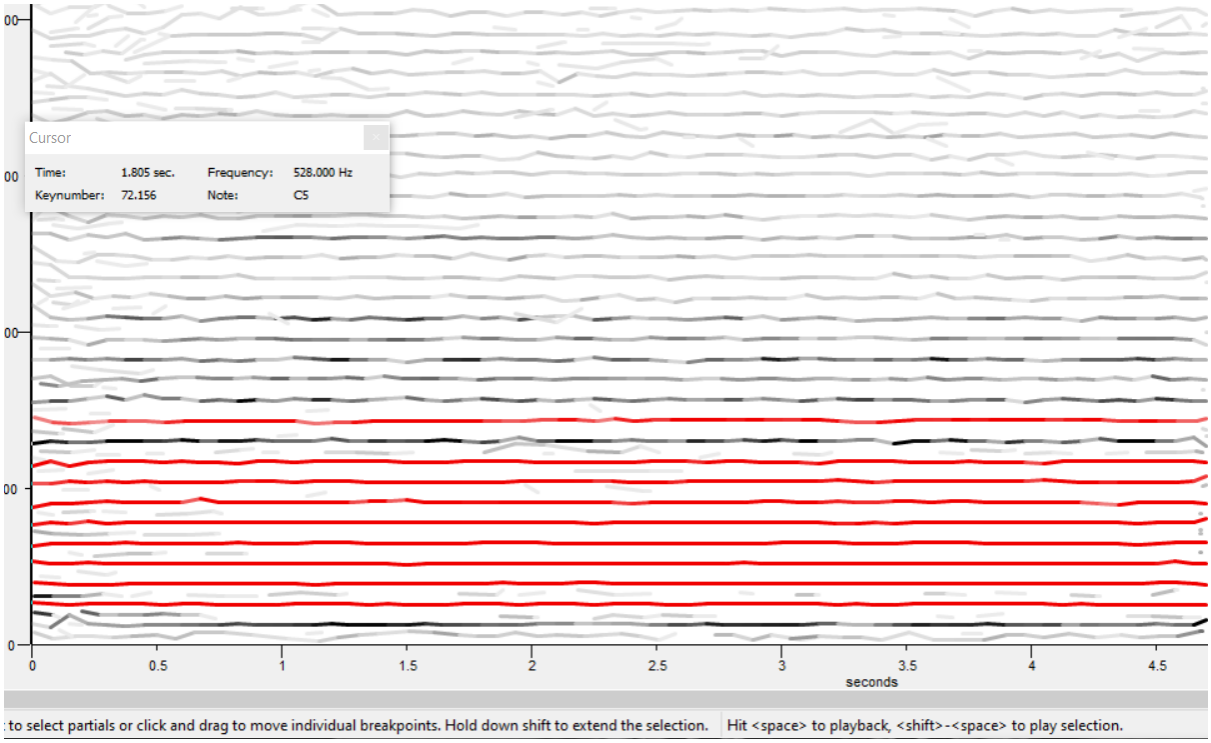
[19] Adam Schreiber music (2018) Kaija Saariaho - Spins and Spells for Cello Solo (1996) [score + audio] available at https://youtu.be/J5Qp-L99cmo (accessed 15th March 2022)

quartet and did not include a solo cello, as well the order of making the music work within the strings, I wanted to highlight the use of the cello but in the context of the string quartet, to discover how its use of timbre would affect the musical composition. The idea of timbre and the dynamics of the strings would also play a role as the music of Kaija's is very expressive and I wanted this aspect of what she does to play in my music. I know her music is challenging, and I know my background is not within the discipline of a classical performer, so this gave me not only a difficult challenge to write for but also execute the music to the desired effect, which Kaija effortlessly displays in her music.

The challenge of finding enough data and knowledge of extended techniques with string music was surprising. I do believe that there is probably a better source for finding this out, but I did find enough to add to the composition. I would, if the chance arises to work with string players again, workshop and find out from a cellist or musician how to go about writing and using such techniques and how this would work in the context of my composition. However, for now I worked with what I knew, and I wrote the music knowing that within this composition there would be sections dedicated to the use of extended techniques. It would be here that the overall use of dynamics and timbre would play a major role in the composition and demonstrate some techniques which Kaija might have used.

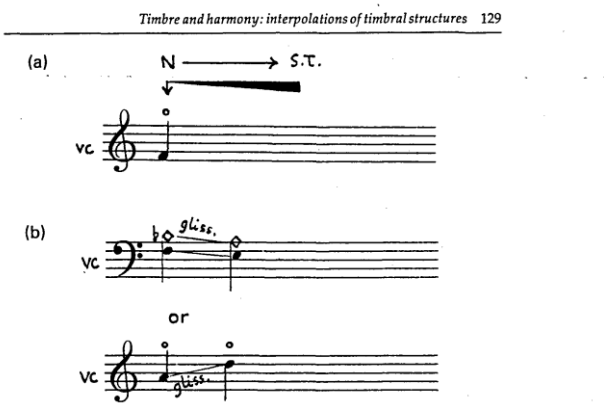
Data for this composition was limited to a certain range of notes and the use of techniques was on display. The main source of data came from the sound of a muted cello playing harmonics. My initial thoughts were that the music would involve a degree of techniques, and to use something that may sound different.

Example 14 music analysis of harmonic muted cello



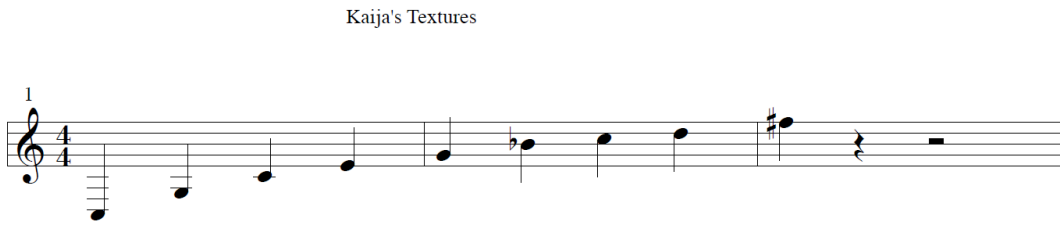
Throughout the piece I wanted the music to be lively and focus on the pulse of the strings playing sixteenth figure which holds the music. This was also used as the focus on dynamics from melodic to then dissonance when the cello played a series of extended techniques. Another challenge was to incorporate the strings to use techniques and still move within the pulse of the composition, and the use of glissando, which became the fulfilling technique. By adding bow pressure in one register and then having the music move at pace became a great sound and something that I used from Kaijas techniques.

Example 15 the use of bowing techniques in Kaijas works.



When it comes to the actual physical use of harmony the required notes are quite limited and it then becomes more about the use of timbre:

Example 16 Notes for Kaijas Textures.



The notes made up the figures used throughout the composition and the only use of in-harmonic notes was the Eb but the overall sound was about timbre and the use of dynamic and extended techniques. I might add the figures and rhythms as well presented in this composition are made up of arpeggios and not chords, again using and vitalising the use of the string players and their range of techniques became the focus for the music written.

Kaija's cello works are taken from the spectral ideas, and I do believe she used the data for this, but my understanding of using extended techniques and composing is limited. However, the overall intention was to use certain notes and sounds which were spectral. Kaija bases her music on an axis of how she would approach her

music, using the idea of timbre and harmony being the same; these are very much spectral ideas, and the use of timbre has always been in the forefront of what spectral composers apply to their music. Here she explains what can be seen or used on this axis basis:

The transitions which here are the basis of the harmony again arise from an application of the sound/noise axis. This time the string harmonics correspond to the "consonance" end of this axis, whereas "dissonance" is represented by noisy sounds broken up into multiphonics. Here the areas of timbre and harmony coalesce in so far as different kinds of playing are associated with the harmony. It is thus that a chord "under tension" can be played with an over-pressure of the bow, like the sound originally analyzed which had served to produce the chord in question. (Saariaho, 1987: pg. 39)

How timbre is used is an integral part of spectral music, but it also becomes interesting in the idea of moving away from traditional harmony and musical practice. As composers, when writing music, we rely on what we know and how we have been taught. A question to ask is whether the musical teachings of western harmony have or can evolve, but with Kaijas work what eludes me is the use of extended techniques and how these are related to spectral music.

3.3 Rehearsal and Recording.

The recording and rehearsal of the three pieces took place at the Sherwell lecture theatre at the University of Plymouth.

I recorded and rehearsed the string quartet using AKG C414 microphones in a X-Y recording method to get an overall stereo recording as well as to not lose much on mono capability as I did not want to lose the sound of the recordings when people listen on mono speakers such as mobile phones and laptop computers.

The recording and rehearsal took place over a couple of hours which is difficult to do with certain pieces to make sure that the sound quality of the recordings and the performances were good enough to represent the writing of these compositions.

I had set up another two microphones for the room ambience, but I found that rehearsing and recording the quartet on my own was difficult and, because the time was limited, I would have preferred more time to listen and set up the recording room and would have tried several other microphone placements to capture more of the strings and to achieve a better setup of the ambience in the room.

Such techniques I would have used would have been stereo imaging the microphones to catch not only the strings but also the room and to try and capture the room reverb which I detected had roughly a 1 sec tail of sound, which would have been great to record. Another technique especially on certain instruments would be close mic setup on each of the instruments; this can and would help when mixing the string players. Also, another favoured technique would have been to use the famous Decca Tree and have the microphones up high around the height of 8 feet; this would not only record the strings well but would have found a nice overall ambience to the room.

With the rehearsal of the compositions, I found that on certain pieces, if I had more time, I would have preferred to have rehearsed longer before recording on the same night. There were aspects of the compositions that the quartet struggled with and upon having a second chance I would have preferred to have had two days to do such a task of rehearsing and recording the music I had composed.

An aspect of this thesis that I have probably not stated or even thought about is that I would not only be the composer but also the engineer and conductor as well. On some of the pieces the quartet were used to having a conductor and I found myself in that position. I think having this extra task put upon me gave me less time to work on the engineering side. This was also impeded because the quartet needed longer to rehearse the compositions. Two of the compositions were close to what I intended which were Grisey's Theory and Klang, with Kaija's Textures, I found the overall result was disappointing, I have included this in the appendix, but the results speak for itself, the music was clearly not rehearsed and this shows, as with the lead up to the recordings they struggled not only with the tempo, but the actual articulation of the music too. I am very perplexed to why this was an issue, but this can be heard in the recordings which I will submit.

I did not find my writing to be that complex in nature, but clearly this was the issue, I think I would find more open minded and rehearsed musicians next time who would be more capable of playing modern classical music.

Chapter 4

Compare & Contrast:

When approaching this thesis and the task of writing in the style of these composers, the idea of comparing my music to theirs appeared to be an incredible task that would be not only a difficult challenge but also a conceit in that my music could be the same or even in their league of writing music.

There is an obvious tension between what and where we come from and the fact that my musical upbringing is completely different to that of the composers in question. I have not studied classical music and my background is from a popular music environment.

The initial idea that was difficult to deal with was also the length of time it takes to write such compositions. Only having a window of a couple of months and having other tasks kept me from further exploration of writing the music, I would have taken the opportunity to workshop the music and learn more about the string instruments but also the availability of different techniques and how I could have found a way of writing for these instruments.

In addition, it would have been ideal to have worked with musicians who had explored or at least rehearsed extended techniques or just modern classical music in general. My experience was that they were not used to playing different modern music and that showed in the recording experience.

A key aspect of my work and the works of said composers also is that they were commissioned to write the music and the time and balance of writing music for the orchestra would have played such a vital role in the development of the compositional practise.

My knowledge of the string quartet and modern classical music is limited to what I know and what I have researched, but I would say that the music I wrote is not that far removed from the composers in question yet also not that far removed from just music in general.

When it comes to the works of Kaija, I know I did not have nearly enough musical knowledge to write such a long piece using extensively string techniques that use extended techniques and approaches to the instruments. I would now write separately for the cello as Kaija did, but, at the time, I wanted to write for a chamber ensemble and I think that may have been a mistake on my part, because it is difficult to write a piece with extended techniques involving more than one player. This is far beyond my knowledge and experiences.

In terms of techniques and ideas when talking about the Grisey composition, I did write a suitable piece of music. It is not strictly in the same form as his, but the techniques that he used I used, and, overall, the music comes across as something that may have come out of this movement of music and musicians.

I found the composition had traces of his works such as modulations and partials. I tried to employ the same sound and techniques and the manner of dynamics too, as the music that comes out of the spectral movement is very dynamic when it comes to their works. I believe this is due to the use of notes and frequencies that are used in the works and compositions. For this my own work is close and the extended techniques are used a similar fashion. I would say that having had the chance to write in movements or such forms, the compositional style of Gerard Grisey would have been stricter.

When writing in the style of Tenney, I found this to be simpler challenge in one respect but more difficult in others. The piece that inspired me to try and replicate it was Clang (1972). Even when it does sound easy in parts, the execution of the music and the wide use of dynamics to create an overall effect of movement and change within the music was very challenging. His first movement is made up of one note being played by various instruments, this is where the use of dynamics, bowing and the subtle use of techniques comes massively into practise. I wanted the music to flow, and I relied on these effects to create my first movement too. Just changing the registers in the strings and bringing the players in at different times and having them move independently from one another and using heavy dynamics helped the progress of this first movement.

Within the second movement is where I struggled with time and comparing my music with Tenney. His music takes on more dynamics and notes and becomes an ever-evolving landscape of notes and frequencies, whilst with mine, I wrote music to have a falling approach to the music; the idea was to have the feel of notes falling from a high shelf and almost completely collapsing in on itself. This was just the idea I had upon using the word Klang as the title, something had to fall or ‘Klang’ in the music and this was me sound painting this conceptual idea.

Where I wanted to move in the final movement is completely different from Tenney. His music begins and ends with a clang sound. This emphasis on starting and ending was very much suited to this music, but for me I wanted to take it somewhere different and as its about clanging notes and such, my idea was to evolve the sound into something different, and that was percussive.

So, I challenged myself to write the strings as if they were a drum machine and use complex rhythms to create something that would clang in different textures and

rhythms as compared to the slow evolving movements of the first two sections; this would finally raise itself to a large grain.

The end movement is made up of two rhythmical sections, one being a laid-back drum groove in a pop sensibility where it is an almost standard drumbeat, the second was in the vein of Bernard Hermann rhythm where the strings were struck in violent sixteenth rhythms and had a hard emphasis on being syncopated and off kilter; this played out to the final few bars where the string quartet played as one on heavy downbeats to bring the overall piece to a climatic final conclusion.

Conclusion:

My journey writing this thesis and working on this large project has been an enormous challenge for me. Not only did I not know anything about these composers or the movement that happened during the 1970s, but also, I have never written music in this style or even tried to understand the complex nature of classical music writing, yet alone know how these would be written in a composition.

The question I have been exploring, investigating, and trying to understand is why composers would use such a limited palette of sounds, only using the spectra of one musical note and creating a full orchestral movement, but also the overall challenge of changing what they knew. This becomes in some ways quite a ridiculous notion of not using what you know to create something you aspire to create. Paraphrasing the quote, you learn everything, then break the rules, but why limit the rules of what you want to create. This is the question and from my research one elusive idea and concept did keep rising from the composers in question but also from the people involved in the movement and this was one that I expected them to evolve to, yet from my first initial research I didn't think this would be the main conclusion to their work.

What was surmised was that when it came to creating the music from one specific note or spectra which these composers would devise their data from, they took what they needed and did not necessarily follow the same procedure of keeping to the limited palette of colours. This became for me upon my research quite a revelation although one that did not surprise me, being a musician and composer myself.

For the most part the music that was formulated was just a rebellious notion of what came before it, and the composers took this idea of data and spectrogram analysis and used this as the idea or form from which they would write music.

This position may seem ironic, since at a certain point the 'spectral movement' was seen as a reaction against the 'avant-garde'. And clearly it was a reaction against certain composers who believed that they were the avant-garde. But, in reality, it was a reaction against their refusal to make even the slightest concessions to the phenomena of auditory perception. Abstract combinations on paper are not musical research. As a result, we fought against this type of musical behavior. However, we were not the only ones to criticize that music which was so prevalent during the late-sixties and early seventies. Advocates of the music I referred to above as disguised academicism accused the so-called 'avantgarde' of emptying the concert halls and alienating the listeners through their decadence and excesses and, in a certain manner, their criticism was justified. However, one need not respond to these criticisms as they have (Murail, 2000: pg.3).

As in all music genres the younger generation is and should always be rebelling yet showing a tribute to their peers and influences; therefore, music evolves, and this is always the reason why music can change and influence so much in terms of emotion and feeling, because it has the rebellious streak of taking something and making it new, be that in classical music or in the mainstream.

Today there are not many people who call themselves spectral composers, the most noticeable would-be Joshua Fineberg and Georg Friedrich Haas[2021] who have written music within the last 20 years which use spectral techniques, also the contemporary artist Deru (Benjamin Wynn) who wrote his album Torn in Two which used spectral compositional ideas and MPE to create an album using such techniques. [22]

The strong contradictions of this movement and how it evolved into what it became is a very interesting one and the unusual fact that the music is not written in great detail was peculiar to me, because it clearly showed that the music was of a rebellious nature, but also it showed that the music was clearly evolving into a beast that

[20] Sihyeon Choe (2015) Georg Friedrich Haas - String Quartet No.2 (1998) Available at https://youtu.be/gnDmycfIweI (Accessed 20th May 2022)
[21] Classical Nerd (2022) Spectralism: An Introduction Available at https://youtu.be/Smw1qwk-hW4 (Accessed 20th September 2022)
[22] Music Radar Tech (2019) Steinberg Studio Sessions: Deru – Part 1 Sept 11th Available at https://youtu.be/dGJLLIJS4is (Accessed 25th January 2022)

maybe the public were not ready for. It is likely therefore, that this, as their contemporaries before them, hindered their own use of sticking to such methods. This is possibly why these composers sparingly used the idea of links in their music to spectral music making.

> *This was really a very new way of writing music and was perhaps what most shocked a certain part of the musical establishment. Formally, the music was built on principles completely different from other widely accepted techniques. Development by proliferation, which is so easily recognized, was abandoned as was the systematic use of oppositions and dialectics. This was even more shocking than the unusual sonorities and I now think that this was the most novel aspect of spectral music* (Murail, 2000: pg. 4).

Challenging myself and my musical knowledge was difficult as I have never written music like this before. I tried adhering to the strict form of what the movement represented, and at times think my approach was satisfactory, but my keen sense of taking a musical phrase and trying to do or create something was restricted by the spectral ideals. This was a major challenge for me. There were notes I could not necessarily use, or key changes or any musical idea or knowledge, because I was limited to the ideals of the data analysis. So, investigating more and learning about the individual composers, I discovered that they took the notion of the spectral ideals but used them to either inspire or just begin a new composition, and this was the revelation for me. It was here that I used this concept and especially in the pieces inspired by Kaija, and Tenney, I used certain methods and ideas to create something different from what I would have previously done in the past as a writer.

I suppose what this all meant was trying to find new ways and ideas to create music. We can all be inspired by one another, but to be completely unique and radical and different takes something more. Perhaps this what the spectral movement was demonstrating; the composers had the rebellious nature of protesting against the past, but because there is such a strong tradition in classical music, this was their

own world in which they broke their rules and others' and created something that was radical for the time. Being the artist who breaks free of convention is always a daunting task, especially when it might not work. I respect the clear notion that they tried something new, they broke the rules, and they created something that was uniquely theirs, and let's face it, how many people can say that?

References

Adam Schreiber music (2018) *Kaija Saariaho - Spins and Spells for Cello Solo (1996) [score + audio]* available at https://youtu.be/J5Qp-L99cmo (accessed 15th March 2022)

Anderson, J. (2000) 'A provisional history of spectral music', *Contemporary Music Review* [online], 19:2, https://doi.org/10.1080/07494460000640231 7-22, DOI: 10.1080/07494460000640231 [15th January 2022]

Ball, P. (2011) *Schoenberg, serialism and cognition: Whose fault if No one listens?,* Interdisciplinary Science Reviews, 36:1, https://doi.org/10.1179/030801811X12941390545645 24-41, DOI:10.1179/030801811X12941390545645 [23rd February 2022]

Belanna111 (2015) *Les Espaces Acoustiques – I – Prologue, for viola and optional live electronics (1976)* Oct 11th Available at https://youtu.be/3FY0yLd2AB4 (Accessed 15th April 2022)

Bernard, JW. (1993) *The Minimalist Aesthetic in the Plastic Arts and in Music* Source: Perspectives of New Music , Winter, 1993, Vol. 31, No. 1 https://www.jstor.org/stable/833043 pp. 86- 132 [17th March 2022]

Bernard, JW (1994) *Voice Leading as a Spatial Function in the Music of Ligeti* Vol. 13, No. 2/3, https://www.jstor.org/stable/854260 pp. 227-253 [20th March 2022]

Classical Nerd (2022*) Spectralism: An Introduction* Available at https://youtu.be/Smw1qwk-hW4 (Accessed 20th September 2022)

Fineberg, J. (2000) 'Guide to the basic concepts and techniques of spectral music*', Contemporary Music Review* [online], 19:2, https://doi.org/10.1080/07494460000640271 81-113, DOI:10.1080/07494460000640271 [15th January 2022]

Fineberg, J. (2000) 'Spectral music', *Contemporary Music Review* [online], 19:2, https://doi.org/10.1080/07494460000640221 1-5, DOI:10.1080/07494460000640221 [4th January 2022]

Faustini, F. ‘How Jonny Greenwood Uses Materiality, Clusters, and Aleatoricism in His Film Music’ [online] https://flypaper.soundfly.com/write/jonny-greenwood-uses-materiality-clusters-aleatoricism-film-music/ [23rd April 2023]

Gilmore, B. (2008) ‘James Tenney and the Poetics of Homage’, *Contemporary Music Review* [online], 27:1, https://doi.org/10.1080/07494460701671509 7-21, DOI: 10.1080/07494460701671509 [28th January 2022]

Harvey, J. (2000) ‘Spectralism*’, Contemporary Music Review* [online], 19:3, https://doi.org/10.1080/07494460000640331 11-14, DOI:10.1080/07494460000640331 [15th January 2022]

Hasegawa, R (2011) ‘Gerard Grisey and the ‘Nature’ of Harmony’ Music Analysis © 2011 Blackwell Publishing Ltd [online] https://onlinelibrary.wiley.com/doi/epdf/10.1111/j.1468-2249.2011.00294.x?saml_referrer DOI: 10.1111/j.1468-2249.2011.00294.x [15th April 2022]

Invertedninthchord (2021) *Gérard Grisey – Modulations* Jan14th Available at https://youtu.be/ETxIf8BCN_4 (Accessed 20th April 2022)

James Tenny (2017) *James Tenney - Clang (1972)* Nov 14th Available at https://youtu.be/LitiwoXjpC0 (Accessed 15th March 2022)

James Tenny (2017) *James Tenney - Spectrum 3 (1995)* Sept 15th Available at https://youtu.be/WKYUiQlP7tk (Accessed 15th March 2022)

Klingbeil, M. ‘Spear’ [Online] https://www.klingbeil.com/spear/ [15th May 2022]

Listening in (2021) *How Jonny Greenwood was Influenced by Penderecki* Feb 28th Available at https://www.youtube.com/watch?v=EcibAL3vicY&t=585s (Accessed 20th April 2022)

Music Radar Tech (2019) *Steinberg Studio Sessions: Deru – Part 1* Sept 11th Available at https://youtu.be/dGJLLIJS4is (Accessed 25th January 2022)

Murail, T. (2000) ‘After-thoughts’*, Contemporary Music Review* [online], 19:3, https://doi.org/10.1080/07494460000640321 5-9, DOI:10.1080/07494460000640321 [14th January 2022]

Pressnitzer, D. & McAdams, S. (2000) ‘Acoustics, psychoacoustics

and spectral music', *Contemporary Music Review* [online], 19:2, https://doi.org/10.1080/07494460000640251 33-59, DOI: 10.1080/07494460000640251 [10th February 2022]

Saariaho, K. (2015) "Kaija Saariaho" [Online] http://www.petals.org/Saariaho/Electronics.html [05/05/22]

Sihyeon Choe (2015) *Georg Friedrich Haas - String Quartet No.2 (1998)* Available at https://youtu.be/gnDmycfIweI (Accessed 20th May 2022)

Surianu, H. & Fineberg, J. (2000) 'Romanian spectral music or another expression freed', *Contemporary Music Review* [online], 19:2, https://doi.org/10.1080/07494460000640241 23-32, DOI: 10.1080/07494460000640241 [15th January 2022]

The Orchestra Now (2021) *Jonny Greenwood: "Popcorn Superhet Receiver"* | *The Orchestra Now* 4 September Available at https://www.youtube.com/watch?v=6RuIFx25CZY (Accessed 25th May 2022)

The Vienna Philharmonic Orchestra topic. (2018) *Ligeti: Lontano (1967)* Dec 18th Available at https://youtu.be/eX7jxO3begc (Accessed 2nd March 2022)

Wannamaker, R. (2008) 'The spectral music of James Tenney', *Contemporary Music Review* [online], 27:1, https://doi.org/10.1080/07494460701671558 91-130, DOI:10.1080/07494460701671558 [10th February 2022]

Appendix

Music: https://on.soundcloud.com/Csnua

Scores:

Grisey's Theory:
https://acrobat.adobe.com/link/review?uri=urn:aaid:scds:US:00982c1e-1475-3d94-a46d-a73cf19985ff

Klang:
https://acrobat.adobe.com/link/review?uri=urn:aaid:scds:US:86283a53-4a04-328d-91a2-7dcb2aff2ea5

Kaija's Textures:
https://acrobat.adobe.com/link/review?uri=urn:aaid:scds:US:1949b52d-26cc-3e07-a495-80319aa6998f