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An investigation into the spectral music idiom and its association with visual imagery, particularly that of film and video

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USE OF THESIS

ABSTRACT

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The exploration of timbre became increasingly significant throughout the 20th century, with some composers making it the essence of their music. This artistic development occurred in conjunction with a technological advancement that together would contribute to the birth of what is now called 'spectral music'. Using computers, composers have been able to discover the spectra of frequencies that exist at different strengths for various sounds. The information realised then became the spectral musician's primary ingredients for composing some extraordinary works. Despite its innovative quality, spectral music is yet to gain widespread interest amongst ensembles, orchestras and ultimately the public. The first two chapters of this thesis are dedicated to the emergence of this largely unknown compositional discipline, its principal composers and the direction spectral music has taken since its inception.

As a composer, I have always had an interest in working with artists from other disciplines. In investigating spectralism, I became intrigued by the degree to which visual imagery has been connected with the work of its associated composers. The opening two chapters allude to this artistic relationship, with chapter three presenting a comprehensive summation of my findings. The influence of the visual medium has been both scientific and personal for spectral composers. While inspiration has primarily come from various forms of painting, the moving canvas of film and video has also been identified. With the latter still largely unexplored, some exciting artistic possibilities emerge for a composer wanting to investigate the spectral idiom and its relationship to moving imagery. The discovery of these creative interconnections and their largely untouched potential, principally inspired my ideas for the *Moment* project.

The creation of *Moment* required a collaborative approach, with the skills of the film director, 'VJ' artist, sound technician, movie editor and musician all contributing to the

artistic end. Chapters four and five outline the process, techniques and equipment used, centring on the musical component of the work. When composing the music, I did not aim to become a spectral composer, but to utilise the approach of that idiom within the context of my personal musical interest, history and culture. What resulted was an interesting texture of tension and release, with manipulated bell frequencies fluctuating to surround and combine with notes from the equal-tempered chromatic scale. Unlike the more common artistic process in film, where the composer responds to the vision, I invited the artist to respond visually to the music. This approach allowed me to explore the potential of the music video for Western art music, currently a popular medium within the commercial music industry. In chapter six, I delineate the encouraging outcomes to the process, as well as the difficulties faced, and make suggestions for further work to be done in this promising artistic field.

DECLARATION

I certify that this thesis does not, to the best of my knowledge and belief:

(i) incorporate without acknowledgement any material previously submitted for a degree or diploma in any institution of higher education;

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ACKNOWLEDGEMENTS

A number of people helped to make the accomplishments discussed in this paper possible. Their support and assistance has been invaluable in the completion of my work, and for that I am deeply grateful.

In particular, I thank the team of people involved in the creation of *Moment*. Discussions with Joachim Strand inspired new research possibilities, and his masterful cinematic music video required a countless number of hours in its creation. Kat Black and Jasper Cook introduced me to the exciting visual world of VJ artistry, supplying their skill and equipment to produce two magnificent shows. Ashley Graetz, Iris Koornstra and Mia Holton contributed a number of inventive video clips. My good friend Michael Berkeley-Hill assisted me with additional film editing, as well as the creation of the *Moment* DVD. Tower Captain David Knewstub, and all those in St Martin's Society of Change Ringers, gave me the opportunity to capture the sound structure of the Swan Bells, the sonic foundation for *Moment*. Sound engineer Kieran Kenderessy, a colleague and friend, recorded the Swan Bells and collaborated with me on the final mix of *Moment*. I am deeply grateful to you all for helping to make the creative ideas of this paper a reality.

Special thanks is also given to my supervisor, Dr. Maggi Phillips, for the many hours she spent reading the different drafts of this paper, and for being a constant guide throughout the research process. Thanks also to Lindsay Vickery and Cat Hope for providing musical direction and feedback at different points along the way.

On a personal level, I want to thank God, the gift giver, my family, who have provided constant support on all levels, and Keren, who remains a continuous source of inspiration and encouragement, walking each step with me. The love you have all shown has enabled me to undertake this challenging postgraduate work, and for that I thank you.

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CHAPTER ONE

1. Precursors to spectral music

1.1. Introduction

The development of so called 'spectral music' in the early 1970's is said to be one of the most important advances in western art music in the twentieth century. Needless to say, the process by which this genre developed is as diverse as the music itself, so this paper cannot claim to present an exhaustive account of its birth. After all, the study of acoustics and sound structure, fundamental components to spectral music, has been evident from the time of the ancient Greeks. Consequently, to present a feasible historic review, this paper will be confined to an investigation of the impressionist period, a time of musical thought identified as having an important influence on the spectral movement. While this chapter aims to provide the reader with general insight into the impressionist mindset and subsequent techniques, the music of Claude Debussy will remain a focus, as he is arguably the most influential composer for spectral musicians in this period. Having established his significance, an investigation into the timbral advances of twentieth century composition will take place. At this point of time an extensive breadth of input into 'spectral' ideas occurred. The paper will reveal a mesh of sometimes overlapping, but often independent, compositional explorations taking place in this phase, bringing about the formalisation of spectral music.

1.2. A connection to impressionism

Towards the end of the 19th century, music in France was in a transition from the older Romantic school, derived from Wagner, to a more contemporary trend that related to the Impressionist painters and Symbolist literature (Buller and Buxton, 1990, p.99). The term "impressionism" was originally used in 1874 by art critic Jules Antoine Castagnary, who had disdain for Claude Monet's painting 'Impression: Sunrise'. While this was the first analytical and public application of the word, evidence suggests that the painters belonging to *Le Société anonyme des artistes, peintres, sculpteurs et graveurs* had been using the term prior to this (Byrnside, 1980, p.522). While the group was certainly

interested in communicating "impressions", they were more concerned with the way light was captured on canvas. According to historian Phoebe Pool, Monet, Renoir, Pissarro, Sisley, Bazille, Morisot, Cassett and the like, all considered "light and the exchange of coloured reflections" the "unifying elements of a picture" (Pool, 1986, p.7). These artists no longer relied on the "traditional method of construction based on drawing, outline or sharp contrasts of light and shade" (Pool, 1986, p.7). The impressionists moved away from the smooth surfaces of Delacroix and Corot, to present a canvas that displayed "visible choppy strokes of paint applied with a hog's-hair brush" (Pool, 1986, p.7). In so doing, the artist would allow more scope for interpretation by the viewer's eye on the shades of colour being presented:

> They used novel techniques to achieve lightness and purity of color, often stroking pure color straight onto the canvas and leaving the mixing normally done on the palette to the viewer's eye. Impressionists might align different shades of one color for emphasis, or many different colors together for effective depiction of light (Hyman, 1994, p.3).

As the neo-Impressionists of the late 1880's explored the use of "contrasting colours in the creation of visual harmony," a similar investigation of light and colour was taking place in the musical arena (Pasler, 2001, p.91). Of the different compositional works eventually placed in this Impressionist category, it was arguably Claude Debussy's approach that would have the most lasting impact on the direction of 'western art music' at this time.

Debussy (1862-1918) challenged the artistic mindset of his day, something evident in two comments made by Emile Durand, his teacher at the Conservatoire. In an 1878 report, Durand said, "with his feeling for music and abilities as an accompanist and sight-reader, Debussy would be an excellent pupil if he were less sketchy and less cavalier" (Nichols, 1980, p.307). In the following year he continued this sentiment by saying, "a pupil with considerable gift for harmony, but desperately careless" (Nichols, 1980, p.307). While Debussy had respect for, and was trained in, the traditional musical standard, he heard sound somewhat differently to what surrounded him. In 1887, members of the *Académie des Beaux-Arts* attached the word "impressionism" to music for the first time when

reviewing Debussy's score of *Printemps*. Like in the contexts of the painters, the term was used in a somewhat unfavorable fashion. The members said, "His feeling for musical color is so strong that he is apt to forget the importance of accuracy of line and form. He should beware this vague impressionism which is one of the most dangerous enemies of artistic truth" (Byrnside, 1980, p.523). Despite this admonition, Debussy's artistic quest remained undeterred and by the time he composed *Prélude à l'après-midi d'un faune*, his music had become widely appreciated and imitated. Pierre Boulez, a famous conductor and composer, commented that, "just as modern poetry surely took root in certain of Baudelaire's poems, so one is justified in saying that modern music was awakened by *L'après-midi d'un faune*" (Nichols, 1980, p.297).

The absorption of symbolism and impressionism became an important part of Debussy's unique musical advance. François Lesure characterized symbolism as "a rejection of naturalism, of realism and of overly clearcut forms, hatred of emphasis, indifference to the public, and a taste for the indefinite, the mysterious, even the esoteric" (Lesure, 2001, p.101). With this belief system sounding out amongst the literary writers, it is not surprising to find Debussy echoing their sentiment in music. In fact, in 1909, Debussy's French biographer Louis Laloy suggested that, "he [Debussy] received his most profitable lessons from poets and painters, not from musicians" (Lesure, 2001, p.101). While these connections are widely accepted, Debussy abhorred the attachment of the term "impressionism" to music. In 1908, he wrote to his publisher, "I'm attempting 'something different', realities in some sense – what imbeciles call impressionism, just about the least appropriate term possible" (Lesure, 2001, p.102). Nevertheless, within two decades the term was widely recognized and while scholars could find properties of Impressionism within earlier music, such as that of Janequin, Byrd, Marais, Telemann, Rameau and Gluck, some defining qualities had emerged. Edward J. Dent describes some of these in his article on Impressionism in *A Dictionary of Modern Music and Musicians*:

> The chief modern exponent of musical 'impressionism' was Debussy, and the term seems generally to be applied to music intended to convey some suggestion of landscape, or of a picture in which colour is more important than outline, the melodic line in some cases being ill-defined and fragmentary, while subsidiary figures of accompaniment are much developed, often in rapid movement, the

> object of which is to produce a general effect of timbre rather than a clearly intelligible succession of notes. Similar effects are also obtained by slow harmonies based on chords which an older generation would have regarded as discords, but which the present day regards as agreeable consonances (Byrnside, 1980, p.525-526).

It was not long until other composers joined Debussy in this school of thought, including Griffes, Delius, Falla, Respighi and of particular note, Maurice Ravel (Read, 1979, p.122). Like Debussy, Ravel also explored the creation of unfamiliar timbre, with similar ideas coming through in the music of each composer. Some would say the analogous compositional approach of Debussy and Ravel was almost inescapable, due to the two composers living in the same climate of thought and progress (Stevenson, 1979, p.166). It could be said that Ravel made the orchestra his instrument, studying it in great detail. Louis Aubert, who sang the first performance of *Requiem and Valses nobles et sentimentales*, said of Ravel that "there was no instrument that he had not studied as thoroughly as was possible, and he pursued this knowledge with the single-mindedness of a man totally possessed by an exclusive passion" (Nichols, 1987, p.11). Ravel's knowledge of instruments helped to create wonderful orchestral colours, possibly reflecting his first mentor Berlioz, described as someone who used orchestral colour as "part of the whole design" (Nectoux, et al., 1986, p.396). The importance of timbre in Ravel's orchestration is indicated by the research of Michael Russ, who would give attention to the composer's use of register, shape and colour. He went on to suggest that his analytical focus indicates the "…essential rather than secondary role of these parameters…" (Mawer, 2000, p.118).

The connection between the impressionists and the more recent spectral movement is primarily found in the composer's attention to timbre. In an article for *The Wire* magazine, Andy Hamilton writes, "French composers such as Debussy, Varèse, Messiaen and Boulez deployed colour intuitively, and spectralists seek to systematise this approach" (Hamilton, 2003, p.44). While the importance of Varèse, Messiaen, Boulez and other twentieth century composers is recognized and discussed in the next section of this chapter, Hamilton's inclusion of Debussy reinforces impressionism's association

with spectral music. In particular, he recognizes the significance of timbre for both camps.

Composer and author Joshua Fineberg (2000c, p.2) suggests that one of the most applicable descriptions of spectral music came from one of its founding artists, Tristan Murail, who described it as an "attitude towards music and composition, rather than a set of techniques". This "attitude" is suggested by Fineberg (2000c, p.2) to encompass the exploration of "sounds and musical colors (timbres)" that evolve in time, producing various musical effects. He elaborates on this point by saying:

> 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 perceptions is the true hallmark of a spectral composer… (Fineberg, 2000c, p.3).

1.3. Impressionism and the overtone series

A connection to impressionism can also be found in the overtone series, an important foundation of spectral music's compositional material. Discoveries into this mathematical occurrence are date back as far as the early Greeks (Fineberg, 2000a, p.85). The harmonic overtone series is a set of vibrations where the fundamental frequency is in an integer relationship with the partials that make up that sound. To take a fundamental frequency and generate its harmonic partials the following equation will be used: rank x fundamental = frequency. The frequency of a pitched sound is determined by registering the number of times a regular rarefaction and compression occurs in the air in the time period of a second. This value is articulated in Hertz (Hz). Figure 1.1 shows an overtone series of a low E_1 (41.2Hz) with its first thirty-two partials. Therefore, the second partial for this E_1 fundamental is 2 x 41.2 Hz, which is equal to 82.4 Hz. The frequencies making up a given sonic structure are also referred to as the *spectrum* or *spectra* of that sound.

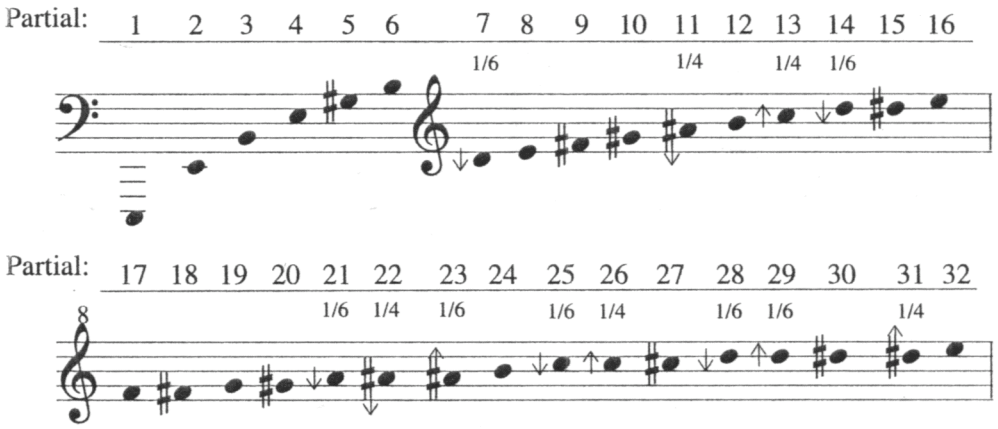

Figure 1.1. The first thirty-two partials of an overtone series based on a low E_1 (Rose, 1996, p.7).

Of particular importance to this research is the work of German physicist Hermann Helmholtz, who in 1850 discovered the 'colour' of sound to be influenced by its overtone structure (Rose, 1996, p.7). This newfound knowledge seems to have influenced the Impressionist composers' exploration of harmony, adding to the palette of sound heard by an orchestra. Experienced music essayist Jann Pasler writes:

> Just as contemporary physics informed new ideas about painting, Helmholtz's acoustics and developments in the spectral analysis of sound fed composers' interest in musical resonance and the dissolution of form by vibrations. In much of Debussy's music, as in Impressionist pieces by Delius, Ravel and others, the composer arrests movement on 9th and other added note chords, not to produce dissonant tension but, as Dukas put it, to 'make multiple resonances vibrate'. This attention to distant overtones, particularly generated by gong-like lower bass notes, produces a greater sense of the physical reality of sound (Pasler, 2001, p.91).

In a research essay by Peter Platt, the influence of the harmonic series on Debussy's music is explored. Platt asserts that from about the '*l'après-midi*' onwards (1892-4), Debussy "continually presents sonorities which correspond with the harmonic series and/or segments thereof" (Platt, 1995, p.39). Kyle Gann, microtonal composer and music critic for the *Village Voice*, also identified this spectral feature of Debussy's scores, comparing it to *Terra d'Ombre*'s (2003-2004), a recent work by Tristain Murail. Gann writes: "If you take the first 10 overtones you get a 'Debussyan' ninth chord… the horns

played quite a few of these in *Terra d'Ombre*'s background" (Gann, 2004, online). In Figure 1.2, the harmonic series of B♭ is presented (Ex 1a). Platt (1995, p.39) has taken the overtones and created vertical chord formations, reflecting what he believes to be "Debussyan Sonorites" (Ex 1b).

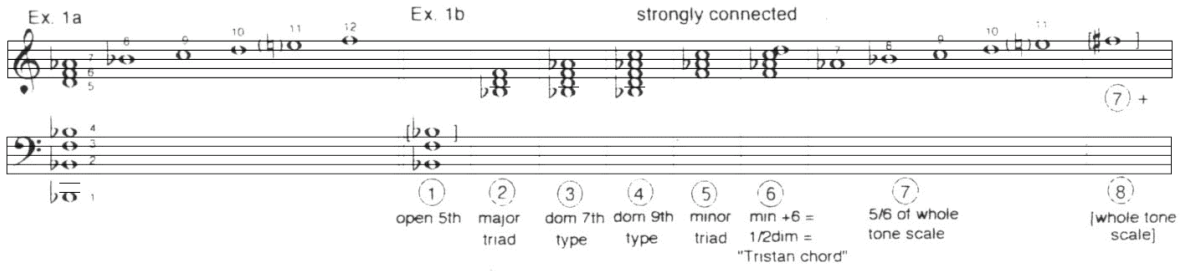

Figure 1.2. Debussyan Sonorites created using the B♭ Harmonic Series (Platt, 1995, p.39).

In making this deduction, Platt pays homage to the preceding work of Jacques Chailley and Rudolf Réti. Their research impacted upon the direction Platt would take in his own work, with both researchers coming to similar conclusions in the way Debussy used the overtone structure. This can be seen in the way Chailley drew attention to Debussy's use of the natural 7th, 9th and 11th, while Reti's work explored the relationship between melody and the harmonic series. Pratt suggests that Reti's research advanced the understanding of "the ways in which melody can carry the flow when the harmonic ambience is not subject to the exigencies of the dominant-tonic principle" (Pratt, 1995, p.39).

Platt demonstrates his proposition by presenting a succinct analysis of a number of Debussy's pieces, including *Prélude a l'après-midi d'un faune*, *Trois Nocturnes* and *Fêtes*. In each, Pratt presents sonorities of the harmonic series within simplified excerpts of the scores. Having put forward his point of view, Pratt then uses the *raga* of classical Indian music as a means to explain the way in which melody can be deployed over the harmonic series, as apposed to the twelve tones of the tempered scale (in which is heard the V-I based chord progression), reflecting Reti's work. Using *raga* examples from

North Indian traditions, Pratt demonstrates the manner in which a drone instrument (eg. a *Tanpura*) and melodic instrument (eg. a *Sitar*) come together. An interesting blend of notes is shown, with the melodic material both complementing and contradicting the cloud of sound created. Pratt's comparison of the classical Indian approach to that of Debussy describes it as "analogous insofar as different melodic colours are heard against a prevailing ground pitch (and, of course, attendant partials)" (Pratt's, 1995, p.51). He goes on to say:

> And indeed it is my experience within the musical repertories of Classical Indian music… and the music of Debussy… that the ear/brain does not need an unequivocal tonic, provided it can feel at home with the relationships afforded by the melodic/harmonic confluence (Pratt, 1995, p.52).

Debussy was no longer bound to tonic resolution, making mode and key flexible. He could choose, for example, not to resolve a dominant 9^{th}, but use parallel movement in such a way that it remained faithful to the melodic/harmonic confluence of the piece. In comparing these two different forms of music, Pratt was not saying Classical Indian music had influenced Debussy, or even suggesting a new theory, but simply discussing a question of "musical thinking, musical deployment" (Pratt, 1995, p.52). In a similar spirit, while the compositional techniques of Debussy may have some limited connection to spectral composers, his thought process has unquestionably been an inspiration for many in the spectral movement.

1.4. Twentieth century composition

Having established a connection to the impressionists, particularly Debussy, it is important to understand some of the compositional advances that took place from this period, leading to spectral music. In Anthony Cornicello's doctoral paper, three key composers follow Debussy as significant precursors to spectral music, those being, in chronological order: Edgard Varèse, György Ligeti and Giacinto Scelsi. Music historian Viviana Moscovich identifies a similar list of forerunners, with the difference found in Ligeti's removal from the list and Olivier Messiaen being identified as the final precursor (Moscovich, 1997, p.21). The influence of these artists on spectral composition cannot be

questioned, however, a number of other contributors are considered too important to be overlooked, as outlined by the work of composer and author Julian Anderson. His journal paper "A Provisional History of Spectral Music" is a keystone document for this literature review and will consequently receive particular attention. While the detail given to each composer will be less than that found in Cornicello's research, the aim is to provide the reader with a broader depiction of the movement's predecessors. Along with Varèse, Ligeti, Scelsi and Messiaen, the music of La Monte Young, Paul Hindemith, Frederich Cerha, Karlheinz Stockhausen and Per Norgaard will also be addressed.

La Monte Young (b.1935), an American composer and performer, was one of the key founders of the minimalist movement, with his piece 'Trio for Strings' (1958) a defining work for this genre. Young had a fascination with music that had an extremely slow rate of change, sometimes creating a drone like effect. Although early spectral music composers were equally interested in having music evolve in a way that allowed the listener to hear the fullness of each sound, their music was rarely as static as Young's, where the same sound could be played for minutes at a time. In choosing this path, the timbre Young was exploring also became a critical element to each piece. By 1964, he was investigating tuning systems that moved away from the tempered scale, with two significant pieces being *Tortoise – his Dreams and Journeys* and *The Well-Tuned Piano*. When describing his approach, Young said he likes to "get inside the sound" (Strickland, 2001, p.673). Anderson suggests that Young's limited pitch content and refined tuning system allows the listener to "absorb the unusual tuning carefully and perceive it in all its richness" (Anderson, 2000, p.9).

Paul Hindemith (1895-1963) made important contributions to music as a composer, conductor and performer. Of particular relevance to this paper, however, is his significant input into twentieth century musical thought. Hindemith presented a number of his theories in a book he published in 1937, called *Unterweisung im Tonsatz* (translated into English as *The Craft of Musical Composition*). Here he presents a series of scales that he derived from the harmonic series and combination tones. In brief, the harmonic spectrum was used to derive a melodic series where all 12 notes of the chromatic scale were

ordered in a diminishing degree of relationship to the given note (see Series 1 in relation to C; Figure 1.3). From the combination tones, Hindemith created a series of intervals that were ordered according to their degree of consonance and dissonance, increasing in tension (see Series 2; Figure 1.4). Hindemith was therefore able to use Series 1 and 2 for the identification and categorization of the "tonal relationships that occur in musical structure" (Schubert, 2001, p.529).

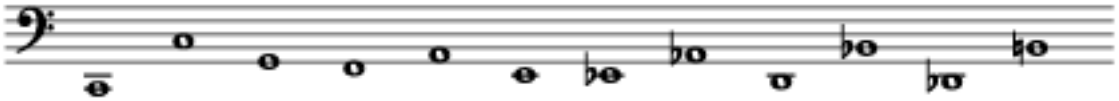

Figure 1.3. Series 1 (in relation to C) (Schubert, 2001, p.529).

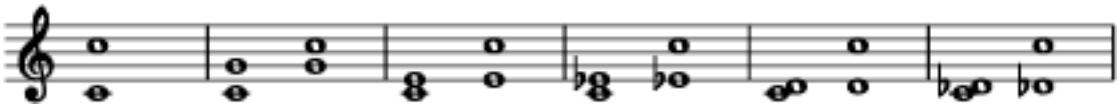

Figure 1.4. Series 2 (Schubert, 2001, p.529).

Julian Anderson identifies the relevance of this theory to spectral music:

> Hindemith places great emphasis upon the derivation of his scales from not only the harmonic spectrum but most especially from sum and difference tones [combination tones] – as far as I can judge, one of the earliest compositional examples of the use of what we now call ring modulation harmony, and it is no accident that Gérard Grisey has cited the Hindemith treatise as an inspiration for his researches into sum and difference tones as generators of harmonic fields (Anderson, 2000, p.10).

The French composer, organist and teacher, Olivier Messiaen (1908-1992) was also drawn to the harmonic spectrum, through which he defended his regularly used cadence of an augmented fourth. The interval can be found within the scales that he termed modes of 'limited transposition'. The most commonly used mode by Messiaen was the second in the series, called an octatonic scale. Previous composers heavily used the first of these modes, the whole tone scale, notably Debussy. Subsequently, Messiaen would only use

this mode when it was heavily concealed in the texture of the piece (Johnson, 1975, p.16). The seven modes can be seen in Figure 1.5.

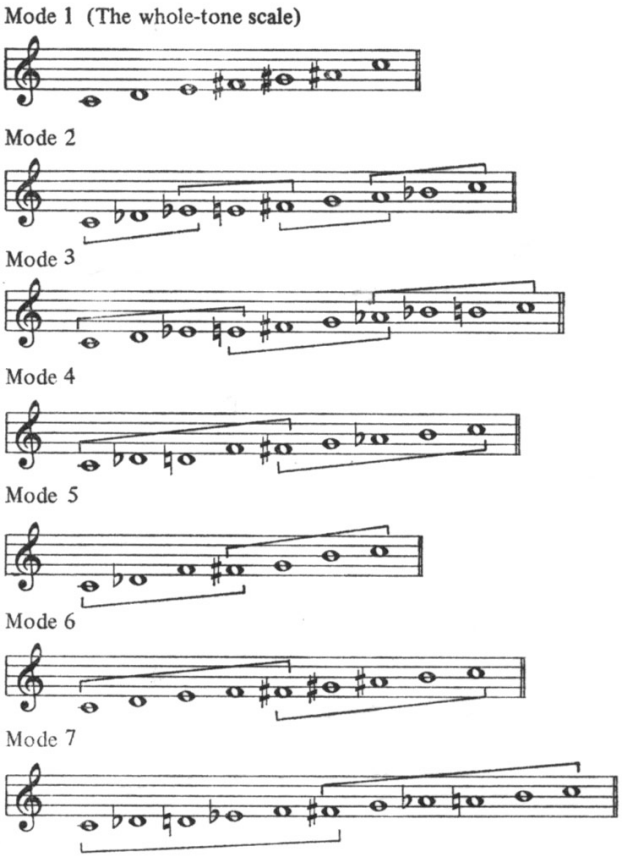

Figure 1.5. Modes of limited transposition (Johnson, 1975, p.16).

Of particular relevance to the spectral movement is Messiaen's chord structures derived from these modes. The 'chord of resonance', derived from mode three, contains a fundamental note and its odd harmonics up to the fifteenth partial (see Figure 1.6). Messiaen also used the device of 'added resonance', where a note or chord would be played quietly above a louder principal note or chord. This could also take the form of 'inferior resonance', where a dissonant cluster of bass notes, often on the piano, would sit under a higher diatonic triad (Johnson, 1975, p.17). Again, an Impressionist connection is made, with Messiaen's harmonic use of unresolved diatonic discords suggestive of Debussy, and to a lesser extent Ravel and Dukas (Griffiths, 2001a, p.495). Like spectral composers, Messiaen made the exploration of timbre critical, and harmony became a

means of accomplishing this investigation of musical colour. Composer and performer Robert Johnson (1975, p.18) writes:

> Traditionally, harmony and timbre are quite separate concepts, but the use of added resonance brings the two together in a way which enables harmony to function as timbre… His [Messiaen] chords became 'sound entities', complete in themselves, and the listener should not be aware of the individual notes which constitute a chord.

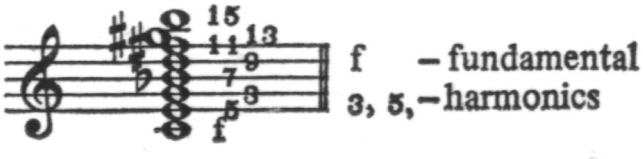

Figure 1.6. Chord of resonance (Johnson, 1975, p.17).

In addition, Messiaen describes his use of metal percussion instruments as a means of creating a sound that parallels his harmonic approach. Consequently, Julian Anderson proposes that Messiaen anticipated the French spectral composers, who would later explore instrumental simulation of non-harmonic sounds. He also refers to Messiaen's use of added resonance in his piece, *Couleurs de la Cité Céleste* (1963), comparing this with *Partiels*, composed by spectral musician Gérard Grisey. Messiaen had trombones play pedal tones at fortissimo and added high triads played by clarinets and piano, with notes coming from, or separate to, the "harmonics of the trombone tones" (see Figure 1.7). To this Anderson writes:

> A comparison of these passages [from Messiaen's *Couleurs de la Cité Céleste*] with the opening of Grisey's *Partiels* (1975), in which trombone spectrum is simulated by an instrumental ensemble, shows to what extent the French spectralists emanated very directly from certain aspects of Messiaen's thought (Anderson, 2000, p11).

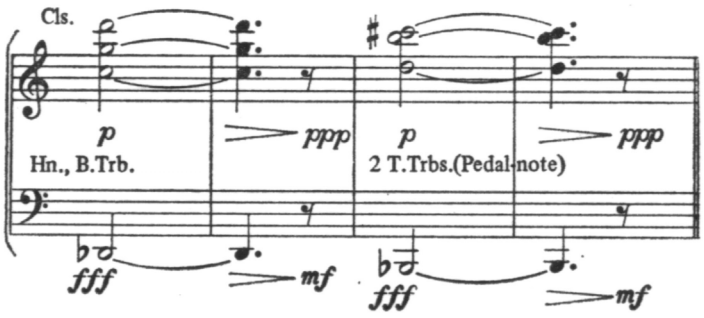

Figure 1.7. *Couleurs de la Cité Céleste* (Johnson, 1975, p.18).

Edgard Varèse (1883-1965) initially wrote in a style that belonged to the tradition of Debussy and Ravel (Hamilton, 2003, p.44). From this foundation, he would take Debussy's use of timbre one step further, exploring music that was not "principally dependant on harmonic progression or thematic working" (Griffiths, 2001b, p.273). His resistance to use the term 'chord', preferring to call his vertical structures 'sound masses', indicated the importance of non-tonal harmony for Varèse. In discussing his approach to timbre, Varèse said: "The role of colour or timbre would be completely changed from being incidental, anecdotal, sensual, or picturesque; it would become an agent of delineation, like the different colours on a map separating different areas, and an integral part of form" (Strawn, 1978, p.142). American composer Elliott Carter reinforces timbre's significance: "…Varèse's music does not depend on thematic motives for its continuity, but rather the relationship between vertical, harmonic structures, instrumental sonorities, spacings, and, of course, the play of rhythmic motives" (Carter, 1997, p.148). Varèse raised the importance of timbre to a new level, making it a compositional device as essential to his music as the theme for a Johann Sebastian Bach fugue.

Interestingly, the overtone structure research of Hermann Helmholtz (discussed in section 1b of this paper, *A Connection to Impressionism***)** became an inspiration for his timbral approach, helping Varèse to think of music as a physical, acoustic phenomenon. With the physical structure of sound being investigated, Varèse adopted the term 'spatial music'. He explained his work as "the movement of sound masses" in space. To this Varèse added, "when these sound masses collide the phenomena of penetration or repulsion will

seem to occur", and "certain transmutations taking place on certain planes will seem to be projected onto other planes, moving at different speeds and at different angles" (Marvin, 1987, p.359-360). These words portray a visual picture of physical sound structures moving in space, colliding and interacting to bring about timbres that are continually evolving. It is therefore not surprising to have Varèse recognize the influence of Helmholtz, crediting him as an inspiration for one of his most respected and well-known works, *Ionisation* (Anderson, 1991, p.37). This is one of the first compositions exclusively written for a percussion ensemble. In particular, "it is the first work in which the acoustic components of percussion instruments are taken into consideration as the foundation for a musical form" (François, 1991, p.49).

Varèse's fascination with timbre also led to the incorporation of electronic instruments into his compositional material. He once wrote: "I no longer wish to compose for the old instruments played by men, and I am handicapped by a lack of adequate electrical instruments for which I conceive my music" (Strawn, 1978, p.141). This foresight Varèse had for the relevance of technology to music, and the impact it would have, was evident in a 1939 lecture he gave at the University of Southern California. Here the possibilities machines would bring to the composer were foretold:

> Liberation from the tempered system, a pitch range extended in both directions, new harmonic splendours obtainable from the use of sub-harmonic combinations now impossible, increased differentiation of timbre, an expanded dynamic spectrum, the feasibility of sound projection in space, and unrelated cross-rhythms (Varèse in Griffiths, 2001b, p.275).

In some respects, this statement could be seen as indirectly foretelling the emergence of spectral music. Through machines, spectral composers have not only been given new insight into the physical structure of sound, but also a seemingly endless source of new timbres to explore. It would be interesting to hear the compositions of Varèse had he access to the technology that is at most western composer's fingertips today.

The music of Hungarian composer György Ligeti (b.1923) is also of special importance to the spectral movement, particularly his textural music of the 1960's. In his

composition *Apparitions* (1960), Ligeti first presented orchestral clusters, a technique simultaneously being used by, but independent of, other notable composers, including Karlheinz Stockhausen. Interestingly, this 'texturalism' of Ligeti's developed while embracing those things Serialism had refused, such as simple harmony, ostinatos and melodic content. The following year (1961), Ligeti would continue exploring the use of this sound texture by composing *Atmosphères*. His use of the cluster became more uniform and static, heard in the context of sustained tones or what he called 'micropolyphony' (Griffiths, 2001c, p.691). Anthony Cornicello (2000, p.21) describes this as:

> A collection of techniques that emphasize sustained sounds or extremely fast repeated phrases, avoid a sense of pulse, and stagger instrumental entrances; the result is usually a sound mass. Micropolyphony usually involves thick, densely packed textures created from chromatic clusters.

When Ligeti uses a series of densely woven musical lines occurring at different speeds, he creates an environment where the individual ideas become indefinable, resulting in a 'sound mass'. His *Lontano* (1967), meaning 'distant', is another significant piece using this approach. Like the title suggests, Ligeti used dynamics and harmony wonderfully to create a sense of distance and space, reflecting Varèse's pursuit of 'spatial music'. In describing Ligeti's approach in *Lontano*, contemporary music author Paul Griffiths writes:

> Ligeti's remark that the piece is neither tonal nor atonal is not just quixotic but states an important truth, for there is no predictable progression… It is a matter, to take his own image, of 'harmonic crystals' dissolving and new ones crystallising out, sometimes little by little… sometimes appearing ready formed and scintillating (Griffiths, 1983, p.60-61).

Italian composer Giacinto Scelsi (1905-1988) initially composed music that centred on the aesthetic trend of the early 20th century. This changed, however, when a painful mental breakdown indirectly resulted in Scelsi opting for a journey of musical discovery. While undergoing lengthy rehabilitation, he spent days repeating single notes on the piano, listening intensely to the sound produced, becoming engrossed in the fullness of its

make-up. This led to his quest to bring out what he described as the 'third dimension' in sound. In explaining this term, Scelsi said:

> Sound is round, but when we hear it, it seems to have only two dimensions: pitch and duration. The third dimension, depth, is there, but somehow… it escapes us. The upper and lower (less audible) harmonics sometimes give us the impression of a vaster, more complex sound beyond duration and pitch, but it is difficult for us to perceive its complexity… despite all the experiments with stereophony and so forth… we have not yet succeeded in creating an impression of sound's real spherical dimension (Hamilton, 2003, p.46).

From the late 1950's, Scelsi would compose music that centred on 'animating' a single tone, or an implied single tone. Compared to Ligeti, the role of pitch became even less significant, with the evolution of timbre emerging as Scelsi's main compositional focus. Furthermore, the pitch, timbre, register and dynamics of a piece were no longer to be heard as separate entities that could be manipulated independent of one another, but became inherent to the potential of each sound. This is evident in Scelsi's *Quattro Pezzi per Orchestra (su una nota sola)* (1959), where the note on each movement is animated using timbral transformation, microtonal pitch inflection and rhythmic reiterations, stretching the identity of each note "far beyond that of a mere frequency" (Fox and Osmond-Smith, 2001, p.421). In comparing the music of Scelsi and Ligeti, Anthony Cornicello (2000, p.25) writes:

> The timbral process applied in these pieces [movements of *Quattro pezzi per Orchestra*] (and many other Scelsi works) are similar to the micropolyphony of Ligeti. Many instruments are employed to colour a single note. However, Ligeti's conception of *Lontano* was for smooth, unaccented musical line, where as Scelsi's music is filled with unexpected breaks and sudden attacks. Ligeti was concerned with the gradual expansion of the pitch ambitus, whereas Scelsi utilized a small pitch range. If the pitches were to move from A to B♭ for instance, Scelsi would begin a very slow glissando, rather than gradually introduce the new pitch in the manner of Ligeti.

For Scelsi, timbre became a means of experiencing auditory hints of the 'third dimension'. While his harmonic thought process didn't focus on the overtone series, he did at times bring out the harmonic spectrum in the way he composed. Music critic Bernard Holland alludes to his ability to reveal the physical structure of sound when discussing Scelsi's *Okanago*, written for harp, double bass and tam-tam. He proposes that

the one note drone coming from the double bass "slowly reveals its related overtones" as "mistuned intervals of a fourth circle it" (Holland, 1997, p.11). Scelsi's approach of creating a timbre that would gradually evolve in time became a source of inspiration for spectral musicians, whose music would also be known for "a gradual transformation of a musical sonority" (Cornicello, 2000, p.25). Composer and author Christopher Fox supports this:

> It was not until the 1970's that the significance of his [Scelsi] work began to be recognized by a new generation. Younger composers, including the American Alvin Curran, the Prix de Rome guests Grisey and Murail, and the Romanian exile Radulescu, discovered in Scelsi's work aspects of the musical world which interested them, struck particularly by the concentration on gradual timbral transformations (Fox and Osmond-Smith, 2001, p.420-421).

Austrian composer Frederich Cerha (b.1926) also had an interest in exploring different sound textures. Independent of Ligeti and Scelsi, Cerha began using sound-configurations that were restricted to a single characteristic, creating musical interest by having variations take place within the chosen sonority. His 1959 *Mouvement I-III* consisted of three pieces, each with a different sonority within which the sound mass could evolve (Grassl, 2001, p.375). This technique was developed on a much larger scale in *Spiegel I-VII* (1960-61), where the orchestra was divided into different sound masses that would continually fluctuate. Julian Anderson draws particular attention to *Spiegel V*, where Cerha merged the orchestra with electronic tape, creating an advanced synthesis of electronic and instrumental sounds. Anderson writes:

> ...as in Scelsi, conventional formal divisions are completely elided in favour of a single, unidirectional process. Although he did not know the 'Spiegel' cycle at the time, Murail's first fully characteristic work 'Sables' (1974) shares many attributes with the pieces of the cycle (Anderson, 2000, p.12).

Karlheinz Stockhausen (b.1928) had a profound impact on spectral music, with his composition *Stimmung* (1967), which was not only an inspiration for future composers, but is identified as one of the earliest examples of the genre (Anderson, 2000, p.13). This 70 minute vocal work uses the harmonic spectrum of B♭, with six singers having to emphasize overtones up to the 24th partial. The often hidden harmonics of the 'fundamental' become audible when the performers gradually alter tongue and lip

positions. Stockhausen began investigating the voice's ability to bring out the partials of sound after the birth of his child, where he would try and sing the baby to sleep. In describing the experience, Stockhausen said, "[I] began humming, did not sing loudly anymore, began to listen to my vibrating skull… trying out everything myself by humming the overtone melodies" (In Hamilton, 2003, p.46).

Another significant work for spectral composers is Stockhausen's *Mantra* (1970), written for two pianos and live electronics. The significance of this composition is primarily in Stockhausen's use of *ring-modulation*. The term *modulation* refers to the alteration of a tone, such as its frequency or amplitude. In the case of ring modulation, there are two spectrums multiplied together, one called the *carrier* (C) and the other the *modulator* (M). Many ring modulators have an input for the source instrument, while the carrier is usually created with an internal oscillator within the machine. Nevertheless, there is nothing stopping a composer from using two instrumental source spectrums. The resulting sound structure of this device is the production of *sidebands*, overtones that are the sum and difference of the two source spectrums, while the original spectrums are removed (Lehman, 1996, online). If, for example, the carrier and modulator are both pure tones as 440Hz, one side band is doubled (C+M=880Hz), and the other is left unchanged (C-M=0Hz). In this case the ring-modulator acts like an *octavider*, producing two tones an octave apart. If the carrier frequency is 440hz and the modulator 110Hz, the output spectrum consists of two components: sum is C+M=550Hz and difference is C-M=330Hz. While the distance of the sidebands from the source spectrum may be the same in terms of frequency, the intervallic distance is varied. Earlier in this chapter the structure of the overtone series was discussed, revealing a frequency (or partial) organization that is relatively straightforward, as compared to its intervallic structure, which remains complex. In contrast to this, the intervallic structure of the tempered scale could be viewed as having a simple interpretation, holding a distance between each note deemed homogeneous in all registers, that of a semi-tone. However, when considering their frequencies, the intervallic structure of the tempered scale is no longer constant in nature. The A above middle C in the fourth piano octave (A4) can be set to different accepted musical pitch standards: the American Standard (A4 = 440 Hz), the older

International standard (A4 = 435 Hz), and Europe now regularly performs at A4=442 Hz. To establish the unknown frequency of a particular note, a relatively uncomplicated mathematical formula is used. Simply multiply the known frequency (or note) by 2 raised to the power (number of half-steps/12). Where the unknown frequency is positioned somewhere above the known frequency, (number of half-steps/12) is positive, and conversely, negative if the note is below (Gruber, n.d. online). Therefore, if the only known frequency were the American Standard A4 (440 Hz, which is usually called A440), to determine the frequency of B4 (two half-steps above A4) the applied formula and result is:

440 x 2^(2/12) = 493.88

If trying to determine the frequency for the note G4:

440 x 2^(-2/12) = 391.99 (note: Figure 1.8 has the result rounded to 392 Hz)

As can be seen, while both B4 and G4 are both a tone away from A4, the frequency is not equidistant, being 53.88Hz above and 48.01Hz below 440Hz. Therefore, when ring modulation produces equidistant sidebands, the sounding result is, of course, a smaller intervallic distance above, and larger one below. Table 1.1 reveals all the frequencies making up the 12 tone equal tempered scale, based on A4=440, (Middle C = C_4). To use these frequency values requires rounding to the nearest Integer.

Table 1.1

Frequency table of 12 tone equal tempered scale

	Octave Number								
	0	1	2	3	4	5	6	7	8
C	16.35	32.70	65.41	130.81	261.63	523.25	1046.50	2093.00	4186.01
C#	17.32	34.65	69.30	138.59	277.18	554.37	1108.73	2217.46	4434.92
D	18.35	36.71	73.42	146.83	293.66	587.33	1174.66	2349.32	4698.64
D#	19.45	38.89	77.78	155.56	311.13	622.25	1244.51	2489.02	4978.03
E	20.60	41.20	82.41	164.81	329.63	659.26	1318.51	2637.02	5274.04
F	21.83	43.65	87.31	174.61	349.23	698.46	1396.91	2793.83	5587.65
F#	23.12	46.25	92.50	185.00	369.99	739.99	1479.98	2959.96	5919.91
G	24.50	49.00	98.00	196.00	392.00	783.99	1567.98	3135.96	6271.93
G#	25.96	51.91	103.83	207.65	415.30	830.61	1661.22	3322.44	6644.88
A	27.50	55.00	110.00	220.00	440.00	880.00	1760.00	3520.00	7040.00
A#	29.14	58.27	116.54	233.08	466.16	932.33	1864.66	3729.31	7458.62
B	30.87	61.74	123.47	246.94	493.88	987.77	1975.53	3951.07	7902.13

Note. Based on A4=440, C_0 to B_8 (Middle C = C_4).

(Twelve tone equal tempered scale, n.d., online)

As an instrumental note is made up of a spectrum of sine waves, the generated sound structure from ring modulation can be very complex, in that each frequency produces its own sum and difference tones. *Mantra* is a fully notated piece with a 13 note ‘mantra’, or formula, played by both pianists, one playing the original series, the other an inversion, with both starting on pitch A3. Each pianist operates a *ring-modulator* and a *sine-tone generator*, altering the piano’s sound as discussed. The first and thirteenth notes are identical to the mirroring sine-tone, therefore making the sound completely consonant.

The other notes in the mantra, however, interact with the electronics to produce varying degrees of dissonance, as described by Anderson (2000, p.13):

> Any pitch played on one of the pianos will have a specific relationship to the pitch of its sine-tone generator, from extremely dissonant to totally consonant and the timbres of the ring-modulation will vary in parallel from non-harmonic to harmonic, the most harmonic resulting from notes in octave unison with the sine-tones, or in simple triadic relationship to them.

In *Mantra*, the mechanical technique of ring-modulation colours the piano's timbre, with repetition of certain pitches within the mantra taking the sound produced from one of mysteriousness to insight. A point is reached where one begins to "hear inside the timbre", approaching the sound as "real harmony, a feature which was to prove highly suggestive to many young composers" (Anderson, 2000, p.14).

Danish composer and theorist Per Norgaard (b.1932) composed arguably the first instrumental spectral composition. Initially inspired by the music of Jean Sibelius (1865-1957), Norgaard's interest shifted in the late 1960's to that of timbral exploration, composing *Luna* (1967) and *Iris* (1966-7). These orchestral works explored texture in a style comparable with the work of Ligeti, however, the timbre tended to be a derivative of the natural harmonics of the overtone series, resulting in a largely consonant sound. In 1968, Norgaard took this interest one step further, composing the first movement of *Voyage into the Golden Screen* using two harmonic spectra tuned a quarter tone apart (G and A♭ lowered by a quarter-tone). Along with Norgaard's evolving overtone texture, a sound reminiscent of Scelsi, the spectral technique of creating complex *beats* from closely adjacent frequencies is also used (Anderson, 2001, p.39). These *beats* are a manifestation of sound's physical structure. They result from the waves of two close frequencies (or their partials) having regular amplitudinal peaks where both waves are positive, and regular points of phase cancellation, where the waves are exactly opposite. An example of this is comparing the degree of beat when an interval of a 5^{th} is played, as apposed to a tritone. The 5^{th} has a large degree of harmonic coincidence, whereas the tritone doesn't, causing the frequencies of one note to beat against the frequencies of the other (Pressnitzer & McAdams, 2000, p.41). This further brings to light Jann Pasler's

reason for using the phrase "physical reality of sound" when describing the overtone structure.

In discussing the influence of Norgaard, and his comparison to Scelsi, Julian Anderson writes:

> It should be emphasized that Norgaard has absolutely no idea of Scelsi's work at this time – it was largely unknown – and was extremely surprised when he did first hear Scelsi's 'Four Pieces'! The work also contains curious pre-echoes of Grisey, Murail and the work of the feedback group, although these composers have remained uncognisant of Norgaard's work. Nevertheless, 'Voyage into the Golden Screen' is an important precursor to spectral music, perhaps the most direct of all, and must be recognized as such (Anderson, 2000, p.14).

1.5. Summary

Though a number of twentieth century composers have paved the way for spectral music, the musical thought process of Debussy and his contemporaries became an important source of inspiration and insight in the way spectral composers approach their art. While a number of significant, and somewhat obvious, factors separate the impressionists from spectral musicians, including age, technology and compositional technique, their mindset keeps them united, with each camp exploring a realm of uncharted timbres, producing musical colours that would challenge and excite the standard of the day. This attitude towards the exploration of timbre continued into the twentieth century. For some, such as Young, Ligeti, Cerha and Scelsi, the journey centred on exploring sustained tones and/or clusters that evolved within a given sound mass. For others, such as Hindemith, Messiaen, Varèse, Stockhausen and Norgaard, the influence of the overtone series on their compositional approach was much more apparent. Nevertheless, each had an interest in gaining a deeper understanding of sound, creating timbres that reflected their personal journey of discovery. Certainly, in comparing these composers, the role of melody became less important in time, with Scelsi taking his compositional approach to a place where timbre became the point. The role of technology was also compositionally significant, particularly to spectral music, something Varèse clearly envisaged and Stockhausen capitalised on, with his ring-modulation. In addition, by the 1960's, the

research of Hermann Helmholtz was embraced in its entirity, with both Stockhausen's vocal composition *Stimmung* and Norgaard's first movement of *Voyage into the Golden Screen* based solely on the overtone series. While a lot of the discussed compositional innovations happened independently, composers were reaching similar conclusions and writing in styles that complemented one another. Consequently, it would be far too restrictive to try and depict the emergence of spectral music along a single line of composers, from say Debussy to Gérard Grisey. History shows it to be more like a web of musical thought and compositional development that led to the genre's birth, assisted by a 20th century technological upsurge.

CHAPTER TWO

2. The spectral movement

2.1. Introduction

The exploration of timbre became increasingly significant throughout the 20th century, with some composers making it the essence of their music. Along with this development, musicians could source new materials in the form of computers, electronics, recording and data processing equipment to aid in their compositional work. As demonstrated in the previous chapter, these compositional and technological developments contributed to the birth of what is now called 'spectral music'. Three key spectral schools emerged throughout Europe in the 1970's, those being the French *Groupe de l'Itinéraire*, the German Feedback group, and a somewhat independent Romanian group. In this chapter, the compositional approach of each of these camps will be differentiated, with a particular focus given to the work of Gérard Grisey (1946-1998) and Tristan Murail (b.1947), key founders of the spectral movement. Some of the more recent developments in spectralism will also be investigated, where many composers are being influenced by, but not completely drawn in to, its practice.

2.2 Spectral camps

2.2.1. Inception of spectral music

The spectral approach to musical composition was first given a name in 1979 by Hugues Dufourt in an article he entitled, '*Musique spectrale*' [Spectral Music]. In this document, Dufourt discussed the importance of a sound's overtone structure and its spectral fluctuation over time, a critical element to this music's development (Cornicello, 2000, p.2). Researcher and teacher, Dr. Eric Drott, asserts the spectral movement to have emerged as a 'post-serial' school of thought. He writes:

> Of signal importance for spectralism is the fragmentation of the sonic object under the dual pressures of serialism and electroacoustic music. It is in this regard that spectralism very much deserves the post-serial label, since it takes as its conceptual starting point the dissolution of sound into the distinct parameters of

> pitch, duration, loudness and timbre, which serialism helped engender (Drott, 2005, p.3).

Spectral composers have had a desire to bring unification once again to these different parameters, placing them all under the banner of timbre (Drott, 2005, p.3). Spectralism has also been described as moving away from the sophisticated mathematical theories of serialism to investigate the hidden intricacies of sound's deep structure. This is reflected in a comment made by composer Kaija Saariaho, who describes the harmonic structures of spectral composers Gérard Grisey and Tristan Murail as vastly different to that of the serialists. Saariaho suggested that serialism was "based more on abstraction, or some intellectual game, than the actual sounding result" (cited in Hamilton, 2003, p.44). While there may have been a desire to move away from serialist complexity, author Andy Hamilton (2003, p.44) proposes that the listener and student of spectralism would find it just as involved. Not only is the process of creating the music incredibly complex, but also the sounding result challenges the ears capacity to understand a magnitude of new colours and textures. Nevertheless, Gérard Grisey seems to contest any argument that would endorse a spectral movement that is governed by any possible number of scientific intricacies, or for that matter, any other distraction from its essence: the exploration of sound. He writes, "we are musicians, and our model is sound and not literature, sound and not mathematics, sound and not theatre or fine arts, quantum physics, geology, astrology or acupuncture" (cited in Kozinn, 2003, online).

In order to approach music as sound and continue on from the exploration of timbre that the spectral music precursors had established, there was a need to persist in moving away from the traditions of western art music. Murail discusses the frustration of using the restrictive elements of notes and rhythmical figures in his paper titled *Spectra and Pixies*, under the aptly named subheading *Beyond Categories*:

> Our conception of music is held prisoner by tradition and by our education. All has been cut into slices, put into categories, classified, limited. There is a conceptual error from the beginning: the composer does not work with twelve notes, x rhythmic figures, x dynamic markings, all infinitely permutable – he works with sound and time. The sound has been confused with its representations,

> and we work with these, with symbols. Since these symbols are limited in number, we quickly come up against the wall… (Murail, 1984, p.158)

In order to break through this restrictive musical wall, leaving behind these well-defined musical practices, a new understanding of harmony is required.

At the 2004 'Sounds French' festival, Matthias Kriesberg (composer in residence at the Centre for Research in Computing and the Arts at the University of California, San Diego) asked the guest composers, "What makes French music French?" An incredibly consistent response was surmised in a comment made by spectrally influenced composer Philippe Hurel, who said, "from Debussy through the spectral composers, our music has been organised around harmony" (cited in Kriesberg, 2003, p.45). In order to fully understand this point of view, one must ask the question 'what is harmony?' Kriesberg (2003, p.45) went on to say:

> The starting point for a definition [for harmony] now must embrace everything that happens at any given instant. Most of the *Sounds French* [Festival] composers clearly view the boundless potential of contemporary harmony, the totality of the moment, as an invitation to think deeply about its implications for musical structure (Kriesberg, 2003, p.45).

This position could be viewed as touching on the ethos of spectralism, in that the spectral composer embraces the "totality of the moment" by uniquely bringing into account the physical structure of sound.

2.2.2. Groupe de l'Itinéraire

Like Impressionism, spectral music also had French origins. During a residency at the Villa Medici in Rome, French composers Gérard Grisey (1946-1998) and Tristan Murail (b.1947) formed a friendship that, along with Michaël Levinas (b.1949), would become a catalyst to founding '*Groupe de l'Itinéraire*' (Anderson, 2001a, p.428). Others in the group included Roger Tessier (b.1939) and Hugues Dufourt (b.1943). Using computer analysis, the group was able to discover the spectra of frequencies that exist at different strengths for various sounds. The information realized then became the spectral

musician's primary ingredients for composing some extraordinary works. In describing his understanding of harmony, Murail wrote:

> When I speak of harmony, I refer to something very specific. What has been called frequencial harmony. I think this term is more accurate than 'spectral' harmony since it includes harmonies far beyond just spectrum. Through this approach to harmony, it is possible to create harmonies (or timbres), which are completely invented, through analogies to the spectra found in nature (Murail, 2000, p.8).

Modern technology gave spectral musicians the ability to control the combination of individual frequencies using a computer. In doing so, they were able to approach possibilities beyond the natural spectrum of a sound. Individual frequencies would become indistinguishable as they were combined and manipulated to form a new timbre of the composer's choosing. Similarly, these same artists began arranging music in such a way that individual notes (each note based on a previously discovered frequency) would become indistinguishable within the totality of an orchestral sound. Composer, researcher and teacher Joshua Fineberg suggests that when the performed sound has a fused perception, the relevance of timbre and colour becomes greater than that of harmony. Fineberg adds to this by saying, "what truly emerges, in fact, is that in spectral music the line between these two concepts has blurred, practically to the point of non-existence" (Fineberg, 2000a, p.98). It is therefore not surprising to discover Olivier Messiaen's compositional influence on all members of '*Groupe de L'Itinéraire*', excluding Dufourt, who received tuition from him. As discussed in chapter one, Messiaen was one of the first to have harmony functioning as timbre with the use of his 'added resonance' device. From the group's inception in 1973, Messiaen remained sympathetic to the work of these young composers, with Grisey and Murail particularly guided by a desire to explore the phenomenology of sound (Castanet, 2000, p.30). In her article 'French Spectral Music: an Introduction', Viviana Moscovich writes, "sound as a whole – and not only as a definite pitch – becomes the composer's raw material… This kind of compositional work called also for a change in such notions as melody and musical timing" (Moscovich, 1997, p.21). Grisey presented this idea when invited to Darmstadt in 1978: "The material derives from the natural growth of sonority, from the macrostructure and not the other

way round. In other words there is no basic material (no melodic cell, no complex of notes or note values" (cited in Rose, 1996, p.8).

Gérard Grisey's first composition utilising spectral techniques was '*Dérives*' (1973-1974), a work for two orchestral groups. While this piece showed Grisey imparting an interesting exploration of fluctuating sound structures around the consonance of an E♭ overtone series, it was his next work, '*Les espaces acoustiques*' (1974-1985), that would begin to reveal some of the techniques now synonymous with spectral music. Made up of six movements, each for successively larger ensembles, *Les espaces acoustiques* would capture his creative imagination for 11 years. Of particular interest is Grisey's use of live instruments to emulate the electronic sound of *ring-modulation* (RM), an effect he masterfully creates for extensive periods throughout the work. This could be a reflection of his time at the Darmstadt summer school in 1972, where Karlheinz Stockhausen gave courses (Griffiths, 1998, p.54). In describing the remarkable exploration of timbre heard in this work, music critic Matthias Kriesberg makes a reference to Maurice Ravel, a master of orchestral colour. Once again a connection between the impressionist period and the spectral movement is raised:

> It is hard to encapsulate in words what makes the piece [*Les espaces acoustiques*] so radically different from most of what had appeared before or has appeared since… Alongside the power emanating from the sheer unconventionality of the concept come persistent sensuality, rawness, masterly pacing and sometimes breathtaking orchestration (with moments that would make Ravel proud) (Kriesberg, 2000, online).

Grisey thought of music as sounds evolving slowly in time to create their own history as part of a whole. He outlined this thought process in his article '*La musique: le devenir des sons*', which translates to mean 'Music: the becoming of sounds'. He believed this approach would cause the listener to begin asking questions about each sound: where it came from? Where it went? How it transforms? How one interprets the sound in 'this place', and later in a different one? When the listener can ascertain how the sounds evolve, they can begin to understand the form. In surmising this approach, Moscovich writes, "The apprehension and the assessment of the difference between the different

sounds at every given moment become the real material of musical composition" (Moscovich, 1997, p.25).

Grisey's thinking remained focused on different sound entities making up the whole, a thought process similar to that of Hugues Dufourt. For Dufourt, the general structure of a piece was not preconceived, as it was to form one evolving entity with the moving sound masses. This can be heard in his compositions *Erewhon* (1972-1976) and *La tempesta d'après Giorgione* (1976–1977). In saying this, Dufourt would always be aware of the work's entirety, finding similarity between the inner divisions and the whole. In addition, he believed spectral music was "founded on a theory of functional fields and on an aesthetic of unstable forms" (Moscovich, 1997, p.24). In describing *Erewhon* (for percussion), Dufourt wrote:

> …Percussion changes are perception of duration… by carrying us to extremes, it intensifies the contradictions – it is the conflict of these dynamic systems that decides the temporal form… All my writing principles rely on opposing and complementary determination systems (cited in Moscovich, 1997, p.24).

While initially concentrating his compositional interest on original instrumental colours and a sense of dilated time, in the mid 1980's Dufourt turned his interest to harmony and counterpoint. During this time his music remained atonal, yet is described as retaining a lyrical quality (Castanet, 2001a, p.666). Despite Dufourt's commonly held association with spectral music, composer and musicologist Pierre Albert Castanet describes him as a "faux-spectral" composer, as his music makes no use of micro-intervals. Castanet also describes the music of Roger Tessier as only indirectly dealing with spectral techniques and rarely using the frequencies discovered within a sonic object to form the basis for a compositional work. Two such pieces where Tessier took this sonic approach include *Clair-Obscur* (1979), for soprano, instrumental trio and two synths, and *Coalescence* (1987), for clarinet and two orchestras. In addition, Castanet suggests the use of micro-spectrality to have come a little late in the work of Michaël Levinas. He believed the association of Levinas with the spectral movement was not clearly heard until the 1990's, where he composed *Rebonds* (1993), *Diaclase* (1993), *Par-Delà* (1994) and his 1996 opera *GO-gol* (Castanet, 2000, p.31). The opera was largely the manifestation of his time

at IRCAM (*Institut de Recherche et Coordination Acoustique/Musique*), where he worked at hybridising the characteristic features of two different instrumental sounds (Castanet, 2001b, p.609). Whilst the spectral input of Dufourt, Tessier and Levinas may not have been to the extent of Grisey and Murail, their contribution and involvement is widely acknowledged. Even though Castanet raises the issue of micro-tonality, one must remember Murail's significant remark, that spectral music is a mindset, not a set of techniques. In essence, the composers are united by the belief that music is sound evolving in time (Fineberg, 2000c, p.2).

In comparing the music of Murail to that of Grisey and Dufourt, Murail's perspective remained global. Although different musical sound structures would be created within a piece, their introduction and exit was always supporting the overall structure of the piece. Murail also tended to be more focused on the science of music, striving to create new formulas as he delved into the world of computers to build music in a functional manner (Moscovich, 1997, p.22). This is reflected by musicologist Damien Pousset who writes, "do not forget that for Murail and his followers what really counts is to establish 'functions' (in the mathematical sense of the word)" (Pousset, 2000, p.87-88). With such attention to detail, it makes sense that Murail didn't want to have his music altered by computers in real-time, as he felt the result too unpredictable (Kriesberg, 2001, online). While the formulas were vital to Murail's work, they were never designed to constrict the creative process, as composer and professor Claude Ledoux (2000, p.51) notes:

> The materials from which it [Murail's music] is made were inspired by the inherent properties of sounding bodies, natural or artificial. These bodies can be modelled by mathematical rules which, whatever their level of complexity, can be found interiorised within any subject who has enough auditory experience. All these laws limit the materials within constraints which predate the musical creation. The composer's goal, however, is nothing other than freeing himself from these constraints, so as to increase imaginative potential (Ledoux, 2000, p.51).

Spectral composer Jean-Claude Risset has a similar mindset to that of Murail, in wanting to make science critical to his compositional approach. In the 1960's, Risset used his knowledge in mathematics, physics and music to begin developing computer synthesised

sound structures. In the mid 1970's, Risset became the head of the computer department at IRCAM, composing *Inharmonique* (1977), *Moments Newtoniens* (1977) and *Mirages* (1978). Here Risset used the computer to develop synthesized sounds that could interact with live instruments in a controlled manner. Risset went on to explore other relationships, such as the space between the timbre of a natural sound and a synthetic sound, as well as the filtering of one sound onto another (More, 2001, p.441-442). For both Murail and Risset, the quest for formulas and the use of computers in the compositional process remain vital.

According to Julian Anderson (2001b, p.403-404), Murail's first compositions to begin demonstrating a spectral approach were *Sables* for orchestra, composed in 1974, and *Memoire/Erosion* for chamber orchestra from 1976, featuring horn and nine instruments. Murail, however, struggles to call these pieces spectral because there was no use of frequencies or spectra in creating the different timbres. Nevertheless, he does recognize a spectral element in his exploration of the overtone series and its state of consonance, with particular attention given to the instrument chosen for each partial. The music gradually transforms from a state of consonance to tremendous dissonance, creating a sound structure that has been given the term 'white noise'. In doing this, Murail began the process of developing "an auditory continuum between timbre and harmony" (Murail, 2000, p.7). Interestingly, *Memoire/Erosion* shows Murail taking a similar approach to Grisey by having the acoustic instruments emulate an analogue electronic device, in this case a *re-injection loop*. Figure 2.1 provides a diagramatic example of this compositional device.

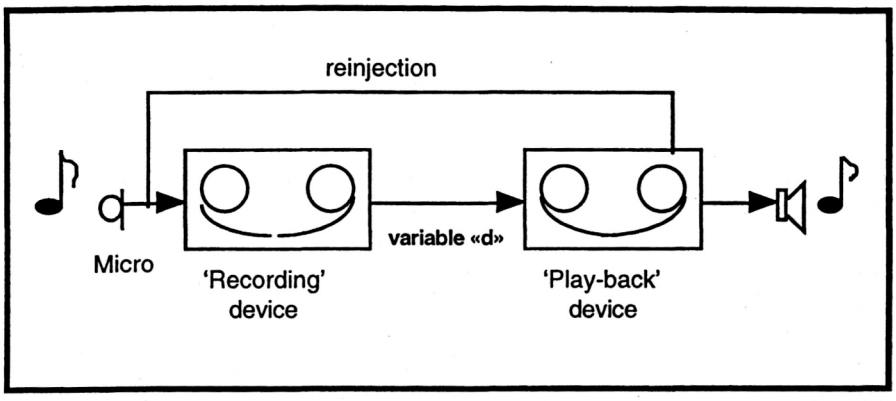

Figure 2.1. Diagrammatic representation of a re-injection loop (Ledoux, 2000, p.59)

In this analogue model, the sonic source is captured by a microphone (micro) and recorded onto tape (recording device) for an indefinite period. This information is then reproduced by a second machine (play-back device) and played through a speaker at a calculated delay (variable d). The sound produced from the speaker is then superimposed on the sonic source and re-injected back onto the tape through the microphone. The process can tirelessly repeat itself as many times as the composer wishes, creating a complex polyphony of sound (Ledoux, 2000, p.58-59).

In *Memoire/Erosion*, rather than a tape reproducing a live recording of the solo horn, which is then re-injected back onto the tape for further reproduction, the instruments imitate the horn. This creates a similar effect to that of the tape, forming instrumental echoes and canons that eventually cause a deformation of the sound source to that of noise (Anderson, 2001b, p.404). Of particular note for Murail is the way in which these early pieces were already signifying and utilising the notion of process. In describing this he writes:

> Historically, the ideas of process and continuous change came before the real spectral work. For me, this fascination with transforming objects and creating hybrids was always there: it's almost congenital. I think retrospectively that this idea, coupled with the importance I (and others) place on working with harmony in a way that completely controls it – giving strength to the formal construction – were the basic ideas of spectral music (Murail, 2000, p.7).

While some differences existed between Murail and Grisey, they were both composing music that had an unprecedented exploration of timbre, allowing them to reveal the hidden intricacies of sound. Their music initially held an unbroken journey of discovery, slowly transforming over time to give the listener an opportunity to hear the complexity and colour of the created sound structure.

In 1980, Grisey and Murail both attended IRCAM, a Parisian research facility dedicated to computer music research, developing software and hardware tools for composition and performance. Since its inception in the 1970's, the centre has attracted many spectrally influenced composers, including Joshua Fineberg, Philippe Hurel and Claudy Malherbe. Though the music composed by attending artists may have varied in aesthetics, they all placed a high value on process and the concept of models. The influence of IRCAM on Grisey was revealed in his composition *Les Chants de l'Amour* for 12 voices and computer-synthesized voice, a piece he worked on between 1982 and 1984. Using the program Chant, developed by Xavier Rodet and Yves Potard, Grisey was able to create a continuous voice that functioned much like the *Tampura* of Indian music, providing a "referential model for the live singers" (Castanet, 2000, p.31). Grisey managed to find a way of cleverly blurring the division that exists between the natural and the unnatural sound.

Murail's first composition to utilise his deepening understanding of computers from IRCAM was *Désintégration*, composed from 1982-1983 for 17 instruments and computer-generated tape. The piece used computers to decode sonic events into frequencies, such as a low note played on the piano. This information then became the model for harmonic construct and form. In composing this work, Murail sought to create a scale of consonance and dissonance through timbre manipulation, progressively changing the amount of 'distortion' heard (Fineberg, 2000b, p.122). The term 'distortion' refers to the process of deforming the construct of the sonic events providing the material for the piece. In other words, whatever the frequency parameters discovered might be, they are manipulated in some way to create new timbres with varying degrees of 'distortion'. This artful process of sonic metamorphosis through the manipulation of

spectra is also known as ‘anamorphosis’ (Dazzling new music from France, 2005, p.7). In describing the use of this device, Ledoux writes:

> …The relation between the composer and his material implies not only the discovery of a pre-existing thing, but also the construction of a possibility. This is the reason that while the notion of ‘process’ forms the basis of Murail’s work, that of ‘distortion’ is the foundation of its development (Ledoux, 2000, p.51).

Possibly the most significant change to take place in Murail’s compositional approach at this time was the use of silence and breaks. *Désintégration* was the first time the transformation of timbre had been interrupted in such an abrupt way since his spectral compositional approach began. Grisey would be heard to do similar in his 1986 piece *Talea*, creating musical ideas that were discontinuous and sometimes sudden, making identification of form more difficult. In *Le temps et l’écume* (1988-89), Grisey would explore three different states of time that were superimposed and contrasted. Again, while some transitions are smooth, others are dramatically abrupt. Although both composers remained loyal to the exploration of timbre, this was the beginning of their becoming less rigorous with some of the precepts that had governed their music in the 1970’s. In the 1990’s, Murail focused most of his attention on a technique he called ‘process of processes’, with *Allégories* (1990) a high point in his compositional transformation. The seed of this technique could first be heard twelve years earlier in *Treize couleurs du soleil couchant (1978)*. It involves the exploration of multiple spectral processes that are layered and occur simultaneously. During this period Murail’s music continued to move away from his initial linear approach, taking on a sound of greater contrast. In describing *Allégories*, Ledoux writes:

> …The piece avoids the linearity of slow, process controlled, transformations [as heard in the 1970’s] and benefits from a more discursive form, richer with its dialectic between predictability and unpredictability; a form more open to expectations, projections and ‘flashbacks’ (Ledoux, 2000, p.63).

Murail also, quite hesitantly, began to reintroduce ideas that were closer to a traditional musical language, including the use of melodic motifs. In describing his concern, Murail said, “it took me a very long time to re-introduce truly melodic elements into my music,

because I was afraid of returning to past melodic clichés, falling back into formulas of theme and variation of all sorts" (Murail, 2000, p.8). Clearly Murail's use of melody was not incorporated with a wish to return to the past, but part of his exploration into an increasingly flexible form. While changes have occurred in spectral music, harmonic understanding and its incorporation continued to grow. To understand what is being heard, the importance of form cannot be understated. Murail writes: "Harmony has been an important asset for building more complex structures that, nonetheless, retain perceptual clarity in their formal development" (Murail, 2000, p.8).

The ongoing growth in the knowledge of sound's structure and the resultant increase in harmonic potential have gone hand in hand with technological progress. When composers initially used computers, it could take months for the program producing the music to be developed. Today, the lengthy compiling of information has been replaced with graphical interfaces that can visually represent what is being heard, and be manipulated with the click of a mouse. In recent years, IRCAM has focused its attention on programs for personal computers, often created with input from world-renowned composers (Cornicello, 2000, p.46-47). This institution played a significant role in Murail's investigation of *process of processes*, with the composer working alongside programmers to create *Patchwork* in the early 1990's. *Patchwork* is a computer-assisted composition tool, allowing the composer to create their own unique visual musical program using predefined boxes that interact and are triggered by an external event. This could be as simple as a mouse click or a touch of the keyboard. An example can be seen in Figure 2.2, where a series of integers are interpreted by a box to reveal notes that have been displayed in common musical notation.

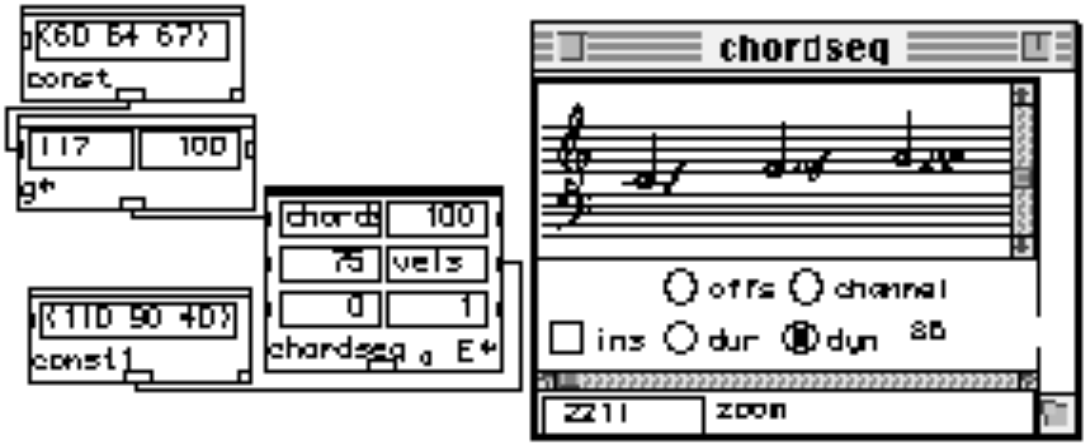

Figure 2.2. Graphical environment of Patchwork (Agon, Assayag, Laurson, & Rueda, n.d., online).

Following *Patchwork's* creation, this program was used by Murail to compose a good deal of his subsequent work (Anderson, 2001b, p.404). Eventually the program gave rise to software called *Open Music*, which presented a number of new features as part of a "second generation" compositional program (Agon, Assayag, Laurson, & Rueda, n.d., online). In addition to Patchwork and Open Music, which aid in the compositional process, IRCAM has developed software for sound synthesis (Modalys, AudioSculpt, Diphone and Chant) and real-time interaction between the performer and the computer (jMax, Spat, Gabor and Suivi). All of the programs listed use a graphical interface that can take a conceptual idea and make it compositional reality in a relatively short time (Cornicello, 2000, p.48)[1].

2.2.3. German Feedback Group

The German Feedback Group had a similar spectral interest to that of Murail and Grisey, in that they wanted to investigate the matter of consonance and in the process establish new defining musical qualities that would mark the term. In addition, there was also a desire to use analogue electronic studio techniques, especially RM, within an instrumental setting. Nevertheless, there were some important differences between the

[1] The IRCAM software can be purchased at their *Forumnet* website (go to http://forumnet.ircam.fr/?L=1).

early work of the Feedback group and *L'Itinéraire*. In particular, the feedback composers still desired the incorporation of some traditional musical elements, with many pieces having a strong melodic quality within a harmonic context (Anderson, 2001c, p.167). The group was established in 1970 when Rolf Gelhaar (b.1943), David Johnson (b.1940) and Johannes Fritsch (b.1941) set up the Feedback Studio in Cologne. This was followed in 1971 by the opening of the Feedback Studio Verlag, the first German publishing house to be owned and managed by composers (Feedback Studio Verlag, 2002, online). Others to join the group included Clarence Barlow (b.1945), Mesias Maiguashca (b.1938), and on a more distant level, Claude Vivier (1948-1983) and Peter Eötvös (1944). Many of the Feedback composers spent time playing in Stockhausen's ensemble, and some attended his compositional classes at the College of Music in Cologne (*Musikhochschule Köln*). Consequently, Stockhausen's influence on the group was significant, with the techniques heard in his works *Stimmung* (1968) and *Mantra* (1970) having a particular impact (Anderson, 2000, p.15).

The music of Maiguashca presents itself as an excellent example of the Feedback group's approach to spectral music. His expertise in electronic music has taken him to many institutions, including the Cologne Studio for Electronic Music, IRCAM in Paris, *Centre Européen pour la Recherche Musicale* in Metz, and *Zentrum für Kunst und Medientechnologie* in Karlsruhe (Béhague, 2001, p.636). In his works *FMelodies* (1981), commissioned by IRCAM, and *Monodias e interludios* (1984), Maiguashca masterfully fuses together melody with spectral principles. More specifically, he uses sum and difference tones to generate a large collection of frequencies that then become the source of the melodic and harmonic material (Anderson, 2001c, p.167). Eötvos' ensemble piece *Sequences of the Wind* (1976) and his orchestral work *Chinese Opera* (1986) are both compared to *Monodias* in the manner by which the pitch material was created (Anderson, 2000, p.17). The *Chinese Opera* also demonstrates his interest in exploring the theatrical aspect to music, as well as the movement of sound in space. In this case, Eötvos explored the use of musical gestures to represent text and speech, forming sound masses that amass and become displaced (Homma, 2001, p. 262-263). Baalo's *cogluotobüsisletmesi* (1980) reflects a spectral approach in that it requires a few notes on the piano to be

retuned in order to fit the desired frequencies of the piece. Grisey later took a similar spectral approach in his piece *Vortex Temporum* (1996). *Cogluotobüsisletmesi* is a highly melodic piece, developing polyphonically through a layer of processes, similar to that of Murails 'process of processes', that utilize the whole keyboard, at some points simultaneously. Since this is humanly impossible to play, Baghlough turned to IRCAM to create a computer-generated performance of the work (Anderson, 2000, p16). (Note: Clarence Barlow desires to have his name spelt differently with each use in print. Baalo and Baghlough both refer to the same composer). Towards the end of his life, Canadian composer, Claude Vivier (1948-1983), composed *Lonely Child* (1980), *Bouchara* (1981) and *Prologue pour un Marco Polo* (1981), three significant spectral pieces. In each, he incorporated non-tempered spectra to explore rich orchestral timbres, or what the composer called 'colours'. In describing these works, Dutch musicologist Jaco Mijnheer writes:

> These 'colours' are in fact chords covering the whole instrumental range and can be understood as the sound of one large instrument, the ensemble. They are composed using a method which imitates electronic RM [as used by Stockhausen]: the pitches of all the parts are calculated by a series of additions based on the frequencies of the notes of the melody and the bass (Mijnheer, 2001, p.846).

In all the aforementioned compositions by the Feedback composers, there is a definite melodic emphasis, another product of Stockhausen's influence.

2.2.4. Romanian composers

At about the same time as *l'Itinéraire* and the Feedback group were established, there were a number of independent composers investigating spectral principles in Romania. Some of these composers were native born, including Stefan Niculescu (b.1927), Aurel Stroe (b.1932), Iancu Dumitrescu (b.1944) and Călin Ioachimescu (b.1949), while others were in excile, such as Costin Miereanu (b.1943) or Horatiu Radulescu (b.1942). In essence, the work of these composers involved fusing together the folk music of their home countries with the science of spectra and acoustical investigation (Anderson, 2000, p.18). Of those composers listed, the work of Dumitrescu and Radulescu is said to be

more experimental, with Radulescu having a particularly interesting compositional thought process. Explained in his 1975 booklet *Sound Plasma: Music of the Future Sign*, Radulescu felt that categories such as homophony and polyphony were exhausted. Consequently, he sought to replace these terms with the expression *sound plasmas*, an aural body that is continually changing, revealing and concealing spectral components at regular and irregular periods. More specifically, these plasmas are made up of spectral complexes that are created using *frequency modulation* (FM), or the harmonics of a low theoretical fundamental sound (Anderson, 2001c, p.167). Developed by John Chowning in the 1970's, FM is one of the most commonly used spectral techniques. It is similar to that of RM, in that *the modulator* (M) is added to *the carrier* (C) to create *sidebands*. There are, however, a number of important differences in Chowning's formula, expressed as: frequency = C + and – (*modulation index* * M). The *modulation index* (I) refers to the degree M is affecting C. In essence, when the modulating wave is prevented from reaching C, the value of 'I' will be zero, which also means there will be no side bands. As the amplitude of the modulating wave increases, so too does 'I', reducing the presence of C, but increasing the number of *sidebands* (Hass, 2001, online). In order to produce a value for 'I', the *peak deviation* must be divided by the *modulating frequency*: I = D/M (Cornicello, 2000, p43). An example of this can be seen in Figure 2.3, where C is 440Hz, M is 100Hz, and 'I' is 0-6. All notes have been approximated to the nearest quarter tone.

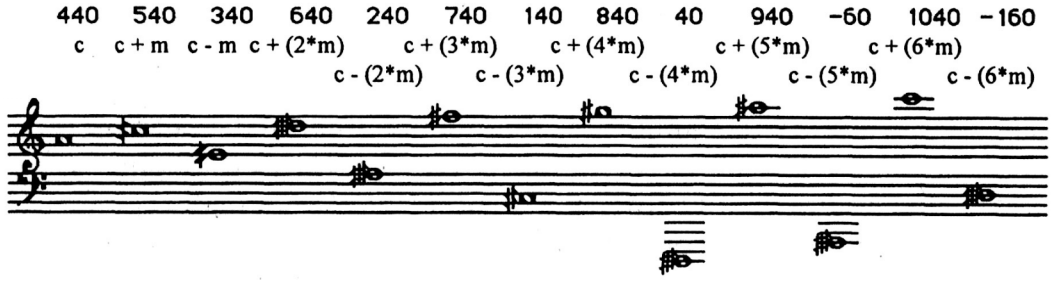

Figure 2.3. Frequency modulation (Fineberg, 2000a, p.96)

In comparing FM to RM, Fineberg writes:

> The major difference from FM modulation is that this type of modulation [RM] is not hierarchic: there is not a carrier and a modulator which modifies it, but two

> equal sounds both of which are directly present in the resultant sound and both of which are modulated by the other (Fineberg, 2000a, p.97).

As Radulescu used FM to assist in his exploration of *sound plasmas*, the role of dynamics and timbre became his principal concern, particularly in the way his music altered between states of pitch and noise. For Radulescu, establishing the *plasma* theory meant distinguishing between *planetary* and *cosmic* music. English musicologist Richard Toop suggests the spiritual element of Radulescu's theory to be what separates him from Grisey and Murail. He writes:

> It is this [spiritual] aspect – in many respects akin to Stockhausen's outlook – that most clearly distinguishes Radulescu's music from 'instrumental synthesis' (also spectrally based) pursued by composers like Grisey and Murail from the 1970's onwards. While the latter composers work is in some respects scientific and clinical, expounding clear acoustic process, Radulescu's aims are essentially spiritual and magical… (Toop, 2001, p.746).

2.2.5. Other independent composers

A number of independent figures also existed outside the aforementioned spectral groups. One such artist is German composer Erhard Grosskopf (b.1934), who began his own investigation of consonance at the end of the serialist period, which led to a spectral approach in composition. His music largely used independent spectral loops that were layered and operating at varied temporal states, creating evolving harmonic textures and structural events (Kunz, 2001, p.441). The loops were more commonly used in an instrumental context, creating vertical structures that swayed between complex and simple, as heard in *Quintett über den Herbstanfang* (1980) and his orchestral piece *Slow Motion* (1981).

Other independent composers have tried to merge the techniques of spectralism with serialism, an approach Grisey challenged. He stated: "In its violently qualitative aspect, it [timbre] necessarily bars any serializing approach; just as it upset tonal thinking, so too does it upset serial thinking, hollowing it out from the inside" (cited in Drott, 2005, p.3). Nevertheless, both past and present spectral composers have and are contending this

belief, composing works that reveal serialist influence, the very school of thought the *L'Itinéraire* group desired to overstep. Of particular note is the music of Jonathan Harvey (b.1939), a British composer whose training was well versed in serial techniques. Throughout the 1970's, Harvey gradually developed his own unique spectral voice, reaching a pinnacle of achievement in 1980 with the composition *Mortuos Plango, Vivos Voco*. Julian Anderson suggests this extraordinary piece, realised at IRCAM, to be the "only serially composed spectral composition" (Anderson, 2000, p.19). The success of this work led to a second IRCAM commission, which resulted in *Bhakti* (1982), a large-scale piece that uses spectral analysis, and according to Anthony Hamilton, also possess serial techniques (Hamilton, 2003, p.48). While some may challenge Anderson's belief of *Mortuos Plango* being the 'only' fusion of these schools of thought, Harvey's music does appear to confront Grisey's belief. Like Radulescu's *sound plasmas*, Harvey believed atonal music would allow him to explore the spiritual world, with tonal music only holding him to an exercise in emotions, of "sentiments which flow", as Debussy put forward (Griffiths, 1984, p.95). Harvey believed atonal music involved a journey into the soul, requiring a mental activity that many in the west had forgotten. The importance of the spiritual can also be seen in the lives and music of other timbral composers, including Messiaen and Stockhausen. To this search Harvey would add a desire to gain new insights into sound's hidden structure. In a 1984 article for *Contemporary Music Review*, Harvey wrote: "One needs to dwell longer on the individual note/chord… to realise its potential, its 'inner life' (Stockhausen). It is not part of a progression, but contains progressions within itself" (Harvey, 1984, p.85-86). To accomplish this, Harvey turned his creative energy to the use of computers, and in the process, continued his journey into the spiritual realm of music. In describing the importance of their use he wrote:

> Spectral music is allied to electronic music: together they have achieved a re-birth of perception. The one would scarcely have developed without the other. Electronic music is a well-documented technological breakthrough, spectralism in its simplest form as colour thinking, is a spiritual breakthrough (Harvey, 2000, p.11).

2.3. Spectral music: today and beyond

From the late 1980's till today, spectral principles have had varying degrees of influence on composers throughout the world. Most of today's spectral composition occurs in France, the only country to develop what could be termed a spectral school. A number of composers have made a conscious effort to add to the knowledge of research already undertaken by Grisey and Murail. Some of the more distinguished pupils included Philippe Hurel (b.1955), Marc-André Dalbavie (b.1961), Jean-Luc Hervé (b.1960) and Joshua Fineberg (b.1966). Often with the assistance of IRCAM, these composers have used the latest technology to gain new acoustical understanding, particularly in the areas of perception and *auditory event streaming* (Anderson, 2000, p.20). A *stream* is described as a single auditory event that comes from the same source, creating a sequence of related acoustic outcomes that are dispersed over time. An example of this might be someone speaking or an instrument playing a melody, both cases holding perceptual unity as a result of spectral continuity. The formation and manipulation of these streams greatly affects the way an acoustic event is interpreted, if at all (Pressnitzer and McAdams, 2000, p.51).

Unlike in France, there have been no apparent young spectral composers continuing the work of the German Feedback group, with the general trend of music in this country taking a very different direction. Nevertheless, some in the Feedback group are still composing pieces that utilise spectral techniques, and Hans Zender (b.1936) has independently taken an interest in this way of thinking, particularly in the use of RM and FM (Anderson, 2000, p.20-21). His unique approach can be found in the way he brings his interest in oriental music to the exploration of harmonic patterns and overtones, as heard in his 1995–6 compostion *Shir hashirim* (Gruhn, 2001, p.790).

British composers, as in Germany, have shown little interest in using spectral techniques, however, George Benjamin (b.1960), François Evans (b.1965) and Nigel Osborne (b.1948) have joined Harvey in this way of thinking. The influence of Murail and Grisey on Benjamin can be heard in *At First Light* (1982), mostly in form and harmony, with the music slowly progressing to an overtone spectrum on C at the end of the third movement.

In his piece *Antara* (1985-1987), for live electronics, two solo flutes, and ensemble, Benjamin again takes a more spectral approach while uniquely incorporating a folk influence, as described by Anderson:

> Despites its [*Antara*] primarily melodic, linear texture, the pitch structure of this work is more strictly spectral than anything else Benjamin has composed to date. Many of the modes used in the piece are constructed from scales of natural harmonics in pure tuning; the contrasting modal areas are formed by modulating between these different scales (Anderson, 2001d, p.273).

Other European musicians to be influenced by spectral principles include Norwegian composer Lasse Thoresen (b.1949) and Belgian composer Luc Brewayes (b.1959). Thoresen has masterfully brought together the influence of spectralism with Norwegian folk music and Harry Partch's tonal system *Just Intonation*. In fact, Thoresen was the first composer to bring the non-tempered intervals of his native folk music into art music (The Music: Composers and Performers, 2001, online). Since meeting Murail in 1982, Brewayes' music has had a tendency to explore the colour found in the spectral realm over sustained fundamentals. His music has retained a melodic quality within this spectral envelope, and he has made full use of live electronics, manipulating the music in real time (Renders and Vandenhouwe, 2001, online). Nonetheless, of those independent composers to explore spectral techniques in the last two decades, possibly the most recognised today is Finnish composer Kaija Saariaho (b.1952). While her output in the 1970's was melodic by nature, from 1980 she shifted her attention to creating music that explored harmony and tone-colour, starting with *Im Traume* (1980). This focus brought her to IRCAM where the use of electronics became an influence on her music, starting in 1982 with *Vers le blanc* (1982). Through the use of computers, she caused one three-note chord to evolve into another three-note chord at such a radically slow rate that it remained imperceptible to the ear (see Figure 2.4). In so doing, Saariaho made an interesting contribution to the French research into auditory event streaming. In this case, the computer is used to control the sound's development, rather than generate the harmonic material.

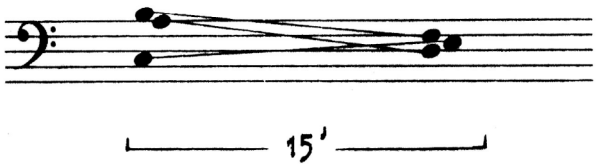

Figure 2.4. The harmonic progression of the piece *Verse le blanc*, for tape (Saariaho, 1987, p.104)

Verse le blanc was soon followed with *Verblendungen* (1982-1984), written for tape and ensemble, and then *Lichtbogen* (1985-1986), a 16 minute piece for flute, percussion, piano, harp, two violins, viola, cello, double bass and electronics. Interestingly, Saariaho followed a similar pattern to Grisey and Murail, in that her earlier works were more static, but changed in the late 1980's and 90's to become more rapid and irregular, as well as to incorporate more melodic material. Despite this shift, the desire to explore timbre has remained, and where necessary, electronics are still used (Korhonen & Nieminen, 2001, p.59). In 1996, Saariaho composed *Lonh* (After), a piece for soprano and electronics, where the text is recited in multiple languages, along with processed sounds from the environment (such as wind, birds and rain). In 2000, this work received the *Nordic Music Prize*. In 2003, Saariaho composed *Je sens un deuxième coeur*, a chamber piece for alto, cello and piano. While no electronics were used, she describes part three of the work as "a colour study in which the three identities are melded into one complex sound object" (Saariaho, 2005, online).

Another significant spectral composer and compatriot to Saariaho is Magnus Lindberg (b.1958). Both Saariaho and Lindberg openly acknowledge the influence of Murail and Grisey on their music, with Lindberg actually receiving tuition from Grisey. Despite this, his work displayed no spectral process up until the late 1980's, when he composed *Twine* (1988) for piano, and an orchestral trilogy made up of *Kinetics* (1989), *Marea* (1990) and *Joy* (1990). In these works, Lindberg managed to combine spectral principles with *pitch class set theory*, a concept associated with atonal composition and analysis (Oramo, 2001, p.711). Lindberg's approach primarily retains the use of equal temperament, avoiding the spectral complexity that a technique like FM might create. The focal point of his spectral work tends to be *consonizing-dissonance*, a process made possible through

IRCAM's *Patchwork* and its derivative *Open Music*. In describing his music, Anderson writes:

> As one of the most prominent composers anywhere on the current musical scene, he presents a valuable example of a composer who benefited from the liberating influence of spectral thinking, without hampering his personal style or becoming part of any 'sect' (Anderson, 2000, p.20).

In identifying the direction spectral music has taken in more recent years, musicologist Damien Pousset suggests a new category of identification for its composers, that of post-spectral. In an article for *Contemporary Music Review*, he addresses the music of Saariaho, Hurel and Dalbavie. Unlike Murail and Grisey, the new generation no longer feel the need to investigate the notion of process or the amalgamation of timbre into compositional techniques. Instead, they are concerned with finding an original approach to these sound oriented tools (timbre and process), something personal to their own music history. Pousset (2000, p.68) writes:

> Kaija Saariaho, Philippe Hurel and Marc-André Dalbavie belong to the group of composers who attempt to reconcile aesthetics by assuming a basis built upon the gains made by spectral music as a base of possible development for their language (Pousset, 2000, p.68).

Like the music of Jonathan Harvey, these post-spectral composers are also described as holding an interest in the principles of intervallic music and serialism. In light of this, Hurel describes the approach taken by today's composers to be one of fusing together those compositional principles once thought incompatible. Hurel states:

> …Ideas spread far more than we think, and the serial contribution isn't necessarily in contradiction with timbre-oriented music. Even compositional principles thought incompatible, not so long ago, are now being used together, without contradiction (…) But especially, this distinction doesn't mean much anymore since many composers of my generation – like Dalbavie and Lindberg – have realised that it is possible to integrate in a so-called 'timbral' musical discourse with contrapuntal, polyphonic or structural elements like Stockhausen, Boulez and Berio developed in the heroic age. All of this to say that if there is a musical consensus to be found, today, amongst the composers of my generation, it is less based on questions regarding spectrum and series, but rather on the means of controlling heterogeneity (cited in Pousset, 2000, p.68).

Although Pousset has only addressed the music of Saariaho, Hurel and Dalbavie, other modern composers can be heard reflecting their compositional approach. Many have taken a more personal approach to the spectral techniques established by its founders, amalgamating various styles of music, including serialism. While this musical trend is evident, it could be said that Pousset is inadvertently siding with Grisey's aforementioned statement, that of serialism being opposed to spetralism. Even though this amalgamation is occurring, it may no longer be *pure* spectral music, but a derivative of the movement, a post-spectral school. Pousset supports the need for a new term by stating:

> The aims and methods of research have most certainly changed since the first attempts at modelling timbre (…). And some people, indeed, speak of a *Second generation* of spectral composers. However, it seems to us rather arbitrary, if not incorrect, to label this trend today as 'spectral music' which, although undeniably drawing on the same sources as spectral music, differs significantly in its contrapuntal re-appropriation of timbre. That is why, temporarily at least, the term 'post-spectral' music will be used as the implicit designation for these changes which are taking place (Pousset, 2000, p.69).

The future of spectral music remains difficult to predict. The music is yet to gain widespread interest amongst ensembles, orchestras and ultimately the public, making it less appealing for record companies and publishers. Nevertheless, interest still remains in the use of spectral techniques, as demonstrated by the birth of the so-called post-spectral composer. Perhaps this new movement may help to create further interest in the spectral sound as it amalgamates with other schools of thought and musical styles from around the world. Even though this diversification appears to be a positive step forward, Anderson believes this trend is merely a reflection of spectral music being seen as no more than a passing sound colour, something that is easily assimilated, rather than a substantial musical technique. In order for spectralism to have a long-term impact, he believes it needs to get in the hands of more ensembles and orchestras for the general public to hear (Anderson, 2000, p.21-22). If this is the answer, the work of Murail remains vital, who continues to compose and teach (Columbia University) in America. Since leaving Paris in 1997, Murail has been creating marketing inroads for the music of the French spectral school as he speaks and has his music, along with the compositional work of some of his

compatriots, performed across the United States. The future of IRCAM also appears to be strong, with composers from all over the world attending their workshops and school programs.

2.4. Summary

The spectral movement emerged as a post-serial school of thought in the 1970's. While some have suggested spectralism to be a desire to move away from the mathematical complexity of serialism, the scientific approach of Murail could be viewed as equally intractable. Nevertheless, the music of Murail and Grisey, and all those in *L'Itinéraire*, pursued an unprecedented exploration of timbre. Their music, largely influenced by Messiaen, initially had a compositional quality that was unbroken in nature, with each piece transforming sound slowly in time. The Feedback group, primarily born from Stockhausen's inspiration, also wanted to explore sound's hidden meaning and, in the process, establish a new defining quality for musical consonance. In both groups, the latest in electronic technology was used, particularly at IRCAM and the Feedback Studio Verlag. Unlike *L'Itinéraire*, however, the Feedback group retained an interest in using traditional music elements, incorporating a degree of melody within a harmonic context. Similarly, the small group of identified Romanian composers also incorporated traditional traits, in their case fusing the folk music of their countries with the science of spectral investigation. In the 1980's, *L'Itinéraire* also, quite hesitantly, returned to using some of these traditions, with a melodic quality once again being embraced. In addition to this, their music became less linear, with Murail and Grisey making use of silence and breaks. For Murail, this was embraced as part of his exploration into an increasingly flexible form. Despite the diversity existing across these schools, as well as in the work of the independent composers, and in spite of all the changes that occurred over the decades, the investigation of timbre has remained central to their work.

Today, most of the activity still remains in France, with this country producing the closest thing to a spectral school, with Hurel, Dalbavie, Hervé and Fineberg all active composers of the idiom. IRCAM has been pivotal in research into sound, with the production of

innovative computer programs creating new musical possibilities. While the Feedback group didn't lead to a similar school, many more independent composers have embraced spectral techniques throughout Europe. In Germany there is Zender, in Britain the music of Harvey, Benjamin and Osbone, and in Finland Lindberg and Saariaho, the latter receiving particular world acclaim. For many of these artists, their approach to spectralism has been more of a personal one. The challenge has been to find a way of combining spectral techniques with their personal musical interest, whether that be folk, oriental, mysticism or a return to serialism. As Hurel describes it, they are not looking for answers to the spectrum of sound, but rather a way of "controlling heterogeneity". For this reason, perhaps it is right for these composers to no longer be identified as a second-generation group of spectral musicians. If they must be grouped in some way, it seems the new category of 'post-spectral' musician more accurately reflects what is happening today. History is full of radical ideas being re-incorporated back into the mainstream. The findings of this literature review give every impression that spectral principles will follow this course.

Whist the ongoing interest in spectral techniques appears to be a positive step forward, Anderson believes this has no reflection on the substantial techniques put forward in spectral music. He proposes that the 'post spectral' composer is merely presenting a passing sound colour that can be easily assimilated. Nevertheless, whilst these composers may challenge Anderson's view, it is a safe assumption that in order for spectral or post spectral music to have any long-term impact, it must reach the ears of the general public. For this to happen, the music needs to be performed by ensembles and orchestras from around the world, as well as heard in an ever-growing number of multimedia settings.

CHAPTER THREE

3. Spectralism and its connection to vision

3.1. Introduction

To understand the emergence of spectral music and its post spectral school of thought, bringing to light its connection to impressionism and the mindset of these composers, has been an important undertaking. This journey has been critical in stimulating the ideas for *Moment*, the artistic project undertaken in conjunction with this research. In this respect, it is particularly relevant to also understand the connection spectralism has to vision. While much of the history of the relationship that exists between vision and music has already been well documented, a specific discussion on the role of spectral music in film and video has largely been overlooked, a subject matter particularly pertinent to *Moment*. This chapter will begin with a general overview of vision's relationship to spectralism, both on a scientific and personal level. Claudy Malherbe's *Seeing Light as Colour; Hearing Sound as Timbre* is both a significant and rare article in this area, and will therefore receive particular attention. This discussion will lead to a specific look at spectral music in motion pictures, an approach to composition that is still very much in its infant stage. Following, the current social trends for vision with music will be outlined, both for the concert stage and television. Lastly, the interpretation of spectral music for the listener who is more familiar with Western tonal music will be considered. By addressing these subject matters, a premise will be established for the work undertaken with *Moment*.

3.2. The visual connection

A parallel between impressionism and spectralism is not only found in the primary significance of timbre, but also in their association with the visual arts. In chapter one, a correlation was established between impressionist composers and the painters of their time. Debussy was even said to receive his most profitable lessons from these artists, as well as from the poets of his day. While Debussy was against the term impressionism being used for his music, there is a well-accepted similarity in the approach taken by both

the composer and his painter counterparts towards colour. In essence, painters stroked unmixed, visibly choppy, colours onto the canvas for the viewer's eye to blend, leaving the traditional sharp contrast of shade and light behind. Similarly, Debussy and the other impressionists left conventional compositional methods behind to focus on musical colour. Clearly defined melodic structures and clear-cut forms gave way to the general effect of timbre. In the music of Grisey and Murail, composer, researcher and author Claudy Malherbe (2000, p.16-17) makes a similar connection to French painter Georges Seurat (1859-1891), a leading figure in the neo-impressionist period. This movement sought to add formal structure to what was being explored by painters in the impressionist period. Seurat developed a technique known as pointillism, where the paintings were created from tiny pure coloured dots (Seurat, Georges, online). This approach came from his premise that the eyes have an ability to optically mix the separate dots (*couleur-lumière*), as apposed to mixing pigments (*couleur-matière).* Seurat believed his painting technique would result in colours showing greater luminosity, as he felt the mixing of pigments led invariably to an ever-darker colour. Malherbe likens the work of Grisey and Murail to that of Seurat, in that traditional orchestration methods (*timbre-matière*), based on variations of chord, counterpoint and harmonic structure, were replaced with compositions founded on the science of acoustics (*timbre-son*). For Murail and Grisey, the chosen orchestration was the result of a detailed sound analysis. Malherbe concludes this line of reasoning by writing:

> As with the effects of the neo-impressionists' optical mixing, which virtually constructs a scale of colours which are not actually present on the canvas, the effects caused by *spectral fusion* allow coherent timbres to be heard where, on paper, only aggregates of distinct elements are notated (Malherbe, 2000, p.17).

Aside from this general scientific mindset connecting spectralism to neo-impressionist art, there also exists the personal visual interest of the composer. For Grisey, music composition involved understanding the shades of light created from different harmonic states. He highlighted this standpoint when he said, "sounds cast a shadow" (cited in Malherbe, 2000, p.20). For him the amount of shadow depended on the degree to which the natural frequencies of a sound had been altered in a composition. Certain intervals were said to create tones that reinforce the harmonic spectrum of the generating sound

structure, such as a trombone playing a low E_1 (41.2 Hz), analysed for Grisey's *Partials*. Other sounds or intervals, however, are the result of varying degrees of harmonic alteration to the generating sound's structure, increasing the complexity of the frequencies heard and the amount of shadow created. The pure harmonic spectrum is said to create the most untainted light, likened to the sun at midday. As the title suggests, Grisey used this visual mindset to compose '*Jour, Contre-jour*' (1978-1979) for ensemble and electronics, taking the listener from the greatest lucidity to absolute darkness (Malherbe, 2000, p.20).

The visual cue for Murail is just as strong, whether his music is representing an image in a metaphorical manner, or representing a state of colour in a more scientific sense. Many of his song titles reflect some aspect of colour or visual image, such as *Treize couleurs du soleil couchant* (Thirteen colors of the setting sun), *L'esprit des dunes* (The spirit of the dunes), *Couleur de mer* (sea colour) or *Serendib*, the old Arab name for the island of Sri Lanka (Murail Serendib & L'esprit des dunes, 2005, online). Claude Ledoux poetically ascribes this aspect to Murail's compositional work:

> The titles given to the pieces are like so many clues to the special relationship that exists between the composer and a particular vision of the world. One has but to listen to *Sables* [Sands] or *L'esprit des dunes*, and the desert appears. On one hand, the marine-like spaces tremble with the chaotic waves of *Serendib*, *Couleur de mer*, or even in the most recent orchestral piece, *La partage des eaux* [The Division of Water]; on the other hand, the Earth expresses its tectonic roughness through Gondwana or again in *La dérive des continents* [Continental drift]… (Ledoux, 2000, p.44).

In a more abstract manner, sometimes this "vision of the world" literally becomes the composer's spectral source for the work being conceived. A good example is to compare Debussy's *Le mer* [The Sea] with Murail's *Le partage des eaux*. Until this composition, all of Murail's spectral material had been sourced from instruments. In choosing to focus on the sounds of water, a new challenge was presented, as Murail explains:

> *Le Partage des eaux* marked the first time I analyzed sounds from nature; previously I had confined myself to instrumental sounds as the basis for the electronic sounds, and *L'Esprit des dunes* uses non-Western instruments and

> sounds. So I was curious to see what I could extract from this information, these natural sounds, usually considered noises, things that we cannot define musically. They are very rich in sound, in fact, and I transcribed them for the orchestra of *Le Partage des eaux*, but I hadn't time to go further (Noreen & Cody, n.d., online).

For Debussy, his aim was to have the orchestra reflect the sound of waves, taking the listener to images of rolling waters. Conversely, while Murail's title depicts the movement of water, spectral musicians are not trying to recreate on instruments the sonic source. Their aspiration and challenge is to find a way of adapting the sourced spectral information to the given musical environment. Canadian composer and Associate Professor François Rose writes: "Naturally, the result of this procedure, while deriving from physical models, no longer shares but replaces the characteristics of the modelled phenomenon" (Rose, 1996, p.11). Composer Matthias Kriesberg supports this fundamental description of spectral music, yet places *Le partage des eaux* in a unique category. Unlike many spectral pieces, Kriesberg suggests the resultant composition stimulates the sounds of water that lie in our aural memory, in such a way that it isn't immediately apparent, yet significant in how we perceive the piece. He writes:

> Mr Murail emphasizes that the origin of his sounds hardly matters: whether orchestral, synthesized or produced by nature, all sounds are in the end simply constructs of tones of varying strengths. But in *Le partage des eaux* the connection between the original sound of water in motion and the resulting music is vital. It's not that you hear waves. (In *La mer* Debussy depicts those far more accurately.) Rather, the structural underpinning of Mr Murail's sound world, in which the boundaries separating timbre from harmony have dissolved, resonates with more common aural memory: the sound of water (Kriesberg, 2001, online).

Spectral musicians would also find commonality with Debussy in the way their approach could be compared to impressionist paintings, as well as looking to their images for inspiration. Damien Pousset compares the form of Kaija Saariaho's compositional work to that of impressionist art. For Saariaho, while there are many different pieces within a composition, they cannot be isolated, but must be seen as making up the whole, creating a sense of directed motion. In making the comparison, Pousset observes:

> As an impressionist painting, the true musical units are not elementary units, but independent events, supported by the formal rhythm. In this way, the act of

> composition lies in this temporality of the event which links the evoked imagination to the work's narrative structure (Pousset, 2000, p.99-100).

Each event within the form is brought together by their connection in time, a stimulant for the message Saariaho is presenting to the audience. Since the 1980's, she has always sought to compose a musical form from the perspective of how it will be perceived. This raises another interesting visual component to her compositional approach; using diagrams to display form. Saariaho would use shapes to generate a pre-compositional schematic layout, a technique referred to as *morphological poetics* (Pousset, 2000, p.99). In her composition *Verblendungen* (1982-84), Saariaho's initial sketch of the form was something she describes as impossible to achieve (see Figure 3.1). In order to overcome this challenge, she turns to a vibrant array of compositional parameters. Saariaho writes:

> Such a formal impossibility forced me to exploit all the parameters in as dynamic a way as possible in order to keep the music moving. For each parameter I worked out a specific, evolving curve which was relative to all the others. The interaction of all the parameters constitutes the culminating points which determine the form of the work (Saariaho, 1987, p.107-108).

While the evolving curve of each parameter is represented in the same manner, it should be remembered that the significance of each varies at any given moment of the piece, based on how it operates. For example, Figure 3.2 reveals the different parameters of *Verblendungen*. In describing how she approaches these different curves, Saariaho writes, "…the graphic representation does not permit the musical significance to be deduced, but it serves as a memory aid to the form of each parameter, preventing me from losing sight of the work as a whole" (Saariaho, 1987, p.109, 122). A visual reference was extremely important to Saariaho in establishing the form of a piece, and more importantly, in keeping to that end.

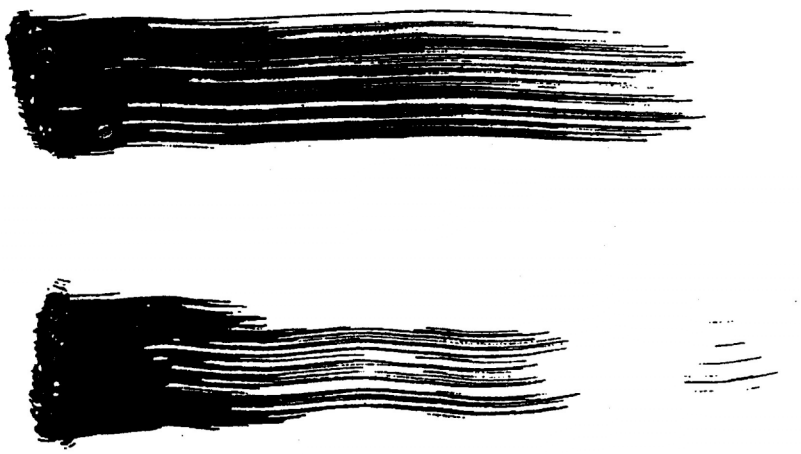

Figure 3.1. First sketches of the global form of *Verblendungen* (Saariaho, 1987, p.106).

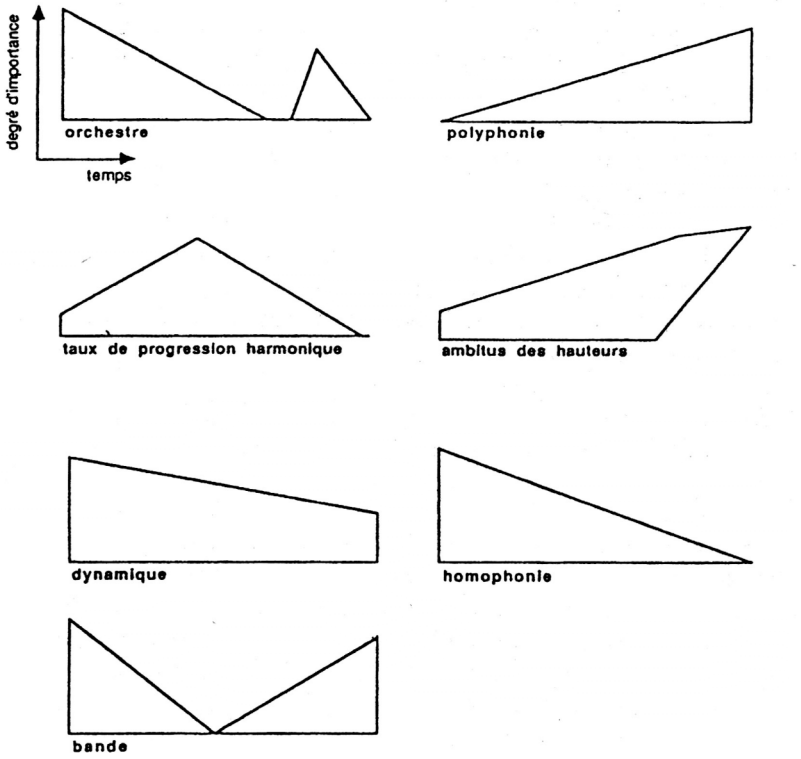

Figure 3.2. Curves for the evolution of the compositional parameters of *Verblendungen*. For each curve, time is represented on the vertical axis (Saariaho, 1987, p.107).

In describing the importance of stimuli from other mediums, musicologists Korhonen and Nieminen write: "Saariaho has often found inspiration in extra-musical sources such as literature, visual and natural phenomena. She has also composed many works with a dramatic or symbolic dimension, or in which various arts cross-fertilize" (Korhonen & Nieminen, 2001, p.59). In 1991 she was commissioned by the Finnish National Ballet to write *Maa* (The Earth), and 2000 she premiered her Opera *L'amour de loin* (Korhonen & Nieminen, 2001, p.59).

Murail too has looked to the visual arts of the impressionist period to gain inspiration. In a 1996 interview with Julian Anserson, Murail said, "I might have a quite intuitive idea of certain sounds, certain gestures for the projected work, and there may also be some images from art, literature or science which provide useful analogies for what I want to do" (Murail, 1996, p.38). His work *Vues aériennes* was envisaged after seeing Claude Monet's *Cathédrales de Rouen*. In this series of paintings, the church is made subsidiary to the progression of light existing at different times of the day. Here the artist has placed the subject of the piece in the background as the transforming quality of colour shifts to the foreground, bringing an interesting temporal element to the piece. As Malherbe observes, this construct of temporality found an "obvious link to musical expression", something Murail took full advantage of in *Vues aériennes* (Malherbe, 2000, p.19). Here, the first three movements reflect a light that becomes increasingly brilliant: *morning light*, *rainy light* and *noon light* respectively. Murail echoes this through the use of *anamorphosis*, a technique that alters a musical construct to generate a gradual change in the degree of distortion heard. In describing the process, Lenoux writes: "This project [*Vues aériennes*] makes use of visual ideas and offers the invitation to a voyage during which the material (the object, the world that surrounds us, the music…) first appears deformed and gradually approaches its real form" (Lenoux, 2000, p.53-53). As the music approaches the original construct, the sonic dimension is said to become more luminous, eventually reaching its original form, or pictorially speaking, its purest light. The final movement is referred to as *evening light*, where the distortion returns to reflect the shadows and warmer colours of this time period. Malherbe encapsulates the general connection Murail makes to impressionist art by noting: "Through light, Monet frees

colour and liberates it from subservience to the subject; through sound, Murail frees timbre which becomes the principal object in the musical discourse, instead of themes and motives" (Malherbe, 2000, p.20). While a difference exists in the techniques applied, the mindset of both Murail and Grisey towards light and its reflection in music appears to be very similar.

In the music of Dufourt, paintings and photographs have been a significant source of inspiration. His large-scale composition, *Les Hivers* (1992-2001), provides an excellent example of inspiration deriving from the paintings of Rembrandt, Brueghel, Poussin and Guardi. The first of the four pieces to be composed in the cycle was *Le Philosophe* in 1992, reflecting Rembrandt's *Le Philosophe en meditation*. Like the structure of the painting, the music is divided into three seamless sections that move from dark to brighter tones, finishing with a subtle spiralling melodic effect that imitates the staircase. The other pieces of *Les Hivers* were completed in 2001, almost ten years later. Dufourt made *Le déluge* the first piece in the cycle, composed using Nicolas Poussin's *l'hiver ou le deluge* as the referential source, with the storm primarily reflected in Dofourt's use of dynamics and fluctuating textures. *Les Chasseurs dans la neige* is the third piece in the cycle, named after and depicting the imagery of Brueghel's masterpiece. While opening with a slower passage, perhaps reflecting the paintings vast landscape, the music becomes brighter as it takes on the luminous quality of the light and the activity of the hunters and villagers. In the final piece, *Les Hivers* returns to a darker timbral quality, portraying the greyness and still nature of Guardi Francesco's *La Gondole sur la lagune* (Culot, n.d., online). Unlike Grisey and Murail, Dufourt appears to be taking more of a conceptual approach than a scientific one, as the descriptive language used to describe this cycle suggests. Music critique Hubert Culot writes:

> To a certain extent, Dufourt's music may be experienced as an attempt at some reconciliation between two art forms while relying solely on musical parameters… the pieces [in *Les Hivers*] are first and foremost abstract musical structures eschewing any directly descriptive elements (Culot, n.d., online).

This literature review reveals a number of connecting features between spectral music and vision. The work or mindset of painters, especially those from the impressionist

period, holds particular significance. André Chastel, a leading author and professor of art history, writes: "The beginning hypothesis is that a painting is like a piece of nature; certain processes from the physical world are transferred to the painting, the whole then elevated to maximum intensity through mastery of form" (cited in Malherbe, 2000, p.26). As Malherbe suggests, this approach goes hand in hand with that of a spectral musician.

3.3. Spectral music and multimedia

According to Professor Royal S. Brown, a pianist provided the first musical accompaniment to film on the 28th of December 1895, at the Grand Café in Paris. Two principal reasons have emerged for music's initial attachment to film. Interestingly, it was not to reflect the action being shown on screen, but to cover up the noises coming from the projector and the audience, as well as to calm a natural human fear of darkness and silence (Brown, 1994, p.12). Nevertheless, with the advent of new technology, film music was made possible and, by the 1930's, its significance to mainstream cinema was established. The impact of this new compositional work is reflected in Paul Hindemith's decision to make film music the theme of the 1927 Donaueschingen Festival, of which he was a committee member (Schubert, 2001, p.527).

In as early as 1938, Edgard Verèse was encouraging the Los Angeles film industry to adopt the concept of *organised sound* [the expression he favored to *music*], a suggestion that was not well received. It seems these American executives were not yet ready to embrace a musical sound that was atonal and not reliant on traditional harmonic progression or melodic development. Despite this setback, in the 1940's and 50's, Varèse received an opportunity to demonstrate the possibilities available to composer and director when he worked on a number of films, largely with his friend Thomas Bouchard. In 1946, Varèse used extracts from previous arrangements for a film called *Fernand Léger in America: His New Realism*. Then in 1950, he arranged a number of baroque fragments for a film on Seligmann and, in 1955, Varèse composed an electronic piece, titled *La procession de Verges*, for a sequence in the film *Around and About Joan Miro*. His interest in exploring music with film was also revealed in his desire to have *Désert*

(1950–1954) accompanied by film images in counterpoint to the sounds. Unfortunately this project never came to fruition (2001b, Griffiths, p.277).

Another pre-cursor to spectralism whose music has been used significantly in motion picture is György Ligeti. In the 1968 film *2001: A Space Odyssey*, Stanley Kubrick used excerpts from four of Ligeti's scores, including *Lux Aeterna* [Eternal Light], *Requiem*, *Atmospheres* and *Adventures*. The process involved selecting these as temporary tracks for the editing process, then approaching film composer Alex North to do the score. Despite the artistic endeavour of North, Kubrick decided to keep the music used during the editing. Unlike Varèse, Ligeti had written these pieces for the concert stage, but they also paired perfectly with the space imagery of Kubrick's film. In rationalising his choice, Kubrick made this controversial statement:

> However good our best film composers may be, they are not a Beethoven, a Mozart or a Brahms. Why use music which is less good when there is such a multitude of great orchestral music available from the past and from our own time? When you're editing a film, it's very helpful to be able to try out different pieces of music to see how they work with the scene. This is not at all an uncommon practice. Well, with a little more care and thought, these *temporary* music tracks can become the final score (Ciment, 1982, online).

While it is true that a multitude of great orchestral music is available, a sense of continuity of style, or malleability of form, can be lost in the musical construct of a film when taking Kubrick's approach. A director should be sensitive to these issues when choosing the music for their film.

Unfortunately for Kubrick, choosing not to use North's score resulted in court battles, as he hadn't received permission to use these pieces from the composer. This disagreement, however, didn't prevent an ongoing working relationship between the two artists, with Kubrick approaching Ligeti for future projects. In his film *The Shining* (1980), Ligeti's 1967 masterpiece *Lontano* was used for some of the more chilling visual sequences and, in *Eyes Wide Shut* (1999), Kubrick called on Ligeti's 1953 atonal piece *Musica ricercata* to add a sinister feel to the orgy scene. In an interview, composer and professor Jonathan Kramer refers to the genius of Kubrick in using this music:

> Sometimes a film director knows music well enough to choose great soundtracks from existing classical music. One of the best in this regard was Stanley Kubrick. His use of an early Ligeti piano piece in *Eyes Wide Shut*… and [the] music of Ligeti in *2001*… were brilliant (Johnson, 2004, online).

Although Ligeti's relationship with Kubrick began on less than favourable terms, the use of his music in this setting gave him access to many ears around the world that had yet to hear his work (Ruhe, 2004, online). The film's cinematic approach in using limited dialogue provoked attention to the music, thus giving Ligeti maximum exposure.

In more recent years, only a handful of composers have been identified as using spectral techniques in Western cinema. In the 1983 film, *Het raadsel van de Sfinks* (The riddle of the sphinx), the soundtrack's timbral exploration was the result of composer Luc Brewaeys. This film was a compositional turning point for Brewaeys, with the influence of Murail and Grisey causing him to move away from his post-serial qualities to that of spectralism (Renders and Vandenhouwe, 2001, online). Hughes Dufourt's piece *Hommage à Charles Nègre* (1986) was composed for the film *Quai Bourbon of Luc Riolon*, with choreography and production by Daniel Larrieu (Hugues Dufourt, n.d., online). The movie is about a 19th century French photographer named, as Dufourt's title suggests, Charles Négre. The music is designed to be in the background, an approach not always taken in film scoring today. Throughout the work there are no strong rhythmical elements, but a slowly evolving sound structure that captures the colour and mood of the film using only six instruments (Rutherford-Johnson, 2004, online). In 1987, the quality of Dufourt's work was recognised when *Hommage* received the Prize of the Jury for the *Music Cinema Festival* (Molino, 2000, online).

English composer François Evans was recognised by *La.M.P.*(*Lampmusic*) to be the only composer using spectral techniques in writing for film (Spectral Film Music, 2004, online). While this literature review has proved this statement to be erroneous, this acknowledgement alludes to the reality that spectral music techniques are still rare in cinema. Perhaps a reason for this is the film composer having to deal with a number of issues that could be seen as stifling personal creativity. In writing for film, the composer

has to allow for a number of requirements, including the director's desires, the nature of the film, dialogue, an often-limited time frame, commerciality, and much more. All these wishes can result in music that is unobtrusive, repetitive and fragmented. Composer Irwin Bazelon reflects this:

> The ever changing series of pictorial events allows a composer little time for extended development of musical ideas. The music tends to be episodic as the scenic episodes. Fully realised musical elaboration, commensurate with shaping a concert work, is out of the question from both the standpoint of time and of sheer physical stamina; a composer may have to write forty minutes of film music in less than four weeks. Simple musical phrases, held notes, repeated figures, sharp accents, rhythmic punctuation, ostinati, drawn-out chords, and single, long, lyric lines become the rule of the day (Bazelon,1975, p.9).

Author K.J. Donnelly echoes the unobtrusive nature of film music by saying, "the assumption was that music should underscore the visuals, creating emotional and dynamic effects, homologising visual activity and providing information and atmosphere for the films narrative development" (Neale and Smith, 1998, p.142-143). Paul Chihara has been a highly successful composer in both the concert arena and later in film. In approaching music for cinema, Chihara considered himself someone who could adapt to what was required, careful not to allow his considerable concert craft to dictate (McCarty, 1989, p.259).

Music that is created using spectral techniques tends to be directed by the chosen process, making it difficult for the composer to allow these other cinematic issues to begin dictating the creative outcome. In saying this, the concept of 'background' music has been questioned since 'classical movie scoring' emerged in the 1930's and 40's. When the movie executives spoke to composer Max Steiner about 'King Kong', they asked him to "save" the movie with his music. History suggests his barbaric rhythms and unexpected dissonances to have done just this, bringing a threatening presence to the ape, while at the same time covering over some simplistic special effects. Oscar Levent remarked that the film "should be advertised as a concert of Steiner's music with accompanying pictures" (Koldys, 1998, p.51). While this may not have been Steiner's goal, there is a trend emerging today where composers openly admit their unwillingness to write in a subservient manner. Composer Ernest Gold writes:

> There are scores written by people who are specifically equipped to deal with sound track and nothing else. The best scores, however, are written by composers used to writing music intended to be listened to. One can adopt or adapt methods from concert music which support the picture and still leave the audience with that marvellous feeling that comes from having heard a well written piece of music (McCarty, 1989, p.260).

Similarly, Oscar and Grammy winning composer John Barry wants moviegoers to consciously hear the music he writes. Barry has now written the "foreground, not the background" music to over 100 films, including 10 of the 17 James Bond films (Lichtman, 1999, p.41). Danny Elfman's music for 'Batman Returns' is compared to that heard at the ballet, with the music interacting with, but not necessarily being subordinate to, the other elements. Film composer Dimitri Tiomkin said, "There is a much closer affinity between ballet and movies than casual thought suggests… Sometimes I think a good picture is really just a ballet with dialogue" (Neale and Smith, 1998, p.152).

Professor Claudia Gorbman presents an argument where so called 'background music' serves the roles of 'identification music' and 'spectacle music'. In describing the two, Gorbman writes:

> Intimate identification music and epic spectacle music have different codes and functions. The former works to draw the spectator in, and not to be heard; while the spectator is more apt to notice the latter kind, which punctuates a pause in narrative movement in order to externalise, make commentary on it, and bond the spectator not to the feelings of the characters but to his/her fellow spectators (Gorbman, 1987, p.68).

The *Star Wars* theme of John Williams is one of the examples given for spectacle music. The brass and percussion explode with a distinctive heroic sounding melody that most *Star Wars'* enthusiasts could sing, and are very much aware of when the music begins the film. As Gorbman proposes, the theme bonds the moviegoers as the music declares the start of a space journey they are all about to embark on together.

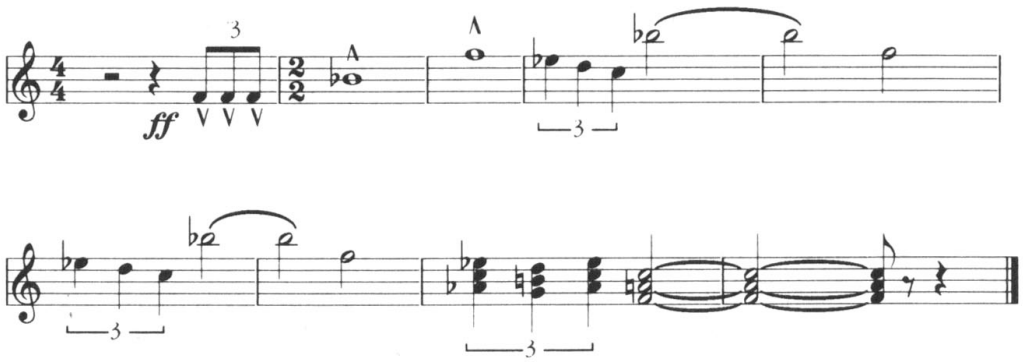

Figure 1. ‘Star Wars’ by John Williams (Kalinak, 1992, p.193).

Clearly there can be no categorical answer as to the role of a movie composer, and therefore the sort of music they need to write. Perhaps this reflects the still relatively young discipline that composition for cinema is. Julie Hebbert (2001, p.339) echoes this by suggesting the “placement and boundaries of music in film are still in need of definition”, and it is important to recognise the “infancy of this discipline”. This was also recognised by composer John Williams in 1991, who said, “the coupling of film and music is only 60 years old, and I believe its impact on the art of music is still in a nascent state” (Dyer, 1991, online). While the film composer does have to deal with a number of issues in creating the music, a world of spectral possibility remains potentially there for those in the industry. British director Norman Warren used the skill of Evans in his film *Hitman* (1997), where spectral techniques were particularly effective during the graveyard dream sequences. Evans focused on jazz instruments, with the sounds manipulated by FM to create a complex array of frequencies that were recorded and treated with a 1970’s analogue delay system. The delay was added in real-time during the mixing sessions (Filmography: Hitman, 1997, 2004, online).

A few spectral composers have taken a more avant-garde approach to moving images and music. Some of these projects could fall into the category of *drawn sound*. This is a style of composition where the sound is generated from graphic markings formed on film, photographic images, paper, or in more recent years, electronic instruments (Davies, 2001, p.558). The Ecuadorian born spectral composer, Mesias Maiguashca, has had a particular interest in exploring live electronics and mixed media, with *A Mandelbox*

(1987-88), *Video-Memorias* (1989) and *La Celda* (2002) all excellent examples of his work. *La Celda* or *The Cell* is a work that explores the interaction of an actor, electro-acoustic music and three video sequences, created by Tamas Walicky. *A Mandelbox* is a computer-synthesizer installation that is deeply rooted in the mathematical makeup of sound and image. Maiguashca explains:

> If we can display a mathematical function in the form of an image, should we not also be able to display it audibly, as sound? And why not have sound and image at the same time… I dreamed of actuating a mechanism that should not only produce an image on the basis of the formula but would also directly control all the parameters of a sound including its deepest level, the wave: "Pure nature" (Maiguashca, n.d., online).

The technology to which Maiguashca had access did not permit this idea, with the program only allowing the process of calculation, to which the audience could contribute, to be displayed. The time taken, from information input to the actualisation of sound and image was ten minutes. Despite this technological setback, Maiguashca created *Video-Memorias,* or *Video Memories,* a year later. In this work, he created 17 video compositions, each 5 minutes in length, where the sound was generated using a fractal image that was stored on the hard drive. The program was created with the assistance of Bernard Geyer in their private studio. In describing the calculation process, Maiguashca writes: “The form, the operation, and the harmonics-melodics have been generated directly or indirectly by numerical information but they have been created freely” (Maiguashca, n.d., online). Perhaps Maiguashca’s scientific exploration could help the audience to conceptually acquire a greater awareness of sound’s mass, in that the aural experience is directly echoing what they can physically see. In so doing, the ‘physical reality of sound’ is reflected in the image.

Although not identified as spectral composers, there are a number of artists who have created some acclaimed works using similar principles. The experimental film work of Peter Kubelka presents itself as an interesting comparative study to the work of Murail and Grisey. In his films of the 1950’s and 60’s, this musically trained director constructed sound tracks that directly reflected the colour of his cinematic images. In *Schwechater*

(1958), Kubelka uses two sine tones that move ever higher each time the colour red appears, creating a white noise effect. The frames for this 90-second commercial, commissioned to be 1 minute by the Austrian *Schwechater Beer* group, are cut into a mathematical sequence of 1 red frame, 1 image frame, 2 red frames, 2 image frames, 4 red frames, 4 image frames and so on is explored (Milicevic, n.d., online). The advertisement, as described by Acquarello, author of the *Strictly Film School* internet site, was never aired as a result of the dissolute image portrayed:

> Given free reign to film the commercial as he chose with the sole provision that he maximize the number of reinforcing shots of people enjoying a glass of beer within the one minute planned commercial spot, Kubelka concocts a maddeningly fractured montage of strobic, repeated subliminal images of casual beer drinking with intermittently punctuating shocks of color and frenetic white noise to convey the self-indulgent consumer message (Acquarello, 2004, online).

Even more reflective of Murail and Grisey's exploration of light was Kubelka's film *Arnuf Reiner* (1960), a minimalist journey consisting only of black and white frames. The black frame holds no light and therefore corresponds to the sonic environment holding no frequencies, or more simply, silence. Conversely, the white frames represent pure light, or in the sound scape, white noise (Milicevic, n.d., online).

The great film composer Bernard Hermann made use of the overtone series in the 1941 film, *The Devil and Daniel Webster*, directed by William Dieterle (originally titled *All That Money Can Buy*). When Mr. Scratch or the devil (played by Walter Huston) appears in the barn for the first time, Hermann uses the overtone series of the musical note C, painting its structure onto the film. When the picture was played through the projector, it created a sustained phantom fundamental to that spectrum. Jim Lochner, composer and author of *Settling the Score*, describes this hidden fundamental as "nothing more than a subliminal sound", creating an effect that is "subtle and eerie" (Lochner, n.d., online). This contributed to Hermann winning the Oscar for Best Original Score in a dramatic picture (Broxton, 2003, online).

It is worth noting that a small number of directors created film techniques that have gone on to influence composers, similar to former interrelationships with the impressionist painters. Of particular note is the work of James and John Whitney, who in the 1940's developed an audio-visual instrument made of twelve pendulums operated manually. The movement of these pendulums allowed different amounts of light to be projected onto film, creating an optical sound track. In order to overcome the sub-audible frequencies that had been recorded, the Whitney brothers had the optical sound track played back at a faster rate. In so doing, they became aware of a change in the timbre of the sound, with the resultant sound quality reminiscent of early electronic music. Karheinz Stockhausen employed a similar concept of speeding up tape some twenty years later in his piece *Kontakte* (1958-1960) (Milicevic, n.d., online).

Farinelli, il castrato (Farinelli the Castrato) is a 1994 film directed by Gérard Corbiau. It tells the story of a young singer named Carlo Broschi (his artistic name was Farinelli) who lived during Handel's time. In order to preserve his voice he was castrated as a young boy, then went on to become a famous opera singer. The challenge to create this man's singing voice was given to the team at IRCAM. The effect was accomplished using their *Chant* software, which had the capacity to analyse and combine the voice of a coloratura soprano with that of a contralto (Artificial Voice, n.d., online). While not spectral music, it is worth noting that this film provides an example of some of the creative possibilities made available to the film director and composer when using IRCAM software, the creation of which was significantly influenced by the experimentation of spectral musicians.

3.4. Modern cultural trends: the concert stage and the music video

Some film composers desire to have their music heard in its own right, resulting in a trickle of film scores being performed in the concert arena. In response to this transition Philip Kennicott, music critic of the Washington Post, denigrated the national symphony for commissioning a film composer. In 2001, he reputedly described a Julliard-trained composer as a "well remunerated Hollywood hack", and asserted that he "doesn't need to

be dipping into the paltry amount that's available to composers of 'serious' music" (Schiff, 2001, online). While this paper will not attempt to argue the quality of the commissioned work, Kennicott's use of the word 'serious' reflects a general attitude or an anti-Hollywood bias that is becoming outdated. Bazelon confronts this attitude best by saying, "actually, 'serious' is a misnomer, for I have rarely met any type of composer who wasn't seriously attempting to do the best possible job with his capabilities. Music means different things to different people, including composers" (Bazelon, 1975, p.37). An interesting perspective is given by respected composer, conductor and author Eddy Manson on why this change in attitude needed to take place:

> Sometimes the concert composer who succeeds in film is accused of 'selling out', which points out the sea of ignorance that separates the two worlds. A composer who scores films is writing 'Gebrauchmusik', music that is functional and made to order – customized music as it were. Within that 'made to order' parameter some very great music has been written for the theatre, for the ballet, for special occasions, for dedications. Can one put down Stravinsky's work for Diaghilev's 'Rite of Spring', for example, as 'kitsch'… film scores by Prokofiev ['Alexander Nevsky'], Copland ['The Red Pony' and 'Our Town'], and Rózsa ['Spellbound Concerto' and 'Quo Vadis Suite'] stand beautifully as arranged for the concert hall and are awesome as film music (cited in McCarty, 1989, p.262-263).

Additionally, Manson strongly encourages concert promoters to start incorporating projected film into the live performance of their orchestra, bringing added context to what is being heard. Composer William Stromberg also sees the artistic value in this sort of juxtaposition. In an interview with Royal Brown, Composer William Stromberg said, "it would be wonderful to see portions of King Kong up on the screen with the music being played live" (Brown, 1999, p.46). No doubt he would be pleased to know composers like Carl Davis are doing just that, and others are following suit. Manson even suggests the use of still photographs, as they can help to create a direction for the 'theatre of the mind', with the image, or images, triggering an internal visual journey that accompanies the music. While this marriage of genres obviously lends itself to composers of film who want to have their music heard in this setting, Manson also encourages the concert composer to take on this challenge. He writes, "much new music, written expressly for the concert stage, could be helped by visual devices, planned carefully by the composer himself" (cited in McCarty, 1989, p.265). With the strong connection already established

between spectrally guided music and vision, including film, the concert stage seems particularly suited to embracing the fusion of these particular art forms.

Composer and professor David Schiff presents a change that is occurring in the concert arena in regards to the influence of vision with a somewhat condescending tone:

> Blame postmodernism or technology, but our expectations of symphonic structure have diminished; we live in an age of short attention spans and sound bites, after all, and delayed gratification is so 19th century. We also live in an eye rather than an ear culture. Many orchestras are talking about using some kind of video even for their classical concerts: the MTV-ization of the concert hall. When that happens, and it won't be long, everything really will be film music (Schiff, 2001, online).

While Schiff's comments that "it won't be long" and that "everything really will be film music" could be a little pejorative, it is fair to say that both money and protocol will guide what enters the concert orchestra program. For many ensembles, the traditional music program is being balanced with performances from other musical styles that create extra revenue, whether that is in film, jazz or rock. In the area of *rock and roll*, as well as other styles that fall into the broader profit making term of *commercial music*, a number of important cultural trends have been established by composers of *Western art music* that are worth noting. The music video has very much become a cultural expectation of the music enthusiasts of the younger generations. If a song is heard on the radio, it is expected that a video clip will be created for viewing on one of the many music television shows around the world. While this may be true, and certainly a marketing necessity for the *commercial* artist, it is a visionary statement made by Director Francis Ford Coppola that is of particular interest. In addressing the future of the music video, Coppola has said that "This short form, basically commercials for records, is losing energy. Why not have a longer form… an audiovisual piece, not just two minutes, but 40 minutes? The sky is the limit for the new music cinema" (cited in Hunter, 2003, online). Most composers of Western art music will compose pieces longer than the usual three to four minutes of a commercial artist, presenting an exciting opportunity for their art form. While history may cause one to primarily associate music television (MTV) with the commercial music industry, Toronto-based RES senior editor and producer Sandy Hunter would challenges

this. She believes those who enjoy more 'sophisticated' music are well suited to a package that includes a creative visual match. From a technological standpoint, Hunter writes: "Not only are these DVD's the evolved heirs apparent to enhanced CD's, music video compilations and concert videos, but they up the ante in terms of unique content and audio fidelity" (Hunter, 2003, online). With Western society craving an audiovisual experience and new technological breakthroughs making this option highly accessible, the composer can consider some latent creative possibilities. In saying this, there is also the ominous implication that what is seen and heard will be at the whim of the multinationals. The composer must be cautious, taking advantage of what companies offer in new technology, while not being monopolised in their artistic endeavours. There is great artistic collaborative potential, not only in cinematic vision permeating the concert stage, but also in western art music infiltrating the market place of the music video or music cinematic experience.

3.5. Western culture and spectral music

In combining spectralism with film, another area of cultural interpretation can be investigated, something particularly pertinent to this research. Before this is outlined, the paper must first address how spectral principles in music are interpreted by Western society. Murail is quoted as saying: "The true revolution in music over the course of the twentieth century has been located in the elevation of a conception and mode of listening that allows us to enter into the depths of sound, to truly sculpt sonic matter…" (cited in Drott, 2005, p.3). How then, when faced with Murail's music, might Western ears respond to a timbre that is not governed by traditional music elements? John Sloboda, internationally recognised for his work in the psychology of music, asserts that the listener who is familiar with Western tonal music will have certain expectations. In particular, there is an anticipation that melodic and harmonic content will abide by certain sequences, such as I-IV-V, setting up the expectancy that there will be a return to I. If, for example, the composer takes the cadence to another harmonic quality, such as vi/VI (a *deceptive cadence*), the listener will describe it as having an element of surprise. Here the listener's response is influenced by a symbolic relationship, where the formal and

syntactic properties of the music are recognised. Jonathon Harvey also comments on this, describing the tonal system as having a temporal quality that drives towards resolution after deviation. He writes: "This is because the hierarchy of components is so compelling: the nature of dominant, subdominant, mediant is so easy to understand" (Harvey, 2000, p.12). On the other hand, spectral structures, though holding a hierarchical quality, present challenges for the expectations of Western listeners. To this Harvey writes: "There is… a hierarchy of spectra – something I have been composing with – but it is not quite so easy to understand and has yet to be taken on board by more than a minority of listeners" (Harvey, 2000, p.12). French-horn player Alexia Cammish also described this cultural experience after a performance at the *Royal Albert Hall*:

> With the Mozart and the Beethoven our Western ears are trained to like, you hear the first half of a phrase and you have a sense of what might come next. Modern music intentionally lacks that, so you don't know what to expect. The aural logic that you're used to goes straight out of the window" (cited in Pepper, 2003, 46).

In describing this aural expectancy, Sloboda writes: "Confirmations and violations of these expectancies, often operating at a subconscious level, are held to be responsible for some emotional responses to music" (Sloboda, 2001, p.545). Joshua Fineberg adds to the comments made by Sloboda, describing the music that falls outside pitched sounds as more difficult for Western ears to discern. He writes:

> …most pitched instruments have spectra which are very close to harmonic. However, many instrumental sounds with less defined pitch, or no identifiable pitch at all, have spectra which are non-harmonic. There are an enormous, if not infinite, number of possible non-harmonic spectra found in physical instruments… In all these cases, non-harmonic spectra are fundamentally different from harmonic spectra in that they do not produce the same clear sense of spectral fusion… or well defined pitch (without spectral fusion the different components are heard separately, giving conflicting pitch cues). While this class of spectra is certainly richer than that of harmonic spectra, it is often difficult for listeners to make the kinds of fine distinctions with these sounds (this is certainly a cultural phenomenon since Balinese listeners, for example, distinguish much more easily between different metallic percussion sounds than do Westerners, who are less familiar with these sounds (Fineberg, 2000, p.91).

This reinforces the belief that Westerners will, as with the examples of the deceptive cadence and, more specific to spectralism, the use of non-harmonic spectra, have a response stimulated when they hear something they do not expect, or do not understand, in music. Described by psychologists as an *intrinsic effect*, it can cause someone to acknowledge an emotive quality existing in the music, but not necessarily feel that emotion. In an experiment conducted by Professor Jamshed Bharucha and Katherine Olney, Western and Indian listeners were presented with music from both their own culture and that of the others. They concluded that when the listeners were faced with music from the other tradition, the breaking of their shared cultural music expectations resulted in a common feeling of tension (Pressnitzer and McAdams, 2000, p.56)[1].

Perhaps these cultural findings allude to reasons why a director would choose to use non-tonal music during a scene where tension needs to be aroused: Ligeti's music was used by Kubrick in a horror and a debauched orgy scene; François Evans spectral music was used during graveyard dream sequences; and Bernard Hermann's 'eerie' overtone of C was used when the devil appeared for the first time. It may also explain why certain descriptive words are used when non-tonal music is discussed. Composer and critique David Moore described the music of Scelsi as "not *pleasant* in the *normal* sense" (Moore, 2001, p.192). If the term 'normal' refers to what Western ears are culturally adapted to, then Scelsi's timbral exploration could cause an emotional reaction that some may describe as 'unpleasant'. Claude Ledoux, when describing the work of Murail, challenges those who are tempted to use this sort of terminology. He writes:

> The 'beautiful' chords (or the 'attractive' melodies) only find their validation through a doubtful relationship to a past that belongs to a completely different

[1] It is important to stress that this discussion is not aiming to address the tension that exists within the music itself, more specifically that of non-tonal timbres, and whether the listener can interpret this tension. Should the reader be interested, Daniel Pressnitzer, Stephen McAdams, Suzanne Winsberg and Joshua Fineberg have written a paper that addresses this issue, with the support of *IRCAM*, *CNRS* (*Centre national de la recherche scientifique*) and *Université René Descartes* in Paris. The title of the paper is: *Perception of Musical Tension for Nontonal Orchestral Timbres and its Relation to Psychoacoustic Roughness*. It can be found in the journal of *Perception & Psychophysics, 2000, 62 (1), 66-80*.

> reality. For Murail, there are no 'beautiful' sounds, as such; except in opposition to the 'ugly' sounds overflowing from his musical output. In order to place ourselves in a more appropriate perspective, it would be helpful to replace the words 'beautiful' and 'ugly' with 'interesting' (Ledoux, 2000, p.50).

While this may be an excellent mindset for those wanting to listen to spectral and post-spectral music, it appears that for the general public there will always be intrinsic cultural expectations. In Western society, the largely unfamiliar sound structure of spectralism is likely to cause a reaction that provokes some sort of tension in the listener, or, if the spectral choices reflect a pure harmonic relationship, a deep sense of calm.

In addition to this intrinsic symbolic cultural experience, the *extrinsic affect* also holds some importance to this research. The human memory has an ability to associate past experiences with certain stimuli, such as smell, taste or sound. When music becomes a trigger for an emotion that is attached to an individual's past experience, it is expressed as being extrinsic in nature. Frequently this association between someone's life history and the feelings generated from music remain idiosyncratic. Nevertheless, there remain occasions where the extrinsic affect can be a shared experience, with Sloboda suggesting examples that pertain to sound usage in cinema. He writes:

> …common cultural experiences can sometimes lead to shared affect which is still fundamentally extrinsic – for example… the cultural associations formed by film-music pairings, such as Johann Strauss's *Blue Danube* waltz with the spaceship docking sequence in Stanley Kubrick's 2001: a Space Odyssey (Sloboda, 2001, p.545).

Listening to a specific piece of spectral music may establish a particular emotive response, potentially one more closely linked to the intrinsic factors discussed above. On the other hand, when the same piece of music becomes attached to a particular visual sequence in film, research reveals the possible outcome of a shared extrinsic cultural affect. By placing the music within this new context, it is therefore probable for a new emotive relationship to be established, conceivably one of a different nature.

3.6. Summary

The connection that exists between spectralism and vision occurs on many levels. In the area of science, the work of neo-impressionist painter Georges Seurat, with his optical mixing (*couleur-matière*), has been likened to the approach of Grisey and Murail, where a timbral exploration has been founded on the knowledge of acoustics (*timbre-matière*). On a more personal level, like the impressionist musicians, spectral composers have looked to the visual arts for inspiration. Dufourt looked to Rembrandt, Brueghel, Poussin and Guardi, using their paintings to inspire concepts in his music, through such things as form, dynamics, melodic figures and overall texture. Murail studied Claude Monet's *Cathédrales de Rouen* to guide him in exploring different shades of light, a topic also of great interest to Grisey. Saariaho did not so much look to images created by others, but used the drawing of shapes as a visual reference for form, as well as for other compositional parameters. Often the desire of these composers to use visual stimuli would ultimately be reflected in their song titles, poetically revealing the colours and images that had inspired the piece. In the area of film, however, the music of spectral or post-spectral composers, and even their precursors, has remained limited. Varèse, Dufourt, Brewaeys, Ligeti and Evans are a few to have their music heard within this relatively new compositional context. Of particular note is Kubrick's use of Ligeti's scores in his 1968 film *2001: A Space Odyssey*, contributing to an enormously successful moment in cinematic history. Also, although not identified as a spectral composer, Bernard Hermann's exceptional use of the 'C' overtone structure in *The Devil and Daniel Webster* contributed to him winning the Oscar for Best Original Score. Perhaps the minimal use of spectral principles in film demonstrates the general lack of knowledge that exists, not only in the general public, but also amongst relevant artists of the cinematic genre. It may also be attributed to the fact that spectralism and its process-driven methodology is at odds with the 'Gebrauchmusik' functionality of movie scores. While this challenge may remain, Evans has shown that the two genres can certainly come together in an effective manner. The use of spectralism in film may be minimal, however, given the right film environment, including a sympathetic director, the creative potential remains open for those cinematic composers willing to embrace spectral music principles.

It is evident from this literature review that Westerners are increasingly living in an "eye rather than ear culture". This trend is reflected in the art of film composition being brought to the concert stage, particularly from those composers who consider their film scores 'foreground' music, along with its supplementary vision. Additionally, western art musicians are increasingly incorporating visual accompaniment to their compositions. This has contributed to Schiff's condescending description of a concert arena that is experiencing an 'MTV-isation' of its stage. Despite this somewhat patronizing opinion of Schiff's, it is a trend that many composers are embracing, presenting creative possibilities for the spectral and post-spectral composer. While some still believe the orchestra is reserved for 'serious' music, society is changing its preferred modes of entertainment, and orchestras are businesses that need to fill seats. With this in mind, the challenge, raised in chapter two, of having the work of relatively unknown spectral and post spectral composers performed and promoted, becomes even tougher. Not many would argue with Julian Anderson's assessment that the general public need to hear this music in order for it to have any form of long-term impact. For those artists wanting to explore the fusion of spectralism with vision, a potential increase in market reach is evident. On an extreme level, a spectral composer who has an opportunity to write for a major motion picture could reach many new ears with their music, as is the case for the spectral pre-cursor work of Ligeti. Aside from this relatively uncommon situation, there are significant technological breakthroughs bringing new marketing prospects for artists who want to work with visual media. In discussing this potential, it should be stressed that the suggestion is not for the composer to compromise their artistic desires for the sake of greater marketing scope. It is merely to consider the marketing potential, evident for those artists who already have an interest in this subject matter, and to suggest technological breakthroughs may provide significant assistance in the creation of long-term impact for spectralism.

While *Moment* is not a performance designed to investigate psychological issues, the matter of cultural expectations raises an interesting consideration. The project will be presented to a Western audience who are said to be living in a visually habituated society.

What will the audience experience be of avant-garde music cinema? The sound scape of spectral music is not attuned to their cultural experience, and therefore likely to cause a tense reaction. If, however, the music is placed within a cinematic experience, rather than performed on a concert stage, does it become more approachable, even though the tension may still be encountered? Do cinematic contexts place the music within an environment where unfamiliar physical sounds gain a cultural context? While, as a composer, I may not seek to answer these psychological questions, I find cultural contexts important areas of consideration when composing this style of music. This literature review reveals spectralism as having had a unique relationship with vision, therefore presenting itself as an excellent form of music to further explore the fusion of these art forms. It was the discovery of these interconnections that principally led to the decision to undertake the *Moment* project.

CHAPTER FOUR

4. Tools and techniques

4.1. Introduction

The decision to undertake *Moment* was prompted by the special relationship that exists between spectralism and vision. Before discussing the specifics of the project, an explanation of the chosen techniques and software programs is important. As with traditional music, there are numerous techniques a spectral composer can draw upon to accomplish their creative end. In this chapter the spectral method of *instrumental additive synthesis* will be explained, critical to the sound structure of *Moment*. A number of software programs were considered for the project, however, the final decision was to use IRCAM's *AudioSculpt*, as will be explained. This knowledge of the considerations addressed will allow for a greater understanding of the processes involved when reading about the creation of *Moment*, as when listening to and watching the final product.

4.2. Instrumental additive synthesis

The simplest manifestation of the harmonic spectrum is called a sine wave, made up of only the fundamental and no other partials from the overtone series. When an instrument produces a single note, although a particular pitch is heard, the spectrum of sound is not a pure harmonic structure. This situation results from a variety of factors, such as the scraping of a bow on a string, the sound of breath through a wind instrument, or simply the natural stretching and compression of the upper harmonics (Fineberg, 2000a, p.86-87). When the sonic object has a less definable pitch, or no pitch at all, the spectral envelope is said to be non-harmonic. The source of these sound structures is extremely diverse, however, there has been some attempt to group them into particular spectral classes: coloured noise, instrumental multi-phonics or bells, and those sounds where the harmonic stretching/compression has prevented spectral fusion (Fineberg, 2000a, p.91). Of special interest to *Moment* is the non-harmonic structure of the bell, described as having multiple layers of spectra that sound together. When the superimposed frequencies do not coincide, it results in beats as the sound waves bounce against one

another (Pressnitzer & McAdams, 2000, p.41). Jonathon Harvey's *Mortuos Plango, Vivos Voco* (1980) is a highly acclaimed composition using the Winchester Cathedral tenor bell as its sound source. In describing the work, Harvey said he wanted to create a feeling of "the walls of the concert hall enclosing the public like the side of the bell around which the soul of the young boy flies freely" (cited in Fineberg, 2000b, p.119). Harvey's exploration of sound's physical structure helped him to create a musical sound scape that reflected this pictorial image. The main partials of the bell's non-harmonic sound structure can be seen in Figure 4.1. Harvey divided the piece into eight sections; each based on one of the bottom eight partials, the order of which can be seen in Figure 4.2.

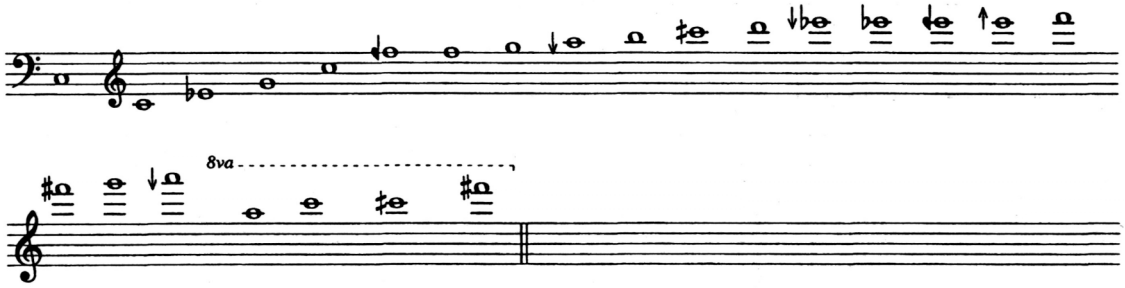

Figure 4.1. Principle overtones of the Winchester Cathedral tenor bell (Fineberg, 2000b, p.119).

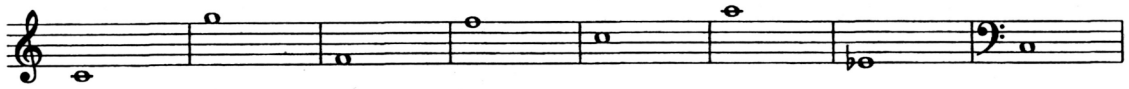

Figure 4.2. Order of bottom eight overtones, defining the sections of *Mortuos Plango, Vivos Voco* (Fineberg, 2000b, p.119).

In the case of *Mortuos Plango, Vivos Voco*, Harvey recorded only the tenor bell and his son's soprano voice. He used the computer to manipulate both these recorded sources, as well as create artificial sonic imitations. This technique, of creating a complex harmonic structure using elementary waveforms (sine waves) is known as *additive synthesis*. While the process holds enormous potential for recreating natural sound structures, in practice it is extremely complex. As already mentioned, a single note on an instrument will produce

an enormous number of frequencies that fluctuate over time, so much so that it is very difficult to convince the human ear that an electronically produced sound has come from its natural source. Consequently, compositions using this technique do not aim at recreating nature (Cornicello, 2000, p.35). While in *Mortuos Plango* Harvey centred his creative attention on computer generated and manipulated sound structures, live instrumentation is often used in spectral music, as discussed in the previous chapters. One of the first and most influential techniques used in spectral music is *instrumental synthesis*, or *instrumental additive synthesis*, a term coined by Gérard Grisey (Anderson, 2001, p.166). In 1975, Grisey took this concept of additive synthesis and applied it to an instrumental setting with his composition *Partiels*. The sonic source for this piece was a trombone playing a pedal of a low E_2 (41.2 Hz). To do the analysis, Grisey used a graphical representation of the sound's structure that outlined time, frequency and amplitude, called a *sonogram analysis*. The diagram remains two-dimensional by having the element of amplitude represented with varying shades of darkness. Unfortunately, the specific analysis Grisey conducted and the exact steps he took to create the work are no longer available. Nevertheless, Fineberg presents an excellent approximation to those steps using more recent technology. According to Fineberg, Grisey would first produce the sonogram analysis, an example of which can be seen in Figure 4.3. This diagram reveals the trombone's partials entering at different points on the time access, with the 5^{th} and 9^{th} partials having the loudest amplitude (Fineberg, 2000, p.116).

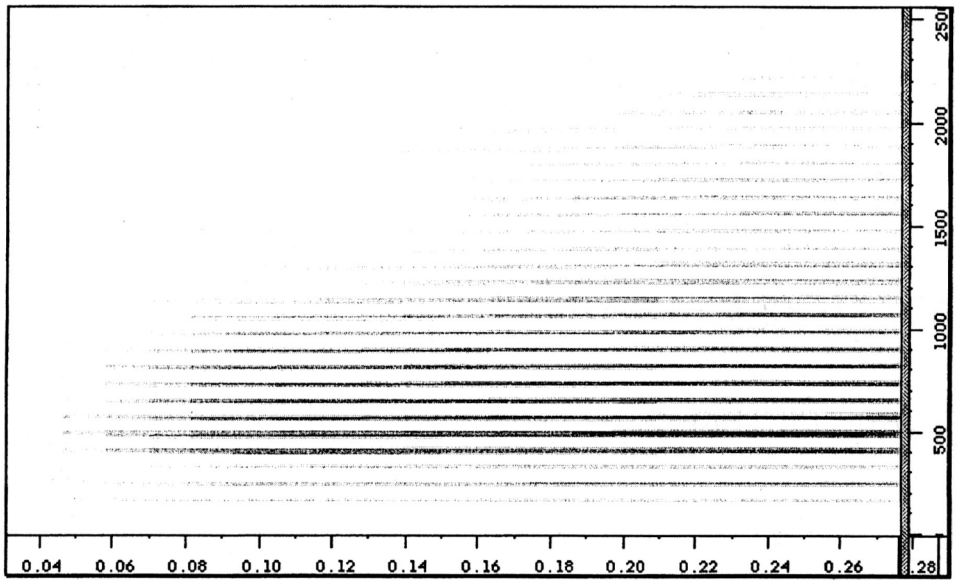

Figure 4.3. Sonogram analysis of trombone playing low E_2 (82.41Hz) at forte (Fineberg, 2000, p.116).

Having examined the sonogram, Grisey could then transfer the spectral information to musical notation (to the nearest quarter tone). Each note receives a dynamic marking that mirrors the amplitude of each frequency. The numbers written above each note represent the partial markings (see Figure 4.4).

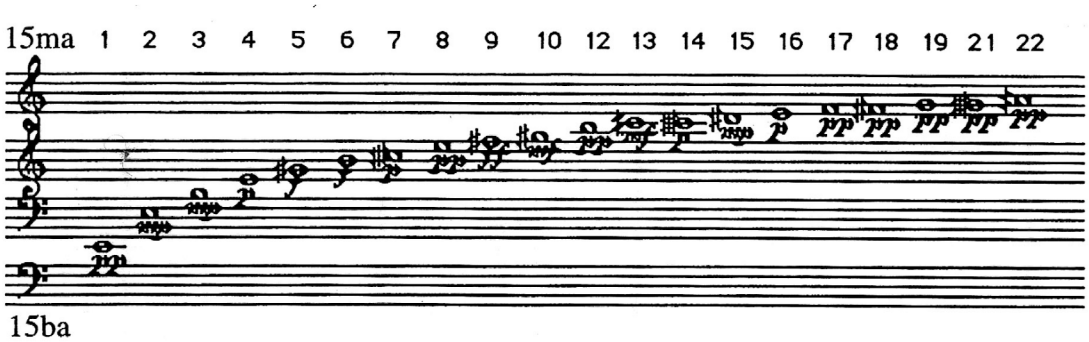

Figure 4.4. Sonogram analysis represented as musical notation (Fineberg, 2000, p.117).

The final stage involved taking information relating to the time axis of the sonogram analysis, as well as the notes and their dynamics from the score notation, and applying

both to an orchestral setting. Grisey's substantial knowledge of the orchestra was critical to him finding the right instrument and effect for each note in the sonic spectrum, combining different timbres to achieve an extraordinary array of colours. The score can be seen in Figure 4.5, with partials again listed on top of the staff for each note.

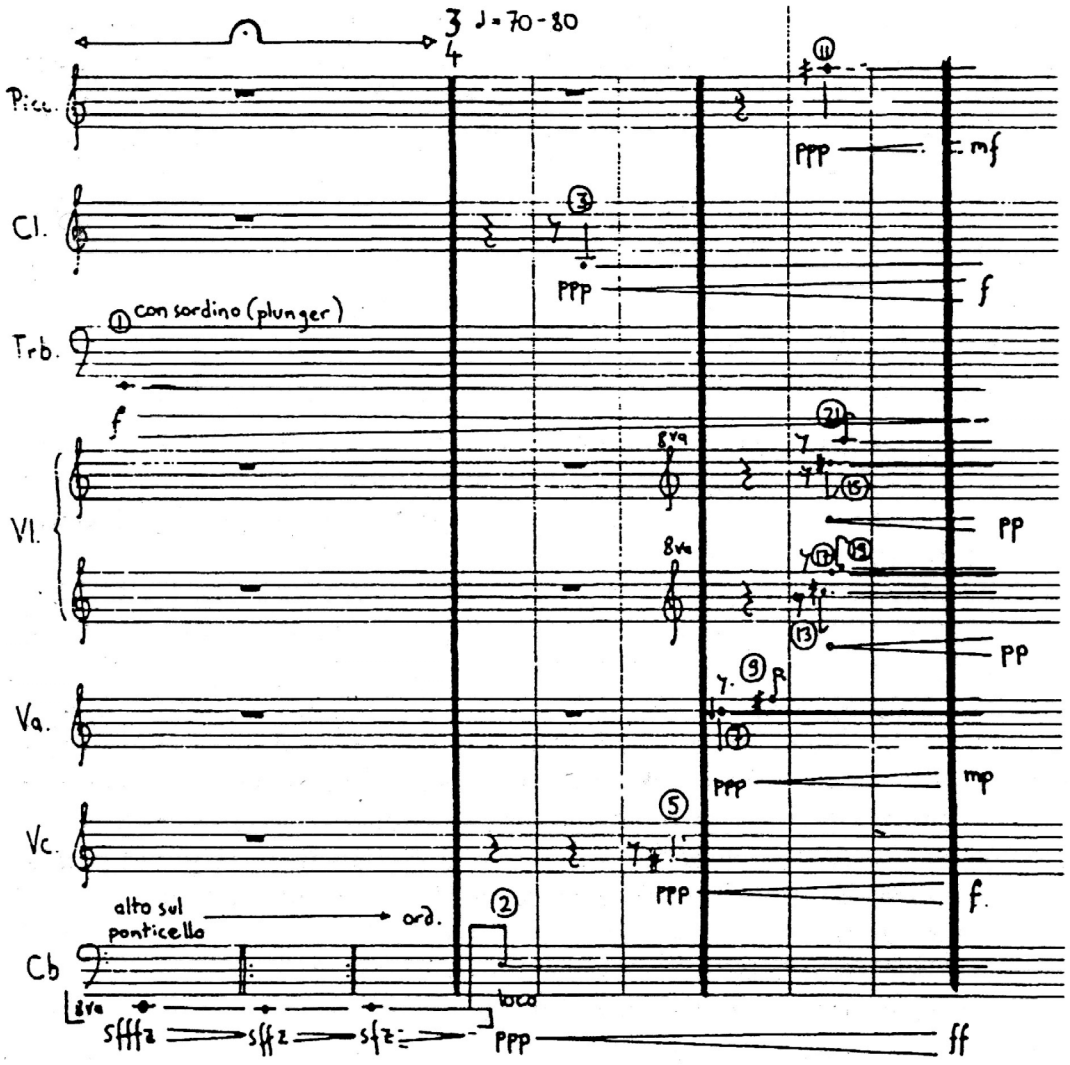

Figure 4.5. The instrumental score (Fineberg, 2000, p.118).

François Rose also discusses this central technique to spectralism, providing another look at Grisey's assignment of frequencies to the instruments in *Partiels* (see Figure 4.6). In doing so, Rose also brings to light the metaphorical nature of this method of composition.

As with additive synthesis, the aim of the composer is not to recreate the sound source within an instrumental environment. Rose writes:

> The significance difference between the model and the realization is that each component is played by a musical instrument rather than being a sine tone. In other words, the simple and anonymous oscillation of sine tones is replaced by complex sounds, each with a distinct identity. Consequently, the underlying concept of adding simple sounds together to create a complex one [additive synthesis] is modified, to the combination of several complex sounds creating an even more complex one. Thus it should be clear that the idea is not to create an acoustical reproduction of an electronic sound, but rather to adapt an electronic procedure for acoustical instruments (Rose, 1996, p.11).

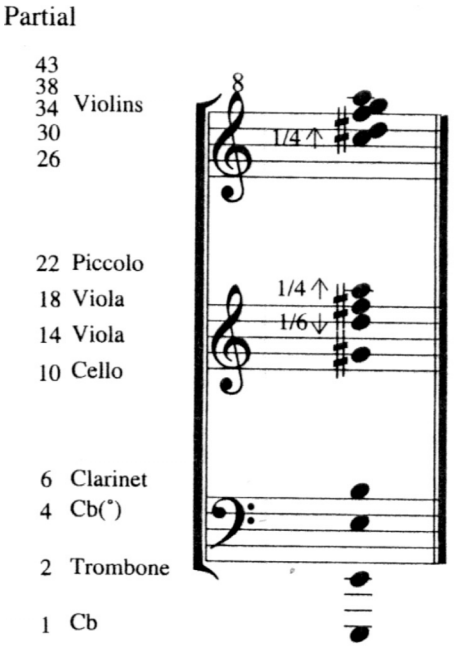

Figure 4.6. The first harmonic structure of *Partiels* (Rose, 1996, p.9).

In using *instrumental additive synthesis*, Grisey employs the terms *harmonicity* and *in-harmonicity* to describe each sonic structure. Figure 4.6 shows the orchestral construct to be within the overtones of a low E, as all notes are integral multiples of the fundamental. Consequently, this spectrum is called *harmonic*. In *Partiels*, Grisey took this original construct and increasingly manipulated the notes, as well as added 'noise' from the instruments, to create a sound structure that intensified in its *in-harmonicity*. This can be

seen in Figure 4.7, with the introduction of in-harmonic tones indicated with black notes. To create 'noise', Grisey utilised such techniques as the string players exercising more bow pressure, or the brass playing sudden changes in dynamic (Rose, 1996, p.9-11). Based on these definitions, if instrumental additive synthesis was applied to a bell spectrum, there would already be a degree of in-harmonicity within the original harmonic construct. Again, it should be remembered that Grisey uses these words to define a conceptual approach that relates back to the overtones.

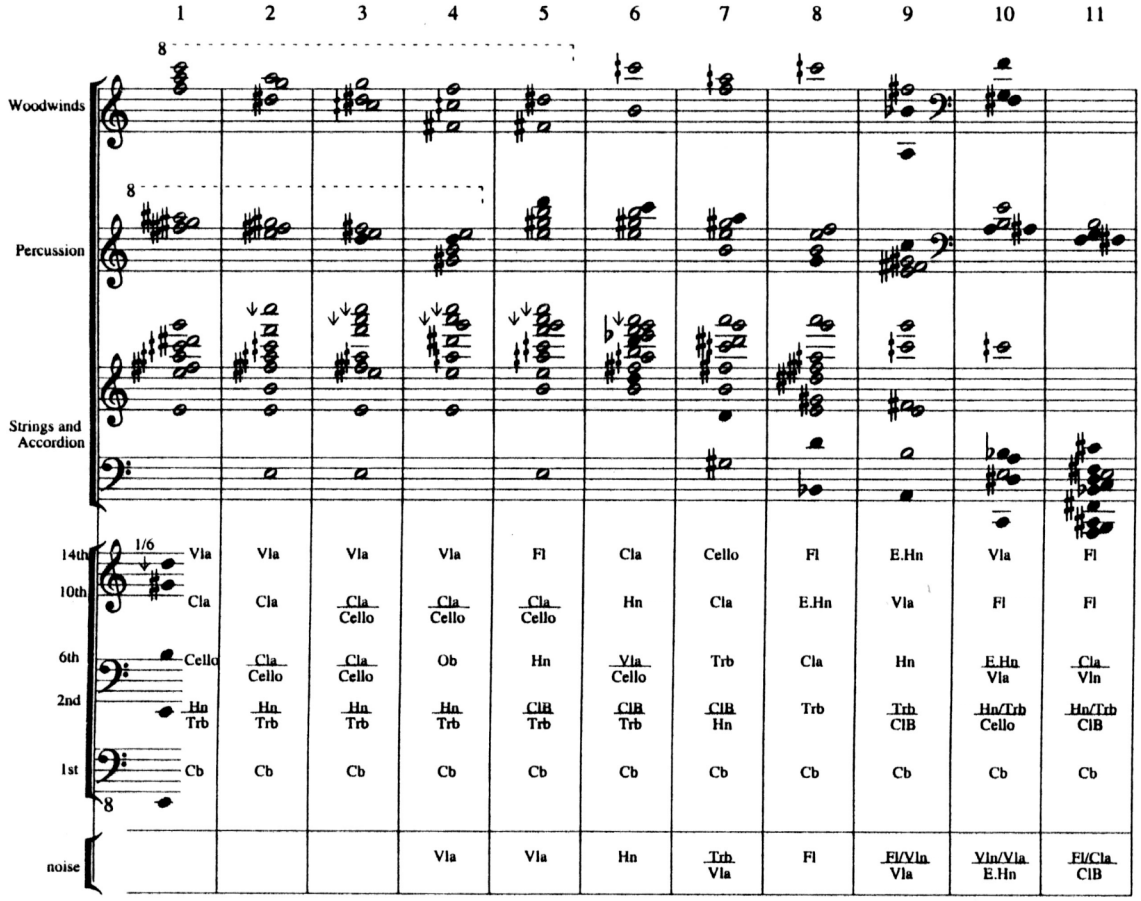

Figure 4.7. Progression from harmonicity to in-harmonicity in Partiels (Rose, 1996, p.9).

Along with harmonic investigation, Grisey was equally concerned with temporal issues. In fact, for the spectral musician the issue of time cannot be separated from that of timbre, they are intrinsically linked. Spectral composers have often approached time in

unique ways in order to explore distinctive sound structures. Nevertheless, *Moment* uses the infrastructure of *chronometric time* (such as the second), an approach taken by most twentieth century composers. Grisey describes this performance environment as having an "illusion of operational efficiency" (Grisey, 1987, 239)[1]. While some spectral composers may find this temporal infrastructure relatively simplistic and somewhat limiting, it strongly reflects the thematic material of *Moment*, and was therefore chosen for the piece.

4.3. AudioSculpt

AudioSculpt is a program developed by a large team at IRCAM, designed for sound editing and processing[2]. The beauty of the software is that it allows the user to work directly onto that image of a sonogram using various tools to manipulate the sound structure. Consequently, it is an excellent choice for artists wanting to explore the hidden intricacies of sound, without getting too stifled by the science of the process. This is reflected in a comment made by Fineberg, who writes: "The program AudioSculpt… has provided easy access to sonograms and has had a great influence in making the subtlety of temporally sensitive analysis accessible and manageable" (Fineberg, 2000, p.101). While other programs were considered, such as *Max/MSP* (developed at *Cycling '74*) and *Open Music*, it became clear that *AudioSculpt* would be my tool of choice[3]. These other programs are significant tools of composition for the spectral composer, allowing them to develop their own musical program through a graphical interface. Nevertheless, for this project I was not interested in designing my own computer music application, and more

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[1] Should the reader be interested in gaining a deeper understanding of the spectral musicians temporal approach, a significant document is Gérard Grisey's *Tempus ex Machina: A composer's reflections on musical time*. See bibliography.

[2] Design and development of *AudioSculpt*: Niels Bogaards. Contributions: Philippe Depalle, Nicholas Ellis, Peter Hanappe, Alain Lithaud, Marc Locascio, David Ralley, Alberto Ricci, Chris Rogers, Xavier Rodet, Hans Tutschku.

[3] For information on *Max/MSP*, visit the *Cycling '74* website at http://www.cycling74.com/products/maxmsp, or for information regarding *Open Music*, visit *IRCAM's Forumnet* at http://forumnet.ircam.fr/?L=1. Both programs can be purchased online at these sites.

importantly, I did not need to. *AudioSculpt* allowed me to fulfill all my artistic desires for *Moment*.

To cover every capability this software holds is unrealistic, however, there are some functions particularly important to the project at hand. *AudioSculpt* has three main areas for sonic modification, those being *filtering*, *cross synthesis* and *dilation or compression of time*. As the name suggests, *filtering* refers to the technique of passing the frequencies through a filter that has a value placed on it, defining a *frequency response curve*. There is four filter options available, including: *band*, *breakpoint*, *surface* and *formant* filtering (AudioSculpt, 2005, online). The first of these filters uses *bands* that create stop and pass frequency sections, something used significantly in *Moment*. In Figure 4.8, four *bands* have been formed, each with a width of 1000Hz, starting at 1000 Hz, with a distance between each of 1000Hz. They have been applied to a sonogram image of an African stringed instrument. The red area stops the overtones from passing, allowing the artist to isolate certain frequencies that stay audible within the sound structure. These bands can also be adjusted to form any desired shape, as can be seen in Figure 4.9.

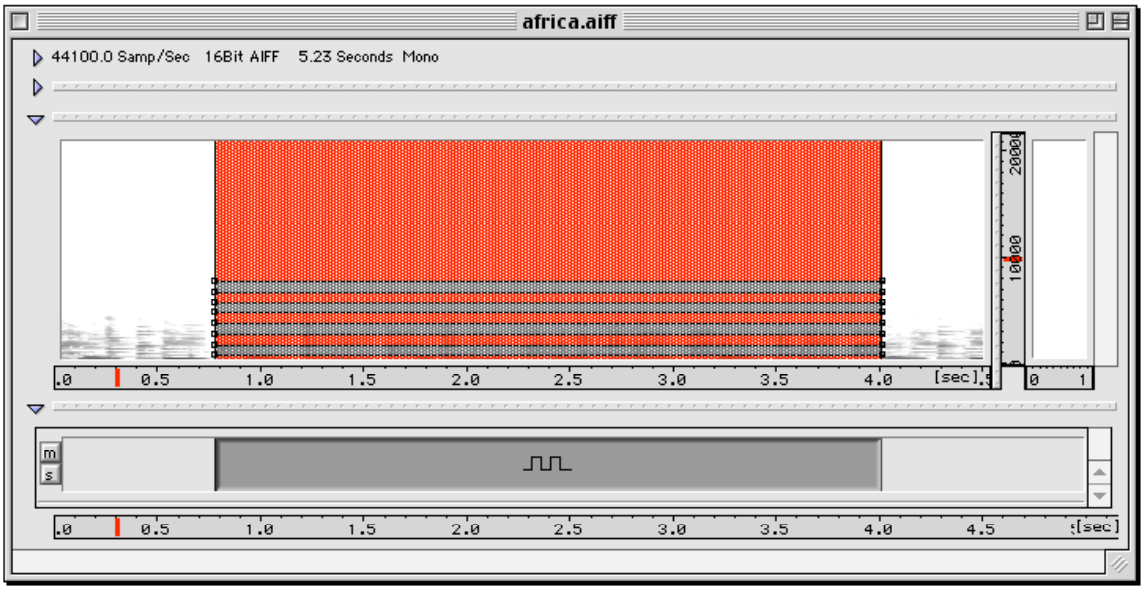

Figure 4.8. Creation of band filters (Haddad, 2003, p.27).

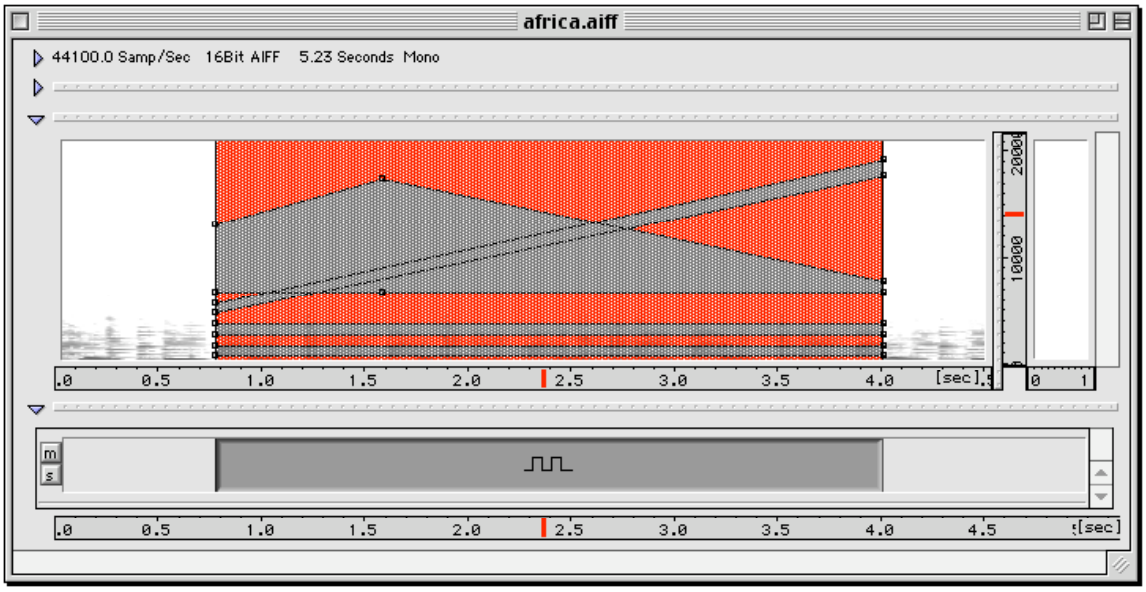

Figure 4.9. Creation of band filters (Haddad, 2003, p.28).

Surface filtering is another *AudioSculpt* tool that proved very useful in creating the desired sound structures for *Moment*. This device allows the artist to draw various shapes onto the sonogram that cause the frequencies they are covering to increase or decrease in amplitude. The adjustment can be made anywhere between -116 dB and +116 dB (decibel). When the dB is increased, the shape gradually becomes a darker shade of blue, and alternatively a darker shade of red if decreased, as seen in Figure 4.10.

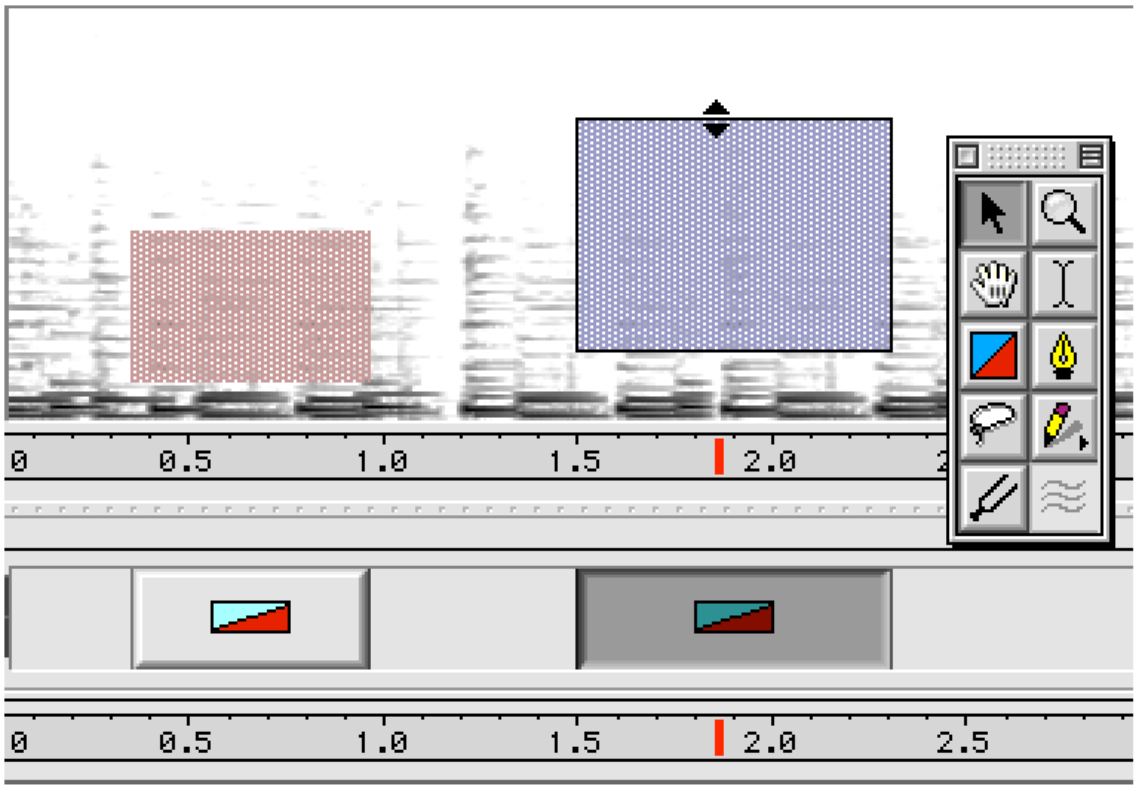

Figure 4.10. Creation of rectangular surface filters (Haddad, 2003, p.13).

The final device of particular significance to this paper is *dilation or compression of time*. This can be created by constant or dynamic means. When creating a constant change of time, a single number is entered as a *scale factor*, with the threshold being 10 for expansion and 0.01 for compression. This uniformly modifies the temporal envelop of the given sound structure where the dilation or compression box is located on the time axis, as seen in Figure 4.11. The sonogram still appears the same, but when played the listener can hear what the given scale factor has done to the sound. As well as this, the program has the capacity to dynamically alter the time, rather than it remaining constant. This is done manually by adjusting a blue line situated along the horizontal axis of time, with the vertical axis corresponding to the expansion and compression of that time (see Figure 4.12).

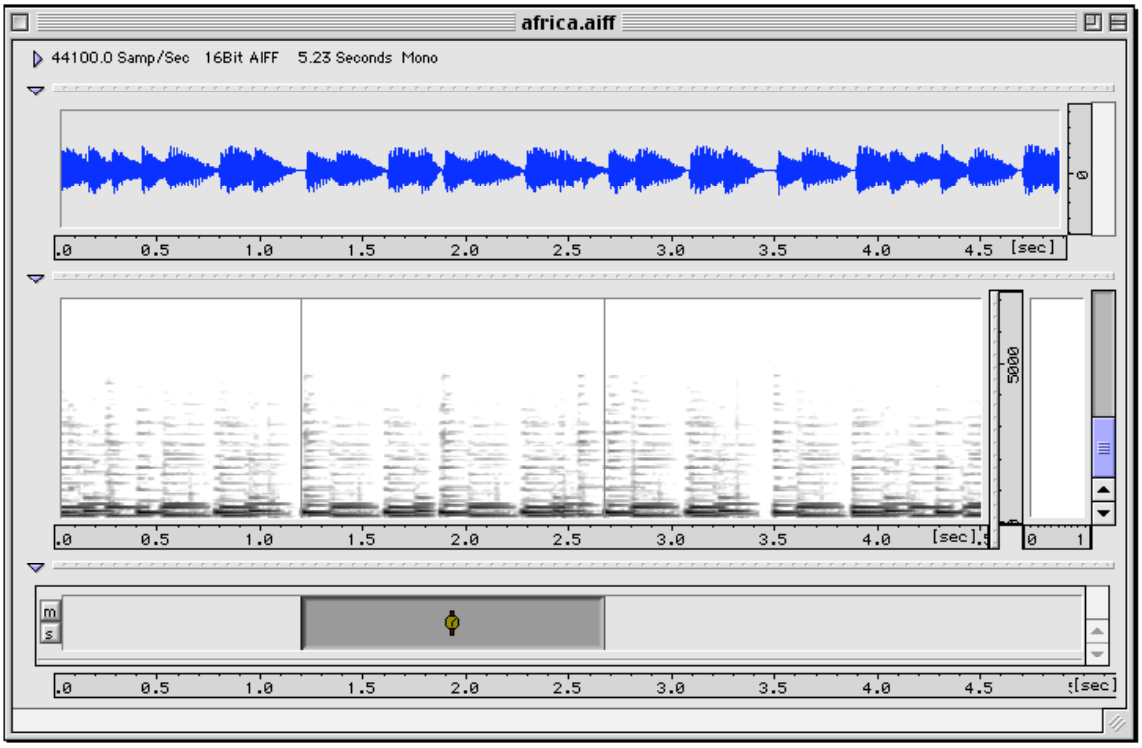

Figure 4.11. Constant Time Stretching: expansion/compression box (Haddad, 2003, p.23).

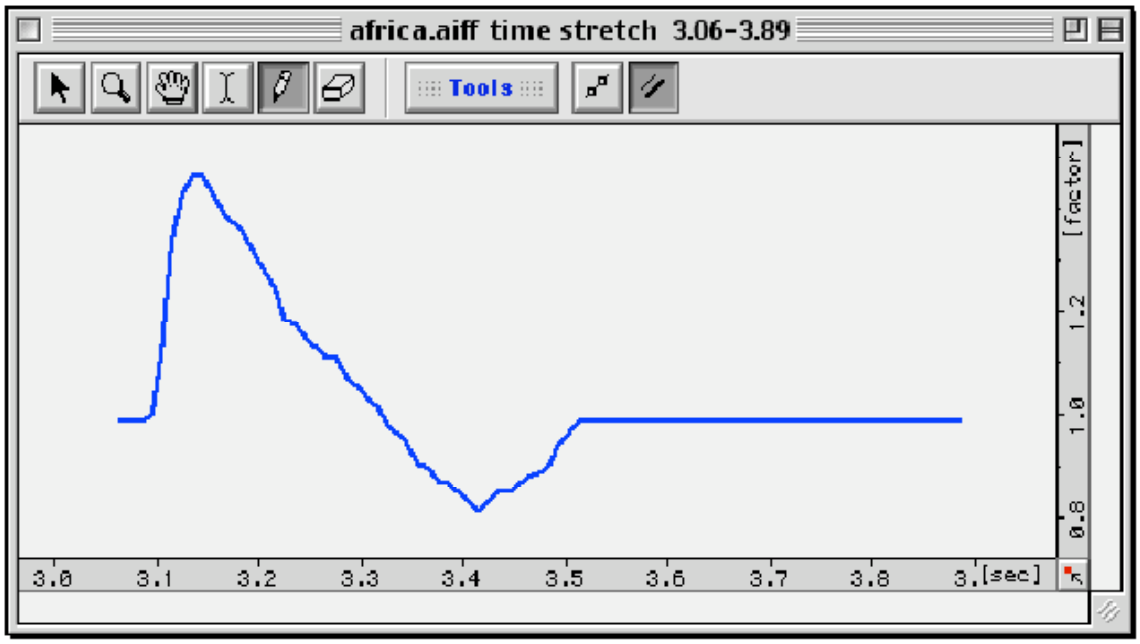

Figure 4.12. Dynamic Time Stretching: expansion/compression treatment interface (Haddad, 2003, p.33).

In his piece *L'Esprit des dunes*, the MAX-FTS software allowed Murail to make similar adjustments to the original sonic structures that AudioSculpt allows. His eclectic instrumentation made use of diphonic Mongolian singing, Tibetan singing and Jew's harps. According to Eric Daubresse and Gérard Assayag, Murail was able to reduce or increase the amplitude of one or more components of a spectrum, as well as fractionate and remove a spectral region. This was done with the assistance of Serge Lemouton at IRCAM. While this didn't prove to be as significant in guiding my work as Grisey's instrumental synthesis, Murail's approach was certainly of interest to me, adding further support and inspiration to the work I had already begun. Not surprisingly, while Murail's approach had a spontaneous element, it remained intensely scientific, and thus less relevant to my intentions. To this Daubresse and Assayag write:

> The back and forth between analysis, evaluations and composition were constant and caused modifications at each phase in the conception of the work. For this reason, it was essential to be able to have a quick and constant aural check of the results; this allowed the eventual modification of the values given to the various parameters to be as intuitive as possible, while nonetheless allowing great precision (Daubresse & Assayag, 2000, p.75-76).

Also, attention is drawn once again to the common spectral technique of combining digital sound with acoustic instruments, an approach I wanted to reflect in *Moment*. Murail has masterfully utilised this type of sonic fusion in a number of compositions. In *Time and Again* (1985), Murail used a DX7 synthesizer with the orchestra as he explored frequency modulation (Anderson, 2001b, p.404). In *Partage des eaux* (1997) a Yamaha TX816 synthesizer is employed by Murail to add an interesting collection of digital textures, with the keyboard controlling an array of computer applications. In describing the work, Matthias Kriesberg writes:

> Sometimes the output [of the Yamaha TX816] is nothing more than microtones to combine with pitched percussion, piano and harps, instruments that cannot adjust intonation; at other times pressing the synthesizer's keys introduces stored sonic events to enrich complex orchestral textures… What is especially intriguing about the use of computer technology in this composition is its dual application. It is used first, in the earliest conceptual stages, to analyse and extract embedded harmonies (or timbres) from sounds of nature, in the performance itself, to generate sounds that pull the orchestration into a new realm (Kriesberg, 2001, online).

4.4. Other programs used in the creation of *Moment*

Three other software programs were used to create the music for *Moment*, all recognized tools in the music industry. As none of these programs are specifically used for the creation of spectrally influenced music, the paper will give only a brief explanation of each application, with particular reference to their use in *Moment*. *Sibelius* is music notation software developed by Jonathan and Ben Finn, capable of doing most of what can be done with pen and paper. While some limitations exist within the software, the creators continue to increase the scoring flexibility available to the composer. All the notational devices I required in creating *Moment* were present in this arranging program. With the score created, rather than extract parts for live musicians, *Sibelius* can be used to create a midi file of the arrangement[4]. In forming the music for *Moment*, *Sibelius* midi files were created for each bell score and imported into the computer based studio environment of *Logic*[5]. This application's capability is enormous, including multi-channel recording (live and midi), loop libraries (with the option of creating your own), software instruments, numerous plug-ins (such as equaliser and reverb) and much more. Many of the electronic sounds for *Moment* came from a sample package called *Garritan Personal Orchestra* (GPO). While there are many efficient sound libraries that can be used in *Sibelius*, the working environment of *Logic* gave me the means to mix the audio files of the recorded *Swan Bells* and *AudioSculpt* with the instrumental midi files from *Sibelius*. Though GPO software can act as a stand-alone tool, in this case it was used as a plug-in to *Logic*, giving access to a wide range of orchestral samples. It should be noted that there are a limited number of playing techniques available, with most instruments having only one sound sample. Even though this placed some limitations on what timbres could be created, the application provides some convincing instrumental sounds at a relatively inexpensive cost[6].

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[4] To find out more on Sibelius software, visit http://www.sibelius.com/cgi-bin/home/home.pl

[5] To find out more on Logic Pro, visit http://www.apple.com/logicpro/, or Logic Express http://www.apple.com/logicexpress/

[6] To find out more on GPO software, visit http://www.garritan.com/GPO.html

4.5. Summary

Instrumental additive synthesis has been a significant technique influencing the compositional work of spectral musicians. Like *additive synthesis*, where complex harmonic structures are created from sine waves, *instrumental synthesis* uses complex harmonic instrumental structures to make a spectral configuration of greater complexity. In doing so, the aim is not to recreate the sound source within the ensemble, but to use an electronic model as a compositional process for acoustic instruments. While Grisey looked at the structure of a trombone's low E in *Partiels*, I took a similar approach to that of Harvey in *Mortuos Plango*, looking to the in-harmonic structure of the bell. To do the analysis, as well as process desired sound manipulations, IRCAM's AudioSculpt application was used. With such a great diversity of software available for spectrally directed music, particularly from IRCAM, a good degree of consideration was required in choosing the application tool. In this case, AudioSculpt was chosen because it principally suited the desired artistic aims of the project. Other programs that *Moment* used included *Sibelius*, *Logic Express* and *Garritan Personal Orchestra*.

CHAPTER FIVE

5. The creation of *Moment*

5.1. Introduction

Moment has been inspired by the mindset and techniques of the spectral movement, primarily the process of *instrumental additive synthesis*. This chapter will expand on the method by which *Moment* was created, commencing with a synopsis to the development of the project, where visual and cultural elements directed its evolution. With this background given, the specifics of the approach taken with the music will be outlined, including the form of the piece, and the way instrumental synthesis was utilised. While the visuals were critical to the overall experience of *Moment*, I am neither a professional visual artist, nor aiming to write a visual arts paper. Throughout the creative process I have had to place a great deal of trust in the visual artists with whom I worked. Consequently, the visual discussion will be of a descriptive rather than critical nature, centring on the unique approach made for each of the three films.

5.2. The creative team of *Moment*

A large team of artists made this project possible:

Director and Composer:	Brett Mabury.
Visual Artists:	Kat Black Jasper Cook Joachim Strand Ashley Graetz Iris Koornstra Mia Holton Brett Mabury
Additional film editing	Michael Berkeley-Hill.

Musicians:	St Martin's Society of Change Ringers Under the direction of Tower Captain David Knewstub
Sound Engineer:	Kieran Kenderessy

5.3. A synopsis of *Moment's* development

As a musician, I have long been interested in working with artists from other idioms. As the connection between vision and spectral sound scapes became increasingly substantiated, my interest to explore this intersection grew. More specifically, with the use of spectral music in film still at a minimal level, I initially wanted to focus my project on this media. I was interested in returning to an early cinematic concept; where a live performance would accompany a narrative silent film. My aim was to both compose something that continued to support the place for this kind of music in cinema, as well as support the place for live visuals on the concert stage. Nevertheless, while I anticipate that these concerns will always remain an artistic aspiration of mine, conversations with Joachim Strand gradually began to stimulate a new challenge. Strand talked of having the video artist respond to the music, rather than the more common artistic process in film, where the composer responds to the vision, reflecting the process taken in commercial music and the potential of the music video for western art music[1]. Amongst the identified spectral and post spectral composers, as well as their precursors, there were no examples of these artists creating a cinematic music video. Mesias Maiguashca appears to be one of the few to explore spectral music and video on some level, especially with his *La Celda*, or *The Cell*. Consequently, I was excited at the prospect of exploring what seemed to be a largely untouched area of artistic expression.

[1] One rare exception to the composer reacting to the visuals can be seen in the work of director Sergio Leone, who masterfully responded to the highly acclaimed compositional work of Ennio Morricone in the *Dollars* films. The *Ecstasy of Gold* sequence, from *The Good, the Bad and the Ugly*, presents itself as an excellent example of Leone's visual response (Marshall, 2004, p.45). While Morricone is not associated with the spectral school, the artistic process taken by Leone reflects that of *Moment*.

At the beginning of 2005, I was invited to be a part of Western Australia's visual arts festival *Artopia*. In meeting with the director, I was told the organisers wanted this to be a festival that reached the general public, not merely those people who were already predisposed to attend such events. This excited me, as I often consider my audience when composing a piece of music. I have always found this to be a wonderful challenge, never a restriction to my artistic process or desires. Musicologist Tim Rutherford-Johnson supports this by writing:

> …in Grisey's music the shift of focus from the intellectualised concerns of form etc. to the perceptual, timbral concerns, the play of noise on the ears of the audience has liberated this music… To think about your audience is not necessarily to enslave yourself: it can spark real creativity (Rutherford-Johnson, 2004, online).

In this situation, I considered the cultural context of the Australian general public, deciding to take an approach that reflected some works by Dufourt, Lindberg and Harvey, and their use of the tempered twelve-note scale. The use of this musical system would give me opportunity to create a sound structure that the audience was more likely to understand. As part of this desire to attain greater cultural sensitivity, I decided to create moments that explored the transitions between spectrally directed compositional processes and that of western harmony. While on occasion this was an intuitive response to what I was hearing, it also came from the cultural considerations discussed in chapter three.

As a West Australian composer, I wanted to explore a sound structure that was unique to this region. Consequently, I decided to investigate and manipulate the sound structure of the Swan Bells, located in the state's capital city, Perth. The 18 bells became an opportunity to create a different musical colour by exploring the frequencies held within each bell. They were recorded individually, giving me maximum control over the direction the composition would take. Through sound manipulation, I caused each bell to ring out in several different ways, then combined these to last approximately one minute. The details of the bells can be seen in Table 5.1, and their notation in Figure 5.1. As discussed in chapter four, these metallic sounding bell structures were then combined

with instruments to create an interesting fusion of sound, at times difficult to distinguish separately.

Table 5.1

The Swan Bells

Bell number	Weight(kgs)	Note	Casting date
Treble	241	D#	1998
Second	238	C#	1988
Third	263	B#	1988
Flat Third	261	B	1988
Fourth	254	A#	1988
Fith	279	G#	1758
Sixth	263	F#	1770
Seventh	284	E#	1758
Eight	300	D#	1725
Ninth	370	C#	1725
Tenth	390	B#	1725
Flat Tenth	453	B	1988
Eleventh	486	A#	1725
Twelfth	589	G#	1725
Thirteenth	728	F#	1725
Fourteenth	831	E#	1725
Fifteenth	1099	D#	1726
Tenor	1480	C#	1726

(The Swan Bells, n.d., online)

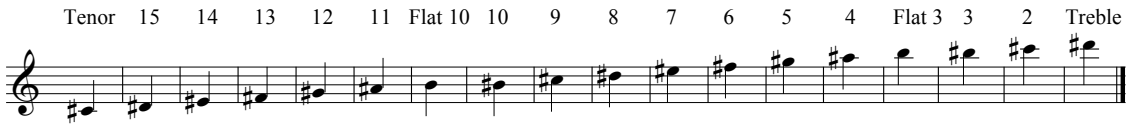

Figure 5.1. Notation of Swan Bells.

Sets of bells with unique peals have not only signalled time, but also the significant events held by time. As a result, I decided to make the piece 24 minutes in length, reflecting a 24-hour day. The visual artists were made aware of this approach, and asked to think about the ocular moments in their day that capture the essence of time passing, especially those moments that we can easily miss. As I composed the music, it was forwarded to the visual artists for them to hear and to gauge responses. I asked some of

these artists to capture minute length periods of film that reflected each of these bells. These captured minutes of vision were then used to create a 24-minute show, executed by the VJ artists Kat Black and Jasper Cook (*VJ Zoo*)[2]. Additionally, both Joachim Strand and *VJ Zoo* would produce a show using their film images.

With the common ingredient being the music, I felt there would be nothing to stop all films from running at the same time. Like our day, at any given moment, we cannot take everything in, however certain events will attract our visual attention. Similarly, due to the layout of the room for *Moment*, the audience would need to choose a cinematic image that attracted their eyes, at the sacrifice of another. I had the audience sit in the middle of three screens, which allowed me to surround them with four speakers, one located in each corner of the room. My aim was also to explore the mindset of Edgard Varèse, where different minute long bell colours, or *sound masses*, would be projected onto the audience, colliding in space. Figure 5.2 is a diagrammatic representation of the room.

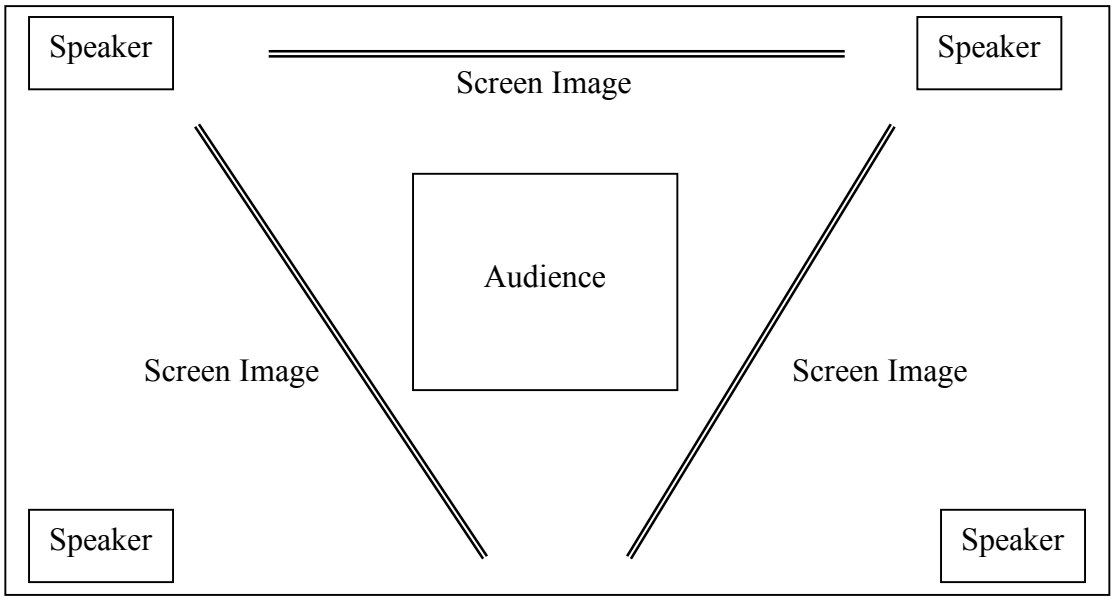

Figure 5.2. Configuration of cinematic space

[2] Kat Black (Kattyb) and Jasper Cook (Bunniboi) operate under the collective artistic name of *VJ Zoo*. To find out more on these artists you can visit there website at http://www.vjzoo.com/

5.4. Form of *Moment*

The general structure of *Moment* is broken into two sections, each lasting twelve minutes, analogous to the twelve-hour clock. To further reinforce this concept, I placed the tempo of the piece at 60 beats per minute. At the introduction, I used the tenor coloured bell, the largest of the bells, to declare the commencement of the piece, symbolically representing 1am. At one-minute intervals another coloured bell would commence, representing 2am, at two minutes one more for 3am, and so on to eleven minutes where the music was to symbolize midday. At twelve minutes a new coloured bell would declare 1pm, and a similar process to the first eleven minutes would take the music to a symbolic representation of midnight, commencing at twenty-three minutes. While I methodically introduced a coloured bell on every minute, I would also ring a second or third bell colour to increase the harmonic complexity during these minutes. It also allowed me to explore the penetration or repulsion of these sound masses, akin to Varèse. This approach required a unique approach to the score. In order to create isolated sound masses that together made up the whole of the piece, it was decided to compose a different short score for each bell, derived from instrumental synthesis. On those occasions where one coloured bell was played against another, or one score against the other, I was not concerned with how these individual notes combined, certainly not in a traditional harmonic sense. It was simply an exploration of timbre[3].

The chosen bell colour marking each minute, or figuratively each hour, did not reflect the light at that time of day, like Murail's approach in *Vues aériennes*. Nor did I strive to have the coloured bells depicting the likely human activity for a given time. The creation

[3] A distinction needs to be made between the natural bell sounds, as opposed to what I am describing as a *coloured bell*. When I use the term *coloured bell*, I am referring to the minute long sonic structures that are founded on the overtones of each bell, utilising the sounds from *AudioSculpt*, with instrumental synthesis added. In addition, *synaesthesia* (a condition where one type of stimulation evokes the sensation of another) was not part of my compositional approach. The music was not composed in a manner where each *coloured bell* caused me to visualise a particular colour. It would, however, be interesting to research the affect *Moment* has on someone who experiences synaesthesia. As the sonic structure of one *coloured bell* collides with another, how does this translate to the visual colours they experience?

of a twenty-four minute piece, reflecting a twenty-four hour clock, was merely a means of creating a structure upon which the music could form. In saying this, the chosen harmony at midday and midnight was very much a conceptual approach, similar to that heard in some of Dufourt's work. With midday holding the brightest light, I wanted to reflect the warmth of the sun's rays at this time through the harmony. By returning to a traditional harmonic approach, I felt the audience were likely to respond to a sound state they culturally knew with a feeling of comfort and calmness, abstractly reflecting the warmness of midday. This conclusion was based on previous compositional experience, as well as those comments made by John Sloboda. To accentuate this experience, I used a perfect cadence, resolving the music to an F# major triad, outlined in the strings before the piano carries the melody, as seen in Figure 5.3.

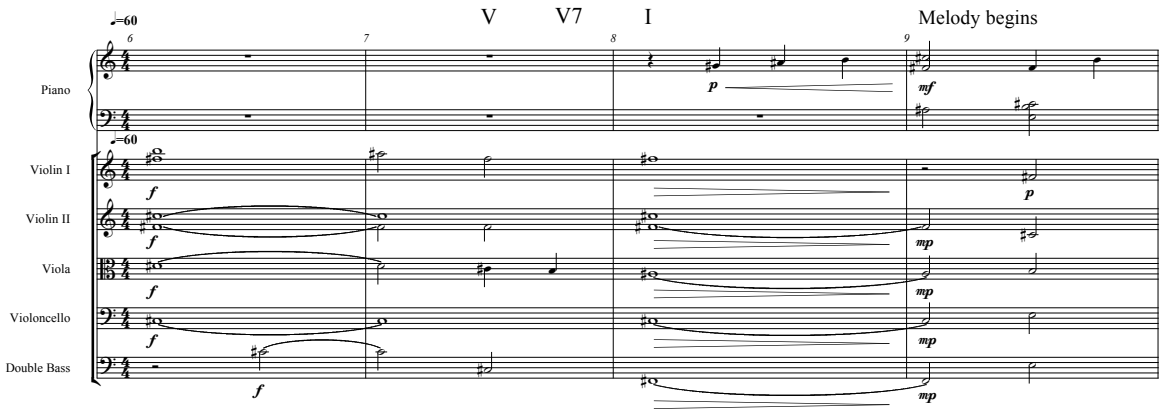

Figure 5.3. Use of perfect cadence in the twelve midday score of *Moment* (bars 6-9).

Similarly, I wanted the twelve midnight score to reflect the uneasy connotation of the darkness associated with that time. To do this I had the manipulated bell structures ring out, with minimal use of instrumental synthesis, over a C# pedal. Each of these metallic sounding bell constructs accompanied the equivalent pitch sung by the soprano voices. I used the vibraphone and celesta to highlight some of the frequencies heard in each of the bell structures, as seen in Figure 5.4. The audio files of the metallic sounding bell overtones for the corresponding bars can be seen in Figure 5.5, taken from *Logic*.

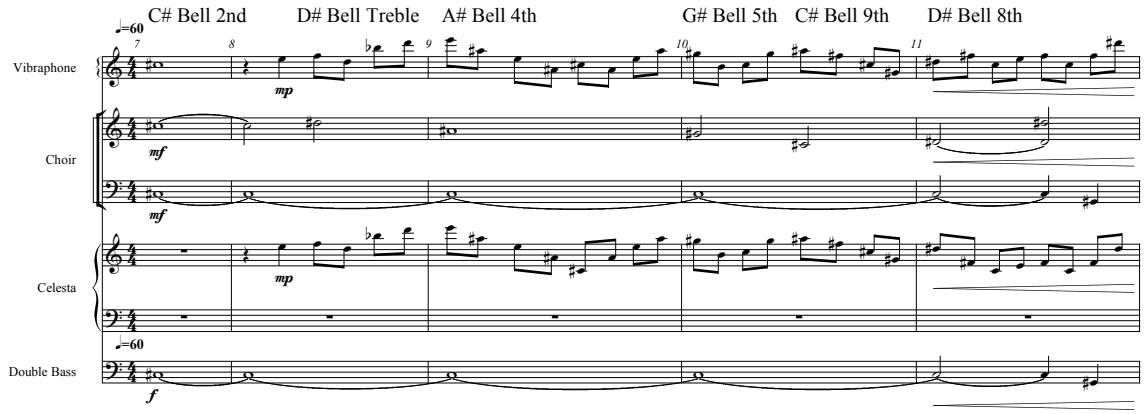

Figure 5.4. Twelve midnight *Moment* score extract (bars 8-11).

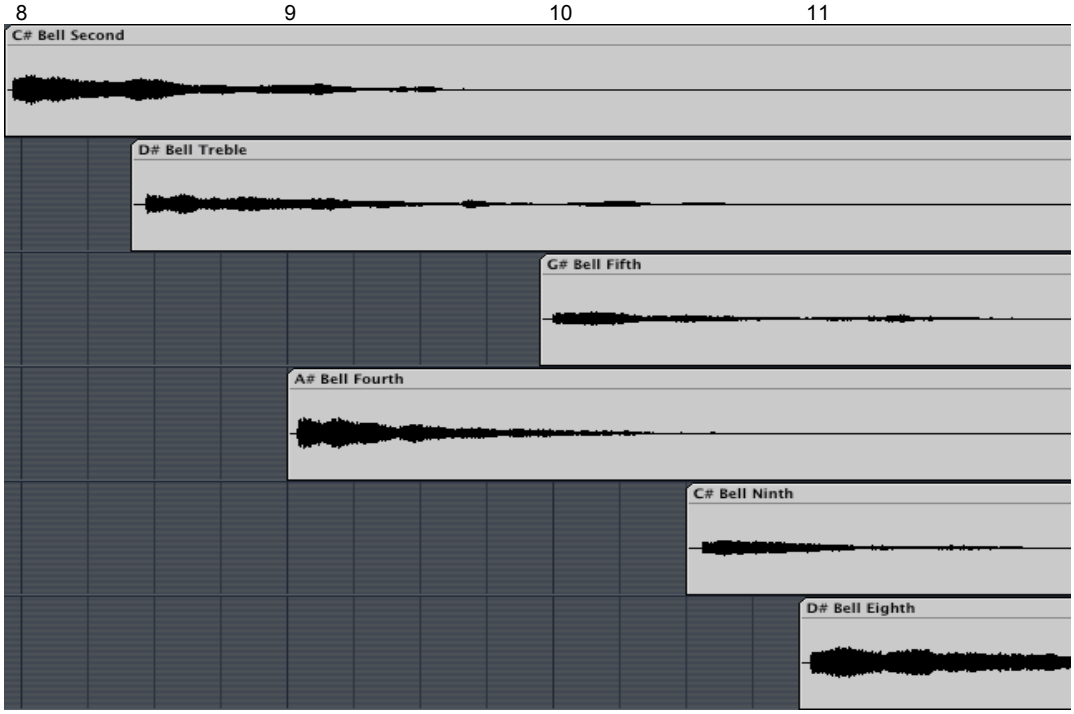

Figure 5.5. Bell overtones accompanying the twelve midnight melody (from Logic).

Another important concept was to order the introduction of each coloured bell so it would anticipate the melody heard at *midday* (played by the piano in bars 9 to 17 of the twelve midday *Moment* score) and *midnight* (sung by soprano voices in bars 7 to 16 of the twelve midnight *Moment* score). Table 5.2 reveals both the order and time (minutes:seconds) at which the coloured bells are introduced. They are categorised by

their name within the Swan Bell structure, as well as the equivalent pitch. Below this is the melodic order of notes for both the midday and midnight scores, given in reference to the bar and beat of its hearing. Where the melodic pitch and coloured bell order coincide, they have been placed above and below one another. Although there are some octave differences between the pitches of the melody notes with that of the bells, particularly in the midnight score, a similar order is verified. While the audience may not consciously connect this comparable ordering when listening to the piece, it brought conceptual unity to the piece.

Table 5.2
Comparison of the Bell Order with the Melody Note Order for both Midday and Midnight.

Minutes	0	1	2	2:10	2:48	3	4		5		6
Coloured bell order	Ten C#4	13 F#4	Flat 10 B5	11 A#5	13 F#4	6 F#5	7 E#5		12 G#4		Flat 3 B6
Melody at midday	C#5	F#4	B5	A#5		F#5	E#5	C#5	G#4	G#5	B6
Bar/Beat	9/1	9/3	9/4	10/1		11/1	11/3	11/4	12/1	12/4	13/1

Minutes	7	8	9	9:30	10	10:10	10:48	11
Coloured bell order	5 G#5	7 E#5	9 C#5	Tenor C#4	Flat 10 B5	11 A#5	13 F#4	Midday
Melody at midday	G#5	E#5	C#5		B5	A#5		
Bar/Beat	13/3	14/1	14/3		15/1	16/1		

Minutes	12	13	14	15	15:30	16	17		17:30	18	19
Coloured Bell Order	2 C#6	Treble D#6	4 A#6	5 G#5	2 C#6	9 C#5	8 D#5		3 B#6	2 C#6	4 A#6
Melody at Midnight	C#5	D#5	A#5	G#4		C#4	D#4	D#5		C#5	A#5
Bar/Beat	7/1	8/3	9/1	10/1		10/3	11/1	11/3		12/1	12/3

Minutes	20	21	21:30	22		23
Coloured Bell Order	6 F#5	8 D#5	15 D#4	9 C#5		Midnight
Melody at Midnight	F#4	D#4		C#4	B#4	
Bar/Beat	13/1	13/3		14/1	15/1	

Note. The *Minutes* is connected only to the *Manipulated bell order*, and the *Bar/beat* is connected only to the *Melody at midday/midnight*.

The series of notes listed in Table 5.2 was echoed not only in the bell colours, but also in the ringing out of the natural bell sound, similar to what is heard at the Swan Bell tower. In essence, the bellringers are not reading a melody, but responding to a series of numbers, an approach I wanted to imitate at different points in the piece. This principally takes place at 5 minutes, 11 minutes, 17 minutes and 23 minutes (6am, midday, 6pm and midnight respectively). Figure 5.6 reveals the sequence of bells at 5 minutes, with bell 12 ringing out on 6 occasions to reflect the symbolic time of 6am. These particular pitches (or numbers) can be seen at 0, 1, 2, 2:10, 3, 4 and 5 minutes in the coloured bell order of Table 5.2. In Figure 5.7 the sequence of bells at 23 minutes (midnight) is notated, supported by the tenor bell ringing 12 times. It also reveals my replication of one of the simplest ringing techniques, where the bells are sounded in order down the scale, called a *round*. The use of the round is also heard during the midday section of the piece.

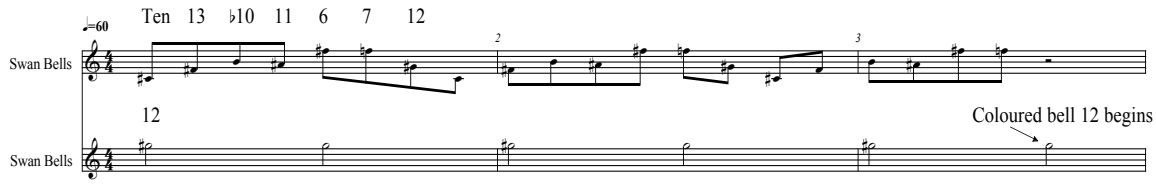

Figure 5.6. Sequence of Swan Bells at 5 minutes in *Moment*.

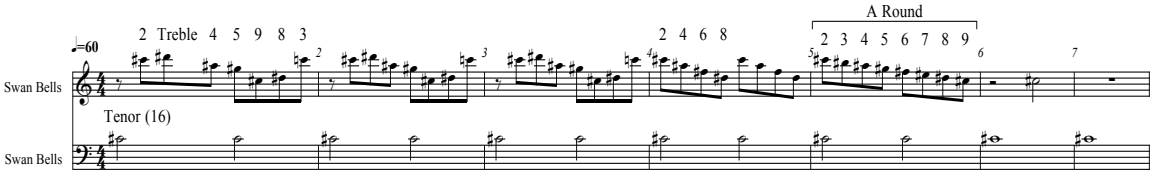

Figure 5.7. Sequence of Swan Bells at 23 minutes in *Moment*.

Due to the nature of the work by Joachim Strand, the form of the piece needed to be definite from the outset. As a composer, I did not have the luxury of making changes to the music that had already been forwarded to him, and towards the end to the VJ artists. Strand's film editing was purposely connected, with us both working and progressing on our component of *Moment* at the same time. In this sense, I took an approach that

reflected the discussed work of Murail and Risset, where the whole was considered from the outset, with different musical events maintaining the global structure of the piece.

5.5. Musical processes of instrumental synthesis in *Moment*

A significant facet to the form of *Moment* was the sequence of bells that established a melody heard at both 11 minutes and 23 minutes. While this concept contributes to the structure to the piece, melody was not the focus of my work. My primary interest lay in the use of instrumental synthesis and the exploration of timbre, where computer technology pushed my work in new artistic directions. The process that I took for each bell was the same, thus it will prove more efficient to give a detailed explanation of how I approached one of these bell colours. To do this I will use G# bell twelve, as it was one of my personal favourites in the exploration of timbre. More importantly, it allows me to continue the explanation of what is heard at 5 minutes in *Moment*, as seen in Figure 5.6 where the commencement of the coloured bell is pointed out.

The first step was to establish a sonogram drawing of the bell structure. At this stage, the artist has the option of adjusting a number of different analysis parameters (window size, window step, FFT size, window type) to attain the specific sound information they desire. An example of this might be adjusting the *window size* factor when dealing with a very short sound file. The *window size* determines the resolution of the analysis on a temporal level. Therefore, if the window size is too large, any frequency changes in the fleeting sound file will not be registered in the processing. For *Moment* I found the *AudioSculpt factory settings* of these parameters to be more than adequate in providing a sonic picture that I could use. The bell sound structures appeared to be conducive to these settings for the manner in which I was going to use them. My work remained a visual and aural exercise, rather than a scientific analysis of sound data, as will be revealed. This approach echoes the comments made by Eric Daubresse and Gérard Assayag when discussing *L'Esprit des dunes*. While remaining precise in his approach, Murail was said to do the final synthesis and mixing with "an aural control of the results", making the "final adjustments *by ear*" (Daubresse & Assayag, 2000, p.75). Figure 5.8 shows the sonogram

analysis of G# bell twelve[4].

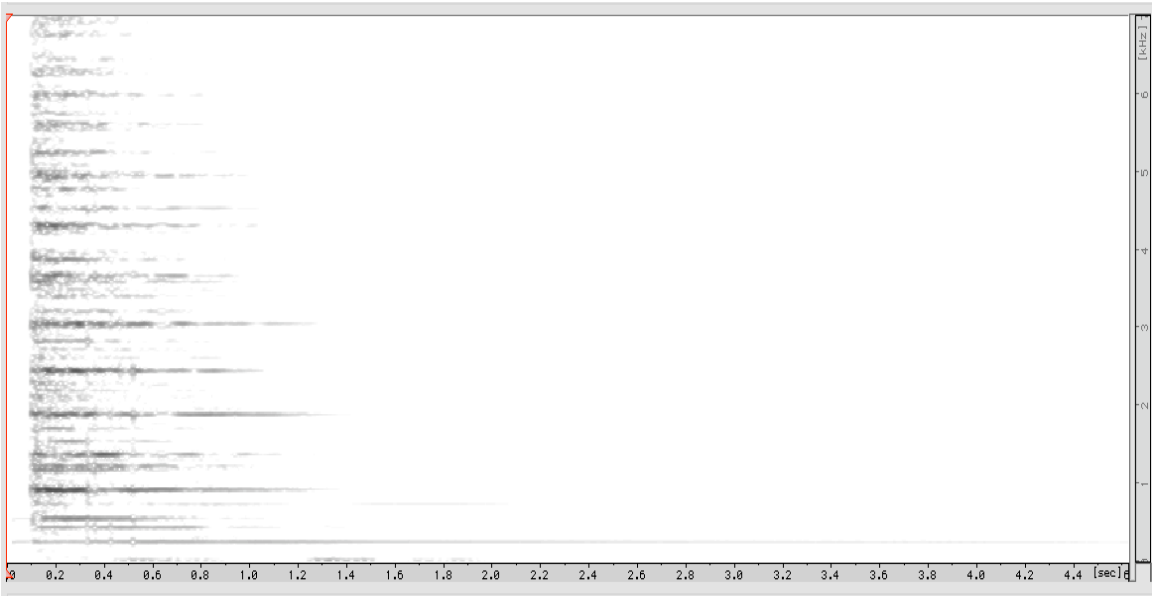

Figure 5.8. Sonogram analysis of G# Bell twelve.

The second phase of this process is where I departed a little from Grisey's work, by the very nature of the software I was using. First I employed the use of the *tuning fork* tool, positioning it on the darkest areas of the sonogram, representing the loudest volume. With a click of the mouse I was able to hear a pure sinusoidal sound of both the frequency and amplitude of the bell at that spot. This information was then used to guide me as I began locating the dominant frequencies, particularly those that matched, or sat near to, a note in the tempered twelve-tone musical scale. These tuning fork investigations then allowed me to begin isolating some of these frequencies by means of the *band filters*. While I had some guide as to what frequencies I wanted to isolate, this was very much an aural exercise for me, exploring an array of different timbres. Once the *band filters* were in place, I then made use of the *rectangular surface filters* and *dynamic time stretching* to further manipulate the sound of the bell. In most cases, including bell 12, this creative work resulted in three different sound structures that could later be used for instrumental synthesis. I called these *AudioSculpt transformation (AST) files*. In the

[4] Listen to track 1 of *Moment G# Bell 12* compact disc to hear the recorded G# Bell 12.

first of these files (AST1) I only used one band filter, located towards the bottom end of the bells spectrum. To bring out these frequencies I set the surface filter at an increase of 20 dB. The dynamic time stretch started at the maximum factor of 10, gradually decreasing as the bell rang out. By doing this, as the number of frequencies and their amplitude decreased in time, the temporal hearing increased, helping to avoid long periods of little sonic activity. The adjustments to G# bell twelve AST1 can be seen in Figure 5.9[5].

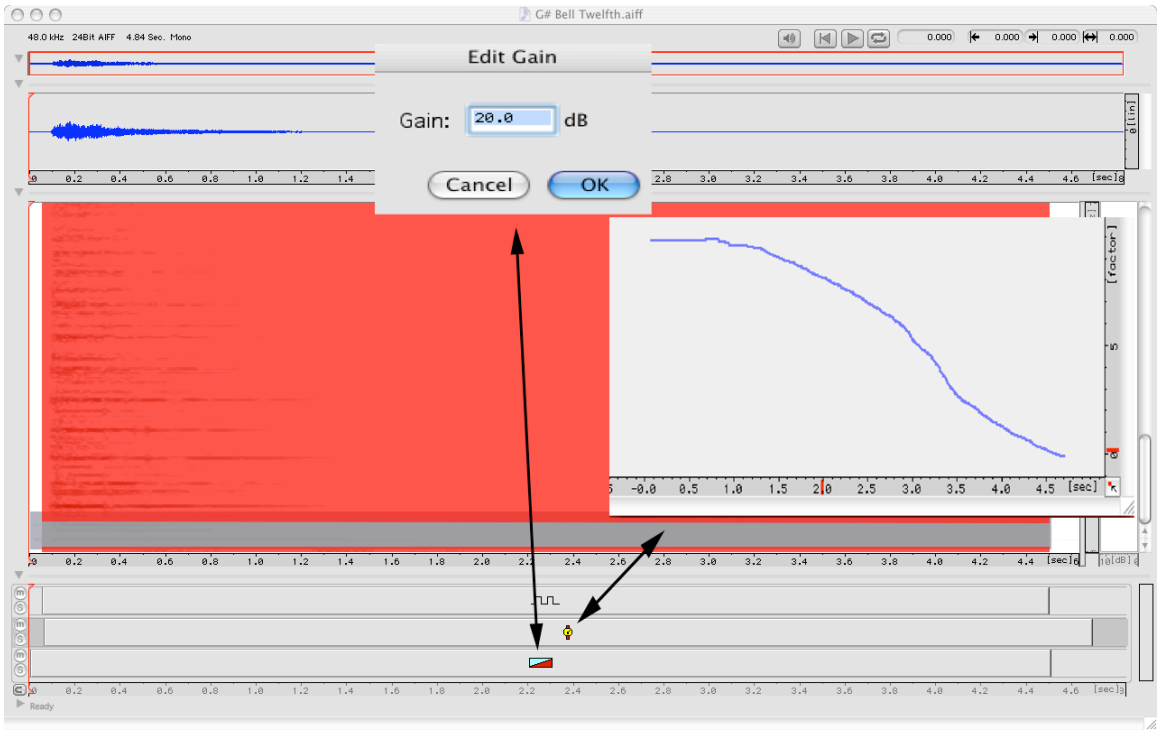

Figure 5.9. G# bell twelve AST1

Upon creating these sound structures, I also notated the frequencies to which I was looking to draw attention. In saying this, it should be made clear that I was not aiming to isolate a single frequency, but allowing a number of overtones to pass through each individual band filter. By removing a majority of the bell's sound structure, those frequencies with the greatest amplitude began to emerge amongst an interesting metallic

[5] Listen to track 2 of *Moment G# Bell 12* compact disc to hear the recorded AST1 sound structure.

timbral state. In Figure 5.10, the three dark lines in the sonogram on the left contain frequencies that can be notated as B5, G4 and A4 from top to bottom respectively. I would also make a notational cue regarding the appearance or disappearance of frequencies, as can be seen here, where the top two frequencies weaken before the bottom.

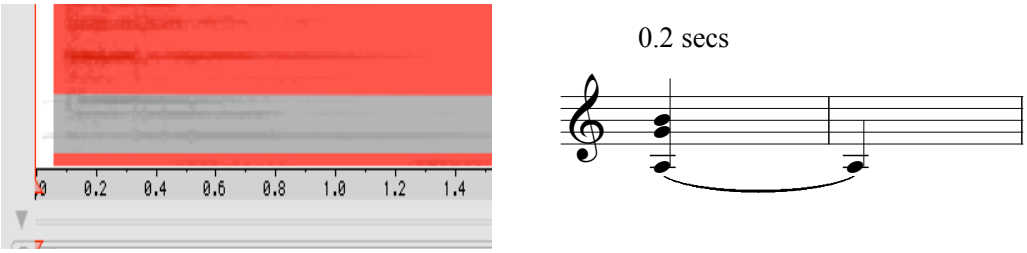

Figure 5.10. Notation of frequencies in G# bell twelve AST1

In the second of these G# bell twelve transformations (AST2) I used six bands to filter the sound structure. In order to create the desired amplitude distribution I used two surface filters, one decreasing the frequencies of the top four bands by -10dB, and the other increasing the second band from the bottom by 20dB. The dynamic time stretch on this sound structure was exactly the same as that seen in Figure 5.9, only in this case, the length of the time box no longer stretches across the full width of the sonogram. Where the box finishes at 3.1 seconds, the bell sound will be played in its natural temporal state. The G# bell twelve AST2 sound structure can be seen in Figure 5.11[6].

[6] Listen to track 3 of *Moment G# Bell 12* compact disc to hear the recorded AST2 sound structure.

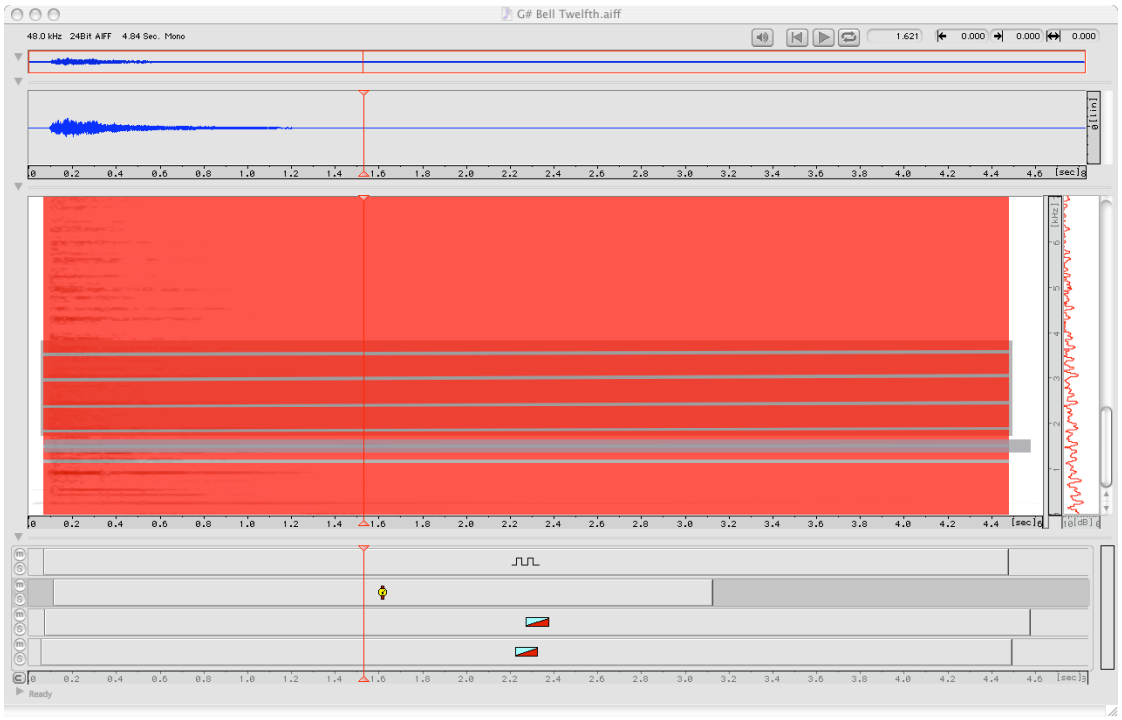

Figure 5.11. G# bell twelve AST2

The six band filters were notated as holding the harmonic structure seen in Figure 5.12, with C#6 coming from the bottom band filter, F6 from the next band filter up, and so on. Again there is a note tied over, however, unlike AST1, this was the result of a surface filter at 20 dB, as seen in Figure 5.11, not a natural occurrence.

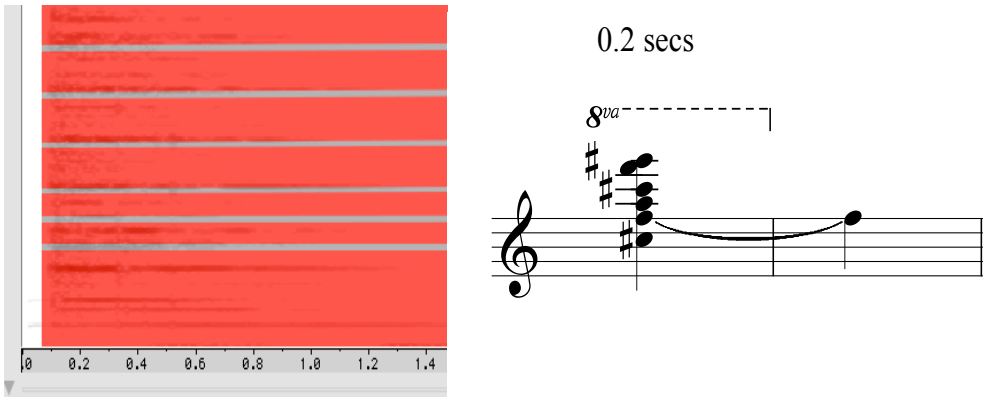

Figure 5.12. Notation of frequencies in G# bell twelve AST2

The final of these three sound manipulations (AST3) moved away from the use of parallel bands. In many of the bell *AudioSculpt* structures, including this one, I manipulated the band filters to create an evolving timbre that sometimes had a subtle melodic quality. In this case I used two bands that started with a narrow width, but were stretched at different points as the bell sound unfolded, revealing more frequencies. In order to have these isolated bell frequencies ring at an audible level for a longer period, I used three surface filters. The top two filters seen in Figure 5.13 were set at an increase of 10dB, and the bottom was set at 20db. Consequently, with the bell's frequencies remaining at a higher volume, I was able to use a constant band stretch of factor 10 without creating a period of little sonic activity[7].

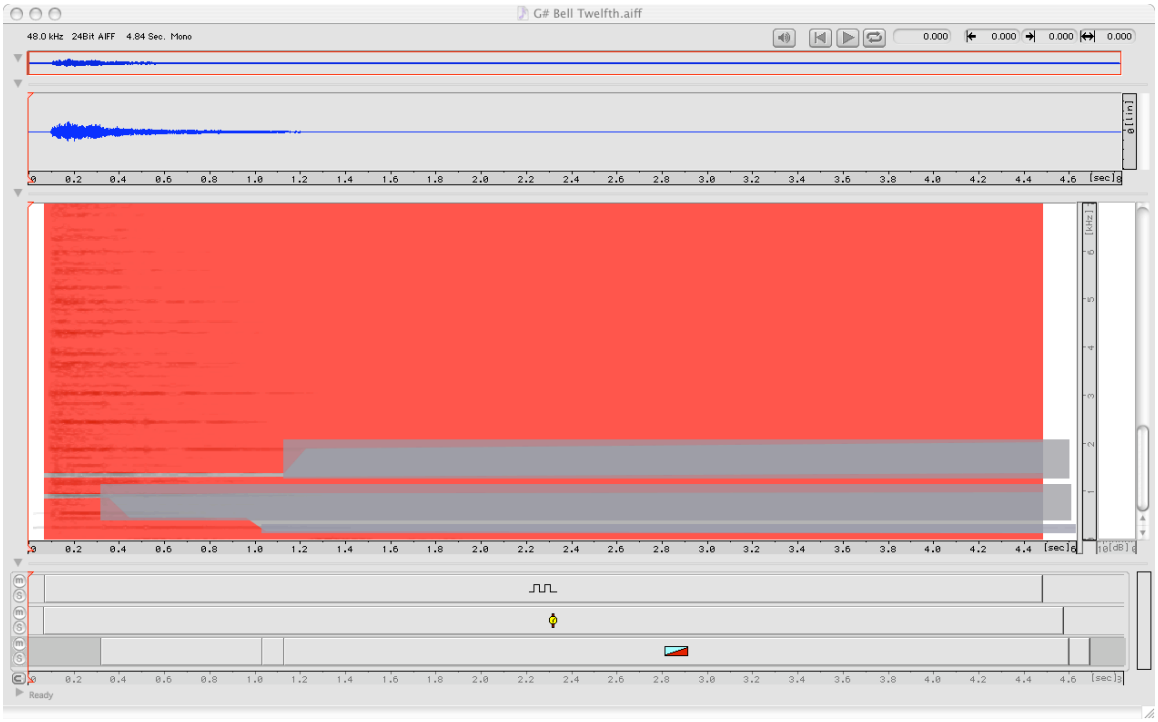

Figure 5.13. G# bell twelve AST3

The notation of this structure was a little more complex, with the entrance of each predominant frequency an important consideration. In Figure 5.14, the harmonic structure starts as two notes a perfect 5th apart, calculated at 0.2 seconds. At the first expansion of

[7] Listen to track 4 of *Moment G# Bell 12* compact disc to hear the recorded AST3 sound structure.

the bottom band filter, two new notes are added at 0.39 and 0.43 seconds. The second spreading out of the bottom band filter introduces an A4 at 1.03 seconds. Finally, a widening of the upped band introduces an F6 and G#6 in quick succession. As each note is introduced, the other components to the harmonic structure remain, again due to the use of surface filters.

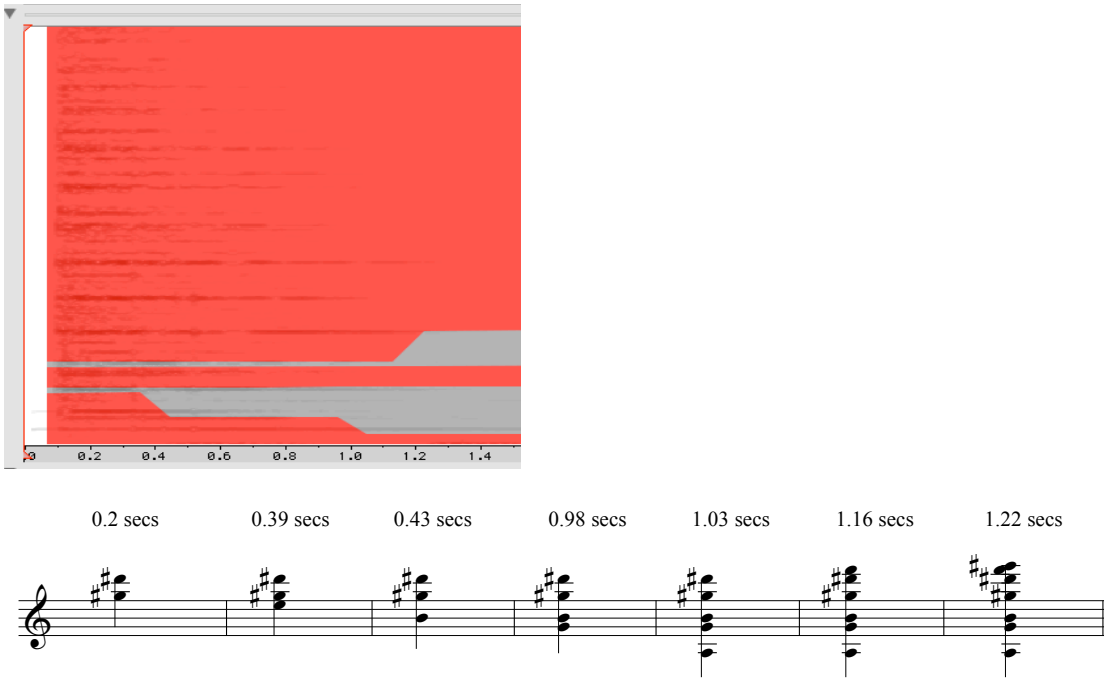

Figure 5.14. Notation of frequencies in G# bell twelve AST3

With each of the three AST files created and the notation analysis done, they were then transferred to *Logic*, making way for instrumental synthesis of the sonic structures using *Sibelius*. I continued to explore the creation of different timbres in *Logic* as I ordered and combined these AST files in different ways, as seen in Figure 5.15. The numbers at the top of the diagram correspond to the bar numbers in the instrumental synthesis score of G# bell 12. On the left is the bell peal that can be seen notated in Figure 5.6, with the order of entry both G# and C# together, then F#, B, A# and so on. When coloured G# bell twelve enters, I decided to combine the sound of AST1 with AST3, followed by the repetition of AST1 to maintain the contained notes of G4 and B5. To apply instrumental synthesis to AST1, the sound of woodwinds and French horns were employed. Figure

5.16 shows G4 and B5 being transferred between flutes and clarinets, with French horns holding the A4. In bar 8 the clarinet takes over from the French horn. While the same notes are sustained, this creates a subtle evolving change of instrumental texture[8].

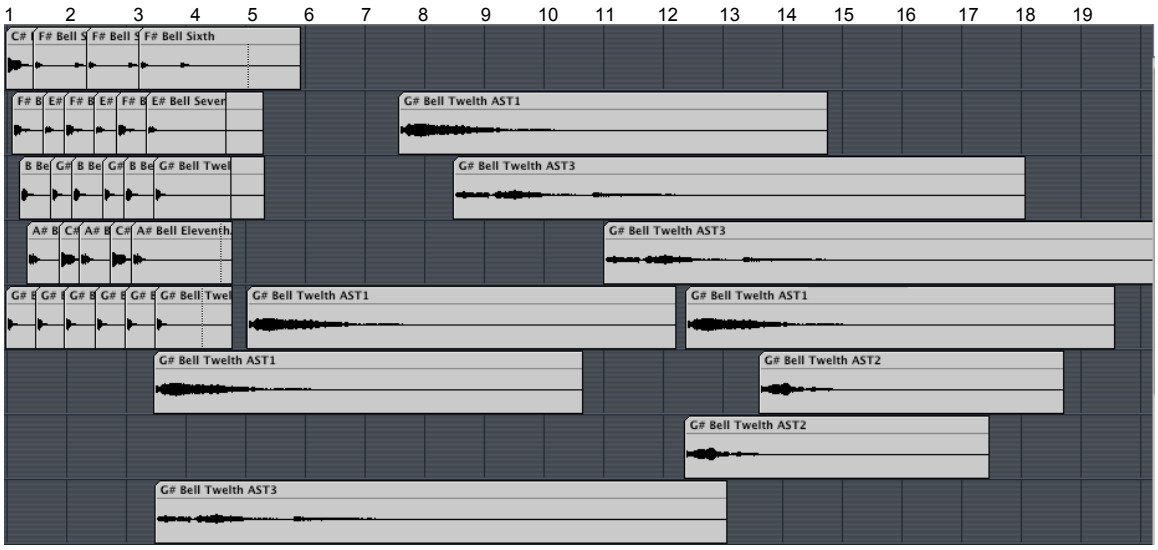

Figure 5.15. Ordering of AST files in Logic.

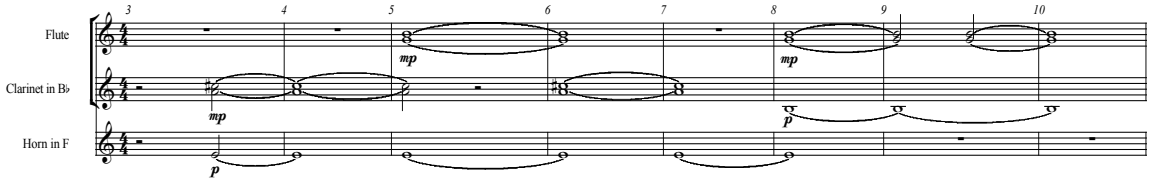

Figure 5.16. Instrumental synthesis of AST1.

In transferring the spectral information to notation, I also applied a dynamic marking to each note that reflected the amplitude of the equivalent frequency. When applying this to the score, however, I did not aim to have a precise instrumental expression of these dynamics as Grisey did. This was due to the use of surface filters, as well as some personal compositional desires to create different timbres. Nevertheless, on occasions

[8] Listen to track 5 of *Moment G# Bell 12* compact disc to hear the AST1 instrumental score, unaccompanied by the manipulated bell structure. Track 8 is the combined sound structure of AST1 with instrumental synthesis.

these dynamics acted as a guide, as can be seen when comparing the dynamics seen in Figure 5.17 with that of the score excerpt in Figure 5.16. On this occasion the correlation can be seen in my decision to make the concert A4 (E4 on the French horn) a softer dynamic to the top two notes.

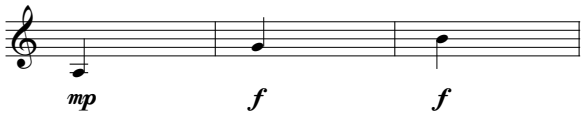

Figure 5.17. Dynamic markings of AST1 notation

For AST3 I decided to contrast the timbre of the woodwind and French horns with that of the string section and percussion. The staggered entry of the strings reflects the gradual addition of notes seen in Figure 5.14, with additional instrumental colouring coming from the tubular bells, then the vibraphone, mirroring the string parts. To bring out the last two notes of F6 and G#6 (1.16 and 1.22 seconds) the Glockenspiel was used. Evidently, the entrance of strings and percussion does not mirror the times seen in Figure 5.14, due to the use of a constant band stretch. On beat 3 of bar 8 the discussed AST3 sequence begins again, connecting with the repeat of this sound structure seen in Figure 5.15. The instrumental synthesis of AST3 is seen in Figure 5.18[9].

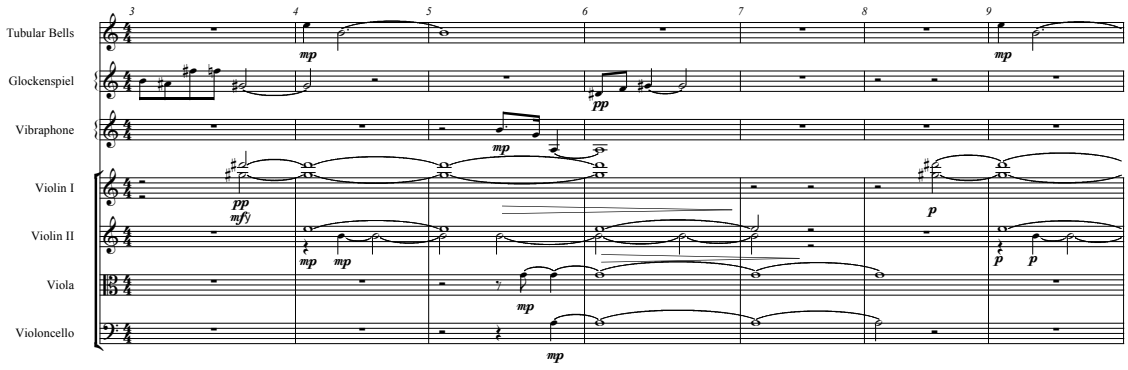

Figure 5.18. Instrumental synthesis of AST3

[9] Listen to track 7 of *Moment G# Bell 12* compact disc to hear the AST3 instrumental score, unaccompanied by the manipulated bell structure. Track 10 is the combined sound structure of AST3 with instrumental synthesis.

Figure 5.19 reveals the dynamic markings given to the notated frequencies of AST3. Like AST1, these dynamics were not used in a precise manner within the score. Nevertheless, the dynamics of violin 1 (D# as *pp* and G# as *mf*) in bar three were to reflect the balance of those same notated notes (D# as *mp* and G# as *ff*), only at a softer volume.

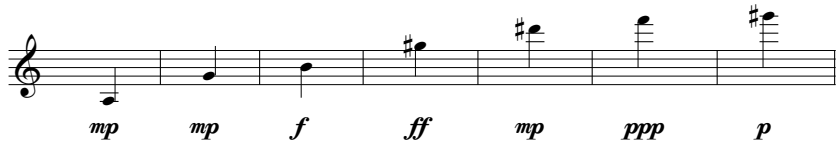

Figure 5.19. Dynamic markings of AST3 notation

AST2 was not used until bar 12, beat 3, and then repeated again on beat 1 of bar 14. I wanted to maintain the sustained string sound of AST3, but retain the instrumentation already used in this bell colour. The first entrance made use of the vibraphone, outlining the bottom four notes of the six note harmonic structure seen in Figure 5.12. The top two notes of F and G# are carried by the glockenspiel and handbells, an octave apart. It should be pointed out that the vibraphone and glockenspiel are both an octave below the notated AST2 structure, and the handbells two octaves, due to the pitch limitation of the instruments. While the intention was not the same as that of Grisey, the location of the AST2 notes in the score, as compared to the original notated form, could be said to create an increase in the G# bell colour's in-harmonicity. In the repeat of AST2 I added the flutes and clarinets, outlining the same notes as the vibraphone, creating an interesting change of texture. Although the AST2 structure does not recur for a third time, in the score I decided to have the vibraphone repeat its four note construct, with the handbells and glockenspiel adding weight to the F, a note that can be heard continuing to ring as the other frequencies of this structure dissipate[10].

[10] Listen to track 6 of *Moment G# Bell 12* compact disc to hear the AST2 instrumental score, unaccompanied by the manipulated bell structure. Track 9 is the combined sound structure of AST2 with instrumental synthesis.

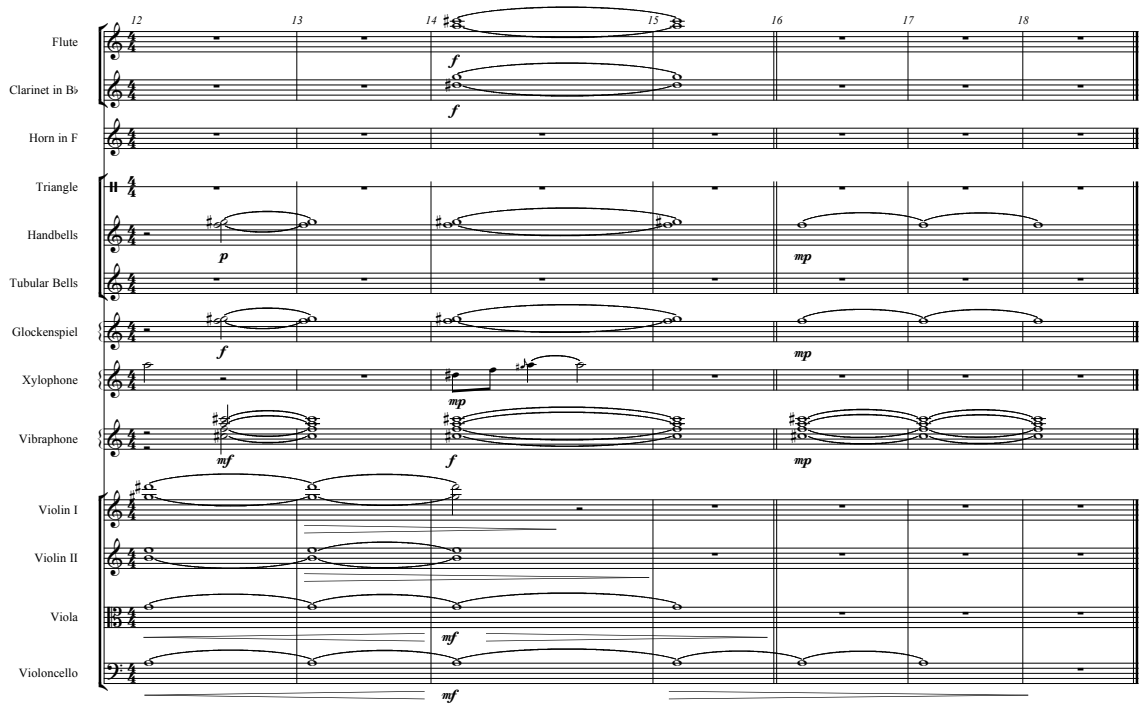

Figure 5.20. Instrumental synthesis of AST2

Figure 5.20 also reveals the strings of AST3 gradually fading away from top to bottom, with the A4 in the violoncello the last to be heard. This process was not akin to the entrance of these notes, where each begins as the frequency appears in the bell colour. I merely wanted to reflect a general visual observation that can be seen in the sonogram, where the upper frequencies dissipate first (see Figure 5.8).[11] As can be seen and heard in *Moment*, there were many different elements making up the whole, not just in the way coloured bells were combined, but also within the coloured bell itself.[12]

[11] Listen to track 11 for the final product of the coloured G# 12 bell.

[12] Due to the artistic aim of this work, there was no need to create, what I would consider to be, a comprehensive *Moment* score. While the formation of each coloured bell required traditional notation for instrumental synthesis, I have not attempted to establish a written reflection of what is happening in the AST sonic structures. If required, perhaps for a live performance, it would be critical for a conductor and/or instrumentalist to have some form of visual reference to the entrance and length of the AST sounds in the score.

5.6. Video art response

Although the use of visuals was critical to the final product of *Moment*, it would be presumptuous of me to begin an in depth analysis of this aspect to the work. Nevertheless, it is still important to give some insight into the process involved for the visual artists. Each of the three video productions involved a slightly different approach, capturing a different visual orientation to the music. Joachim Strand's work encapsulated the more traditional filmic approach, not in narrative, but in rhythm. When composing music, such things as tempo, accents and length of note are taken into consideration. Similarly, a director will consider the length of the shot, with the shorter sequences said to increase the visual tempo. As well as this, the content within each shot will begin to create its own rhythm (Bordwell and Thompson, 2003, online). An example of this is Strand's use of water drops for F# Bell 13 in the second minute of the piece. The movement of some of these droplets is connected with glockenspiel, vibraphone and piano hits in the music. In this capacity, he has taken the rhythm of the music and matched it specifically with the rhythm of the images within the water shots.

As already outlined, when responding to the music the artists were asked to consider visual experiences that reflect the passage of time. Strand had a particularly interesting interpretation, describing the musical experience as a journey:

> The song was like a story, or actually more like an auditory journey, which I wanted my visuals to reflect, thus the use of driving/walking visuals. The motion towards something I felt was what the song was all about, what this something was would of course be up to every individual listener/viewer… but this was my 'journey' (J. Strand, personal communication, April 24, 2006).

Strand's working title, *Into the Pear and Out of the Ear*, captures the beginning and end visuals of the film. The movement into a pear at the start was said to suggest travelling into a fantasy, the imagination of the mind. In describing the journey out of the ear at the end, Strand writes:

> I felt the whole thing started as your [*Moment*] music came into my ear, so the visuals would then flow out of my 'ear', directly from my brain, and onto the screen. In hindsight, it might be saying something along the lines of all

> journeys/perceptions/experiences are individual… (J. Strand, personal communication, April 24, 2006).

The nature of VJ Zoo's work brought a different visual approach to the music, something I was interested in contrasting with Strand's filmic slant. In essence, the VJ artist will improvise with video to music, something that can be done both in the studio and in a live performance situation. For *Moment* it was decided to record a live video mix in the studio, as the music is fixed in nature. Kat Black and Jasper Cook used VJ software called Resolume, as well as a number of other effects plug-ins. As already mentioned, two shows were created, one using footage from Ashley Graetz, Iris Koornstra, Mia Holton and myself, and the other using their own video images. The group piece was given the working title *Polished*, pointing towards the process of having Black and Cook interpret and compile the different visuals. VJ Zoo gave their work the slightly more ambiguous title *Purple*. In both VJ productions the length of each shot was of a long duration, creating a slow moving visual tempo that reflected their interpretation of a gradually evolving music structure. Unlike Strand, there were no obvious visual and musical rhythmic connections, such as the water drops. Nevertheless, both Strand and VJ Zoo had a slow moving visual response to what they heard. An additional similarity I noticed with both Strand and VJ Zoo was the use of a layering effect, where different images would merge into one another. At times the collage of images in these shots was so strong that it became difficult to make a differentiation between the individual layers. I found this interesting, in that the music was composed with a similar approach, using different layers to create the whole. In G# Bell 12, I had three different AST layers, and to this added a layer of GPO instruments using the instrumental synthesis technique. Like the visuals, each of these different sound structures are at times not easy to separate, as they combine to create the whole. I felt this comparable artistic technique created an effective subtle connection, not only between the two art forms, but also between the two visual approaches.

5.7. Summary

As I composed the music and thought about the structure of the space, the influence of the composers associated with spectralism became apparent. The work of Dufourt, Lindberg and Harvey provided added support to my choice of using the twelve-tone tempered scale. The conceptual approach of signalling midday and midnight in the music reflected some of Dufourt's work, in particular his *Les Hivers*. In the form of the piece, the different musical events maintained a global structure, something important to the work of Murail and Risset. When manipulating G# Bell 12 in *AudioSculpt*, and later using instrumental synthesis to colour these frequencies, it largely remained an aural exercise. Even in the scientifically dominated world of Murail, the final synthesis and mixing was at times also done by ear. Grisey's instrumental synthesis process was of critical importance, with the notated dynamic markings of the bell overtones the only aspect of the process to become less significant. In saying this, I did use these dynamics as a guide in the instrumental synthesis of AST1 and AST3. While not specific to spectralism, the *spatialisation* work of Edgard Varèse inspired my desire to create different sound masses that were projected from speakers at different areas of the room. Also not of a spectral nature, yet of particular significance, is the work of John Sloboda, an expert in the psychology of music. His cultural findings directed my decision to consciously utilise traditional harmony at eleven minutes into the piece, where I attempted to abstractly capture the warmth and comfort of the midday sun.

In terms of the film, while the artists involved all used visual rhythmic principles, it was predominantly evident in the work of Strand, who took a filmic approach. In particular, I also became aware of the visual artist's desire to use a layering of images in each shot. While not a premeditated outcome, I believe this technique created a valuable subtle connection to the work as a whole, linking not only the music to the vision, but also the work of VJ Zoo with that of Strand. To take *Moment* from an idea to a reality required creative input from a large number of artists. At times this collaborative approach meant having to place a degree of trust in the expertise and opinion of the other artists, allowing them to push the piece in new directions. While I felt this mind-set was necessary, the aim to explore the symbolism of time remained a constant incentive. As I experienced

Moment for the first time in its entirety, it was clear the outcome, though different from my initial plans, remained true to what I wanted to communicate and explore, and I believe right for the given context.

CHAPTER SIX

6. A concluding review of *Moment*

6.1. Introduction

The creation of *Moment* was a challenging exercise, with a number of factors influencing the process and outcome of the project. The inspiration of the various composers associated with spectralism is evident, not only directing my considered and deliberate decisions, but also some of those made intuitively. While the visual artists primary concern remained the film, their thoughts and opinions regarding the work as a whole would also shape the direction I needed to take with the music. In this chapter I expand on these experiences, providing further insight into this creative happening and the personal conclusions I have come to. Particular attention is given to the music, where I delineate the encouraging outcomes of the process, as well as the difficulties faced. The audience reaction to *Moment* is then considered, both for the Artopia performance, and for the DVD. In addition, the experience I had of directing an artistic team is conveyed, providing some insight into why I believe this group was able to work together, overcoming some unforseen complications. Finally, I put forward some suggestions for further research, and bring to light a number of exciting possibilities for the future of *Moment*, or other similar projects.

6.2. The *Moment* experience

6.2.1. Categorisation

Upon being introduced to spectral music I began discussing this school of thought with other musicians. It quickly became clear that in my circle of colleagues little was known about this genre, with many having no prior knowledge of the music. This lack of awareness is reflected in the already discussed comments made by Anderson, where composers and orchestras receive these techniques as passing sound colours, rather than substantial techniques. Anderson writes: “This impression [of unsubstantiated spectral techniques] is no doubt reinforced by the fact that the opportunities to hear much of this music are too scarce for proper assessment” (Anderson, 2000, p.22). Without an

opportunity to hear the music, this lack of understanding and appreciation amongst Australian musicians is likely to be perpetuated. For myself, coming from a Western background, and having focused my university studies on jazz, the world of spectral music was especially different from what I had previously heard or studied. Nevertheless, in order to grow as a musician, I feel it is important to explore genres of all kinds, using this study to inspire new works. Composer, Jonathan D. Kramer, endorses a comprehensive learning attitude:

> To be a well-rounded musician, it is important to study music of all periods, from the earliest to the present, and to learn to respect and enjoy all sorts of music… Do not wall yourself off from other kinds of music than that with which you are professionally involved. Listen to pop, jazz, folk, film music, ethnic music from many parts of the world, etc. Learn to differentiate the good from the bad in each of these genres (cited in Johnson, 2004, online).

As well as contributing to personal artistic growth, this holistic approach has also, on rare and inspired occasions, brought about a new genre in music. Jazz was born by combining elements of African music with elements of Western European music. By merging jazz, gospel and blues, musicians have given us the sound of rhythm and blues (or R&B). Composers of all genres have found ways of merging different styles over the years, and this continues in the current musical environment. In support of this I refer back to the comment of Philippe Hurel: "…if there is a musical consensus to be found today, amongst the composers of my generation, it is less based on questions regarding spectrum and series, but rather on the means of controlling heterogeneity" (cited in Pousset, 2000, p.68).

In my own journey I initially examined the impressionist composers to seek inspiration for the creation of third stream music, which combines Western art music with jazz. This in turn resulted in my research into spectral thinking and it's association with vision. In creating *Moment*, I merged the influence of various approaches to sound exploration with that of a more traditional harmonic approach, and then looked at the visual response of video artists to these sound structures. In view of this, it became clear I was no longer aiming to write what Pierre Albert Castanet or Julian Anderson would call spectral music, as it is not a pure reflection of the techniques they describe as defining this genre.

Nevertheless, the discussed comments by Murail and Grisey could be said to challenge this approach. The music for *Moment* was created with a mindset to explore sounds structure; something Murail stressed was the key to spectralism, not a set of techniques. Similarly, Grisey endorsed a spectral movement that held central to its existence the exploration of sound, not science, maths, literature, or any other distraction from this aim. While these other disciplines may assist in the compositional investigation of sound, they are never intended to become the focal point. If a category was to be given, I would feel more comfortable placing *Moment* within Damien Pousset's post-spectral school. Even though the spectral mindset and their techniques were embraced throughout the creation of the work, I adapted this approach to my personal music history and interest.

6.2.2. Process

The discovery of Grisey and Murail's comments, and in particular the work of the post-spectral composers, was freeing for me. As I began studying this genre, and the different techniques used, I tended to side with Andy Hamilton, who described the music as a complex art form. If the techniques of spectralism, rather than the mindset of the movement's composers, were to define my work, I would have felt restricted in the directions I wanted to take musically. The experience would have been of a spectral process dictating, rather than my creative energies. I believe it is valid to use spectral techniques in a changeable fashion, using the same concept to produce a different sonic result. This is supported by Joshua Fineberg, who stressed the malleability of spectral process before discussing the techniques used by composers in a number of different works. He writes:

> The [spectral composition] examples should be used to help readers make the transition from an abstract idea or technique to a concrete realization – without implying that this is the only possible use of the idea or technique. The pieces grouped under the label spectral cover an enormous range and while many composers are influenced by the same ideas, they rarely manifest that influence in the same way. The examples should help show how a range of musical forms can grow out of spectral ideas and techniques as well as helping to illustrate the special balance between calculation and intuition, theory and experimentation, that is so important to understanding spectral composition.

Throughout the process of creating *Moment*, it was my aim to achieve the balance Fineberg speaks of. When using *AudioSculpt*, I strived to calculate those frequencies that were of greatest amplitude within a given bell. At the same time, in order to isolate and bring out the identified overtones, an intuitive approach to the sound manipulation was required. While using spectral theory, more specifically the technique of instrumental additive synthesis, I experimented with its application, adapting it to my musical experience and the interests of this project. As Fineberg recognized, although Grisey used this idea in a particular manner for *Partiels*, the manifestation of the technique in *Moment* is noticeably different. Similarly, the ideas presented in this paper can be taken and moulded to produce a different result in other artistic works.

6.2.3. Language

In choosing to explore the genre of spectral music, I experienced considerable change in my encounters with sound. The overtones existing within different sound structures began to ring out as I became more sensitive to their existence. In addition, with any noise becoming a potential source of composition, I found myself in a seemingly endless source of musical possibility. On one occasion I became aware of some interesting evolving sound structures coming from a distance. My immediate conclusion was that I was hearing music emerging from a stereo. However, as I began to listen more intently to the sound, I became aware that these fascinating notes and their overtones where actually being created by a machine cutting some type of metal, coming from a factory close to where I was standing. It was not long before I began thinking of ways I could use these machines, or 'instruments', to compose a piece of music founded on the sound structures they were creating. This experience revealed to me that my musical understanding was indeed changing. The source of compositional material, in this case the sound of metal being cut, had become much greater than the traditional twelve-tone harmonic language I previously studied.

A consequence to this manner of musicianship has been the need to find new ways of describing the innovative work. Previous chapters have alluded to this need, where

composers have conceived and explained different terms to describe the music they created. Grisey's use of the frequencies formed from a trombone playing a low E_2 in *Partiels* brings to light the challenge faced. Here the inappropriateness of traditional harmonic terminology to describe a previously unexploited sound scape becomes an understandable conclusion. Research scientists Daniel Pressnitzer and Stephen McAdams write:

> The potential musical universe has thus 'exploded' in a certain sense. Sound synthesis opens truly unheard perspectives, extending the act of composition to the sound material itself. The distinctions between note, frequency, timbre, and harmony become fuzzy, or even irrelevant, and accumulated traditional experience finds itself impotent to organize the emerging sound world (Pressnitzer and McAdams, 2000, p.33).

As a consequence to this spectral approach, when explaining the sound structure investigation I made of G# bell 12, the use of traditional harmonic language was intentionally avoided. In saying this, I am aware the option to use this language was more adaptable in my approach than that of Grisey, and for that matter, many of the spectral composers. By choosing to remain within the twelve-tone tempered system, I immediately increased the chance of inadvertently creating a traditional sonic experience within the instrumental component of the G# Bell 12 colour. An example is seen in Figure 5.20, where the vibraphone, clarinets and flutes outline an F augmented chord, a sound structure I found within the frequencies of the bell. I believe there are two principle reasons for these traditional harmonic possibilities. Firstly, although the old English bells were created with a focus on the fundamental, or strike tone, the non-harmonic overtones within a bell contain a minor triad structure, as can be seen in Figure 6.1, as well as Figure 4.1, where the principle overtones of the Winchester Cathedral tenor bell are revealed. Consequently, with my focus to bring out the overtones of greatest amplitude, it makes sense that, at times, I would create harmonic structures of a traditional nature.

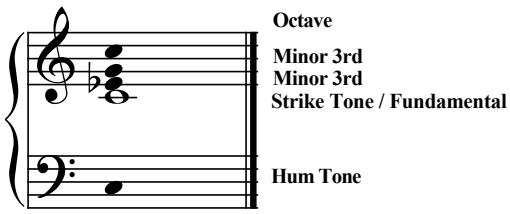

Figure 6.1. The overtone structure of a bell with C4 strike tone (Jones, 1967, online).

In addition to the structure of the bell, there is also the natural bias I have to reflect my traditional musical history, a probable reason for the aforementioned F augmented chord. Even though I was guided by *AudioSculpt's* scientific representation of those frequencies with the greatest amplitude, as already outlined, there was also the intuitive use of those frequencies. Logically, the frequencies my ears were inclined to isolate, and how I interpreted those frequencies in the score during instrumental synthesis, would reflect my twelve-tone traditional harmonic life experience. Composer and author Brian Eno underlines this when discussing artistic preference:

> Since performers are often in a position to choose between a fairly wide selection of notes, their own cultural histories and predilections will be an important factor in which 'strains' of the stock they choose to reinforce (and, by implication, which they choose to filter out) (Eno, 1976, p.281).

Certainly there were times in *Moment* when I made a conscious decision to use traditional harmony, both as part of a coloured bell structure, particularly A# Bell 4, and as an entity in itself, such as at the midday section of the piece. Nevertheless, despite these influencing factors towards traditional harmony, my mindset was not to consciously create this aural experience when exploring the overtone structure of G# bell 12, nor most of the other bell structures, despite the fact it could sometimes be interpreted this way. In addition, the manipulated bell frequencies of *AudioSculpt* cannot be ignored in the harmonic totality of the G# Bell 12 colour. As a result, I feel it would have been misleading to use this terminology in recounting my approach. While not pertinent to discussions in the previous chapter, if a harmonic analysis of *Moment's* music was to take place, it would need to take into account the projection of one coloured bell structure onto another. Again, the mindset I had was not traditional harmony, but an exploration of

these projected sound masses evolving in time. The nature of this non-tonal spectral approach makes traditional harmonic analysis methods inoperative, and therefore the language used would need to follow suit. In addressing this is issue of departing from tradition, Claude Ledoux writes: "The [spectral] compositional technique is positioned outside of conventions and force the analyst to discover new concepts in order to understand them" (Ledoux, 2000, p.65).

6.2.4. Computers

As part of my striving to become a well-rounded musician, I have also looked to increase my knowledge of computers and the role they are playing in the creation of music today. Before beginning this masters research, my ability to take advantage of this tool was restricted to *Sibelius* scoring software. This limitation was of some concern to me, as the significance of the computer in music creation is continually increasing. Like the spectral composers before me, by embracing and developing my knowledge in this digital arena, a new world of musical opportunity becomes available. The use of *AudioSculpt* software has broadened the boundaries of my artistic experience. While it has been difficult at times to leave behind the comfort of working with live musicians, as well as, to a large extent, the traditional music language, the process has been invaluable. By placing myself in a computer generated musical experience, I was forced to find a new way of expressing my artistic endeavours. In the process I found myself creating something far beyond the boundaries of anything else I had created prior to *Moment*. As spectral composer Risset has said: "The computer's synthesized sound material presents a malleability without precedent, it lends itself to new modes of arrangement, to new architectures" (cited in Moscovich, 1997, p.24). I believe this experience will happen at different levels for any artist willing to place themselves in a similar experience, as echoed by composer and professor Claude Ledoux, when discussing the work of Murail:

> Through the proliferation of objective data coming from these complex models, computers allow the composer to discover things that are 'beyond' the imaginable, in which the artist transcends his personal tastes and their risk of limiting him to a strictly subjective set of choices and, consequently, limiting the selection of possible processes. Thus the computer allows him to think about

> multiple procedures and even to verify them in real-time situations; thereby allowing him to choose the one which best fits his compositional project (Ledoux, 2000, p.46)

If a 'procedure' can be chosen, as Ledoux describes, it could therefore be held that the musician already has some concept of the artistic outcome. I believe this is particularly important for those artists who have little knowledge of the different computer programs available, and how they can be used. While still trying to come to a conclusion on the direction I wanted to take for the masters project, I began looking at, and in some cases learning, different computer programs. Frustratingly I found the process of elimination eluding me, resulting in an overwhelming number of program options. I began to realise it was not as simple to identifying the pre-eminent program currently available for spectral music, as the strength of a particular program fluctuated depending on the artistic goal. Consequently, when I finally settled on the concept for *Moment*, I quickly came to a conclusion on what programs I would use.

Knowledge of your artistic endeavour is particularly important, and perhaps a prerequisite, for programs like Max/MSP and Open Music. Here the artist has to develop his or her own program, something that could take hundreds of hours to accomplish. Having a desired outcome in mind means the artist will be able to focus their time on what they ultimately want to create, rather than trying to find the tools to enable this process to begin. In saying this, I fully anticipate a composition to evolve, and possibly take on a different form, as the artist responds to new digital discoveries, especially in the environments of Max/MSP and Open Music.

In using *AudioSculpt*, although it presented itself as the most suitable tool for my artistic endeavour, it also brought with it the frustration of language issues. While the program itself is in English, the most recent users manual is in French. In addition, while IRCAM provides personal support for its English-speaking software users, it is a French based organization.

6.3. An audience perspective

6.3.1. *Moment* at *Artopia*

In composing the music for *Moment* I was sensitive to the cultural group that would be in attendance. The literature review revealed a lack of interest in contemporary works by the general population, including spectral music:

> …in the world of music, contemporary classical composers inhabit a dissonant ghetto all their own. Few people listen to them, few critics review them and few people understand them. Western classical music as a whole makes up only 3.5 percent of the world's total music market (contemporary works aren't broken out separately). In 2002, classical-album sales were down 17 percent. Orchestras rarely feature contemporary works (Pepper, 2003, p.46).

One of my concerns in dealing with the probable audience was that I would compose a piece of music they would disconnect from. My aim was to create something they could receive and respond to, whether that is positive or negative. If the audience were to disconnect from the experience I would feel frustrated as an artist. It would feel as though I had not fulfilled my desire to communicate something that elicits a reaction, ideally a favourable one. In saying this, I realise many ground breaking artists have not been received by their generation, some causing not even a ripple, yet later they were to be revered as one of the greats in their field. Given the point of this paper is not to discuss the role of the artist, I will keep away from such a debate. I raise this issue merely to reveal my awareness of the value in composing music that may initially be unaccepted or ignored by a given culture, and to stress this decision to consider culture was primarily personal.

In working within the discussed culturally sensitive compositional paradigms, a wonderful energy in the music resulted. When the manipulated bell frequencies fluctuated to surround and combine with notes from the equal-tempered chromatic scale, there was an interesting texture of tension and release created. As mentioned in the previous chapter, when using *AudioSculpt*, I did not aim to isolate single frequencies. Consequently, a number of overtones can be heard fluctuating around the instrumentally

synthesised note. This fluctuation was further enhanced by the recorded 'change ringing' technique, where the bells spin through 360 degrees when a rope is pulled. The result is a variation in pitch as the bell head swings toward and away from the microphone, called the Doppler effect. The approach of having slightly differentiating pitches is similar to one taken by Jonathan Harvey in *Tombeau de Messiaen* (1994). On tape Harvey had 12 pianos tuned to the harmonic series of each of the twelve pitch classes, which combined with a live solo piano part that remains normally tuned. In describing the piece Harvey writes:

> …when the balance is good (so that taped and live pianos are indistinguishable) the piano has the role of providing the grit, the resistance to the spectra without seeming to be altogether outside them, partly because it often plays the same, or nearly the same, spectral pitches. The fact of partly not fitting makes the discourse interesting for me, as it changes constantly from spectral fusion to micro-tonal polyphony and back (Harvey, 2000, p.14).

Before briefly addressing some of the audience comments, it should be noted that the audience experience of the music was certainly affected by the acoustics of the performance space. The room had, in my opinion, a little too much reverberation for the composition, causing some of the fine elements of the music to be lost. It became difficult to hear with clarity some of the bell colours, as well as to ascertain from where the bell sound masses were being projected. The acoustics were something I new would have an impact on the music, but I did not anticipate just how much in this space. This issue concerning the venue is something every composer should carefully consider when choosing a space to have his or her music heard. Despite this small setback, the aural experience still contained all the principle elements I hoped it would, and discussions with the audience after each of the six shows revealed some interesting responses. There was a general consensus that it created feelings of melancholy and tension, with the music often described as eerie. While the sample is hardly enough to begin making conclusive remarks, perhaps these comments reflect the cultural experience of the audience, where non-tonal experiences may create feelings of tension, as discussed in the chapter three. It could also further reinforce the probable use of non-tonal music in film to create a feeling of uncertainty and tension, as revealed in the use of Ligeti, Evans and Hermann's music. In terms of the imagery, some members of the audience made a point

of watching the show through twice, so they could take in the entire visuals from another screen. In contrast to this, a small number commented on their need to shut their eyes, as they wanted to create their own mental pictures. How the audience dealt with multiple media options was of particular interest to me. I was aware of the need to avoid an excessive amount of stimulation, as this was likely to cause the audience to disconnect from the experience. It would have been particularly annoying to find out over stimulation had nullified all the time spent trying to create music the audience could receive. Grisey alludes to this potential outcome:

> One of the most arduous tasks for the composer will be to determine up to what point complex structuring affects perception in a non-negative way. On either side of such a point are two poles of boredom due to a lack or saturation of information… (Grisey, 1987, p.245).

It could be said that the observation made of a slow moving visual tempo helped to minimise this possibility of saturation for the audience. Interestingly, the slow moving nature of spectral music was never discussed with the visual artists, yet this was something they all responded with. Of the three screens, I observed an audience that focused on the filmic work of Strand. Again, while I cannot present any irrefutable psychological findings, perhaps this preference for Strands work reflects the cultural experience of the audience, whose visual understanding is likely to be more filmic in nature. In addition, it is plausible that the audience recognised the volume of work Strand put into the project, giving the visuals a stronger connection to the music than that of the improvised VJ performance.

Ultimately, the *Moment* show at Artopia was a synthesis of different artistic experiences, designed to give the audience a means to approaching a primarily unknown spectral sound scape. Given the characteristics of the audience and the feedback received, I believe this aim was largely accomplished. The gifted poly-artist and author Dick Higgins addressed this ability of an audience to decipher the blending of multiple artistic expressions. I was anticipating a similar experience for my audience:

> The notion of intermiedia – the conceptual fusion of two or more previously defined areas of art or concern – underlies many recent developments in art…

> …note how the intermedial interest seems often to feel, to the artist, as an imperative to try out new fusions, and to a public (or receiver of a work) as an approach offering an ingress to a previously mysterious work. The viewer asks 'what does this resemble' and works out a sort of averaging that demystifies the work (Higgins, 1990, p.134).

6.3.2. *Moment* DVD

The DVD has allowed me to present the *Moment* experience in a different context, while remaining true to the music I created. The surround sound system permits me to project the coloured bell structures from different areas of the room, an important component to the experience of the piece. While the viewer is limited to only one screen, they still have the ability to select from the three different visuals. Also, while beyond the scope of the current project, DVD technology now allows the viewer to select from different visual options to program their own show[1]. If the visual artists gave consent for the viewer to have this interaction with the art, the option is there for the viewer to program their own *Moment* experience. Although the focus of the work was not the creation of a DVD, it does point towards the comments already made, encouraging the artist to use modern technology to their advantage. In creating this adaptation, I do not feel as though the artistic work is being compromised in any way. The DVD merely allows me further opportunities to give others their own *Moment* experience, creating greater market scope. It also presents another means by which the spectral mindset can reach a wider audience, as well as further endorsing the place for cinematic music art.

6.4. Working with other artists

The *Moment* experience was made possible through the contribution of artists from various backgrounds. While I have undertaken numerous projects with other musicians, this is the first time I have worked with visual artists in this capacity. Possibly the most important collaborative consideration was my trust in the others ability to capture the music in visual form. In looking at other works they had created I could get a general

[1] The DVD also contains a section that allows the viewer to see the set up of the room when *Moment* was screened at *The Project Lounge* for *Artopia*.

sense of their particular artistic voice. Similarly, I forwarded all potential team members some music I had already created through *AudioSculpt*, giving them an impression of the music they would be working with. Along with the desire to find this practical artistic synergy and admiration, there was also the vital discussion of our general artistic philosophies and goals. When I managed to find common ground in these areas, a strong foundation was formed, upon which we could begin creating. Needless to say, some of those I spoke to held a different philosophy to me, resulting in a mutual decision not to pursue collaborative work.

Working with experts from other art idioms brings with it a new dynamic to the creative experience for the composer. When working with other musicians, I have felt more confident in directing the instrumentalist as to what I want in their performance. While there is a degree of trust required by the composer towards the performing musicians and their interpretation of the piece, a common language allows for unhindered communication to achieve the desired sonic result. The artistic context is also clear, with musicians striving to create a sonic representation of what has been penned on paper. The 'feeling' of the music is sometimes difficult to transcribe, hence the importance of this interaction between composer and instrumentalist, or conductor, as the case may be. In contrast, I often had to trust, and be directed by, the judgement of the visual artists for *Moment*, especially when their desire was to push the piece in new directions. By giving them the freedom to input their own ideas, I also believed this would create a greater sense of ownership for them with the final product. As outlined in the previous chapter, this influence was initially seen in my decision to have the artists respond to the music, as encouraged by Strand. Another significant change was the visual artists desire not to create segments of imagery that were bound by a time of one minute. Originally I wanted to link together one minute of vision with one of the coloured bells, and have these projected on different screens around the space. The speakers were to be strategically placed at each screen, so that the coloured bell sound would only come from the area of the room in which the picture was being seen. Nevertheless, as the artists began listening to the music, they felt this would be too visually abrupt and not a true reflection of what they were hearing. Strand and VJ Zoo both considered the piece to be a continuously

evolving sound structure that required smooth imagery. After some discussion I trusted their judgement and the project took a different path. In saying this, as director of the project, I maintained control of the creative course at all times, declining some ideas and accepting others. This artistic management of various concepts was a balancing act throughout the creative process. In this type of collaborative work, I feel it is important for the artistic director to supervise rather than control, as it can increase the potential for a more adventurous, yet effective, piece of art.

Encountering the *Moment* visuals for the first time led to some personal surprises in what they captured. When composing the music, there were images appearing in my mind throughout the process. Consequently, as the images from the screen complimented and contrasted my minds expectations, some unexpected viewing moments occurred. In saying this, I hold these surprising elements as equally valid, as the musical experience for each artist, and their response, is personal. Again, I expect the response of an art critic to be different to mine, where they can conclude on the quality of each visual, the standard of the music, and the merging of the two in both the *Artopia* experience and the DVD. I anticipate there would be regrettable occasions where the visual would be considered a disruption to the music, or visa versa, either by an art critic, or worse, someone in the creative group. In saying this, I believe the team formation process outlined above, together with open communication, can minimise the potential for this disharmony in the final product, at least from the perspective of the team. Ideally, and certainly the creative teams expectations should be that, any separation of the different elements made by a critic merely points toward the added artistic strength of the whole. Individually each piece could be strong, or conceivably even weak, yet together they make for an incredible audiovisual experience.

6.5. Latent possibilities

The creation of *Moment* has stimulated a number of other potential artistic endeavours that are influenced by the spectral approach. In contrast to the pre-recorded format, I am interested to explore the interaction that musicians can have with VJ artists in a live

setting. The beauty of the work already done is that I can select from the bell colours previously created, projecting these assorted sound masses from numerous speakers situated in different areas of the performance space, most likely using Max/MSP. Additional coloured bell structures would be formed to add further variety to the sound exploration. The experience would remain within the context of multiple screens, again giving the audience the opportunity to see how different VJ artists respond to the same music. If I was to depart from the bell structures, I would like to bring something into this visual arena that reflects my artistic background of music improvisation. My aim would be to adapt different spectral techniques to this jazz influenced environment, investigating what ones are most pliable and sonically interesting. Live musicians would bring a new sound dynamic for the VJ artists to respond to, and greatly compliment their work. When describing this visual approach, author Paul Spinrad writes, "VJing is a type of performance that combines the visual possibilities of filmmaking with the improvisational pleasures of jazz" (cited in Black and Cook, 2003, online). To my knowledge, the use of spectral principles within a jazz setting is yet to be researched, presenting enormous potential for the improvising musician.

Aside from working with VJ artists, I am still interested in my initial masters concept, which involves an exploration into the use of spectral principles when scoring for film. Rather than have the music pre-recorded, I want it to be performed live to a silent film. I anticipate the compositional techniques to be both traditional and spectral in nature, as I strive to stimulate different emotive responses that reflect the narrative. An element of improvisation would also be utilized, bringing a unique experience to each show. Interestingly, this desire to experiment in the combination of these different spheres further endorses Philippe Hurel's belief that most composers today are revelling in the challenge of controlling heterogeneity.

6.6. Conclusion

In creating *Moment*, I embraced the trend revealed in this research, where a handful of composers have considered the various spectral techniques available, and then adapted these to their particular musical interest. Part of this journey involved a deepening understanding of computers and the role they play in today's music. While not a paper dealing specifically with computer pedagogy, I believe my experience illuminates the possibilities of a small number of programs currently available, and how relatively quickly they can be learned. What's more, by being placed in this digital experience, the composer can be pushed in new artistic directions that they may have previously considered unattainable. Computers offer opportunities for composers to go beyond the confines of what they were once held to, presenting numerous process opportunities and a gateway to once inaccessible sonic constructs.

Further partnerships between composers and visual artists would aid the intriguing marriage of sound and vision explored, particularly in the area of the cinematic music video. This research has revealed a definite interaction between spectral music and the visual medium; however, the largely unexplored film and video genres present wonderful new creative opportunities. In working with artists from other idioms, while a new level of trust is required, it can bring a collaborative quality to the experience. There are creative ideas a visual artist may present that a composer has yet to consider, as it has never been a necessary process in the fulfilment of their artist goal. From this interaction, the composer may be inspired to think differently about how they approach their music, and in so doing, discover an untapped potential in their musical voice. Similarly, this paper could also be of interest to the video artist, giving insight into the mindset of the composers associated with the spectral school of thought. Like the artists involved with *Moment*, it may strike a chord and inspire new ideas in their own visual artistic journey.

The incorporation of visual images in the concert arena, along with new audiovisual technology, presents exciting opportunities for the artist interested in this work. As well as providing innovative exploration prospects, some audiovisual devices present wider

reach breakthroughs for a visually oriented society. Ultimately though, regardless of who experiences the work, I believe the most exciting outcome to collaborative art is when the individual elements combine to make a greater whole. There is something magical about these experiences.

In giving a historic account of spectralism and it's connection to the visual arts, as well as some insight into the *Moment* project, I hope to have challenged the musical thought process of those who are yet to venture outside a traditional harmonic experience. I encourage composers to consider how the spectral principles presented in this paper could be moulded to their own compositional experience. More specifically, for those composers who enjoy working with vision, I believe there is an untapped potential to be investigated in the combination of this sound scape with film and video, creating various forms of cinematic music art. When I think of music as being a sound scape that evolves in time, which may or may not include traditional harmonic structures, a mental boundary is removed. By embracing the spectral approach, a seemingly limitless source of compositional potential results as we explore the sonic structures in our world.

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