# From fusion to stratification: Plurality of textural ideas

How can we examine textural relationships in instrumental composition?

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## THESIS OUTLINE



**COMPOSITION PORTFOLIO, PERFORMANCES & RECORDINGS:**

The Berkeley Octet 2015
*Disunity* for String Quartet 2016
*Disunity* for String Quartet, workshop recording at City University, 2016
*Turbulence* for Trio of Flutes 2019
*Dissipation* for Quintet 2020
*Explore This!* for Sextet 2021
*Explore This*! Concert performance and recording By Explore Ensemble, City University, 9 June 2021

**ABSTRACT**

My research includes a portfolio of five compositions that explores textural ideas in a range of instrumentation from those of contrasting sound worlds to those of the same orchestral family. I have been drawn to smaller ensembles to see if ideas of fusion can be achieved through intimate instrumental forces and I have found fusion can be achieved effectively in small ensembles and contrasting instrumentation.

In my examination of 20th and 21st century composition I identify an alignment in my creative process with a selection of composers who are exploring sound and fusion in texture. I find that landscapes of slow transformations and pitch stasis effectively achieve the fusion of textures, but I do not exclude the inclusion of melodic lines. Instead I strive to build these both into my composition and find it effective for creating moments of contrast. I also find illuminating the work of Garth Knox taking strides to open up a wider palette of performance practice in instrumental music. I draw similarities with Kokoras' approach of sound scales and applied this to my own composition.

I focus in on the works of three musicologists and composers: Panayiotis Kokoras, Denis Smalley and Manuella Blackburn. In my thesis I take a chapter to explore each of these, their methodologies and how this has effected my composition. All three composers are specialists within electroacoustic music and I take these practices and applied them to instrumental composition. I find that Spectromorphology does make an effective instrumental composition tool and that this used alongside visual aids and language from Blackburn serves as an inspiring methodology. Through this research I argue that there are many approaches to electroacoustic music that can be effectively applied to instrumental music for the exploration of the plurality of textural ideas.

**SYNOPSIS**

In this thesis I seek to better understand and contribute to the evolving approaches to texture in the field of instrumental composition, using different creative approaches as tools for the compositional process. This thesis consists of five chapters, which are summarised below.

In Chapter I, I explore texture through a survey of music of the 20th and 21st century where texture takes on a new and more important role in composition. Texture, alongside sound and timbre became an all-important element rather than a secondary consideration to pitch, harmony and melody. With this elevated role, the possibilities of texture opened up and through my research I have discovered that while these different methodologies and approaches to texture are many and far ranging, they can be loosely categorised into two groupings. These two groupings represent opposite ends of the spectrum: textures of fusion and textures of stratification. It is through these groupings that I structure Chapter I, first examining seminal composer's contributions to fusion textures and secondly the stratified approach, although composers' claims about their textural goals will be balanced against the listeners' perceptual evidence from the musical results.

In Chapter II, I provide an introduction into the works and methodologies of Panayiotis Kokoras with a focus on his newly defined type of texture "Holophony" which has proved to be a point of interest within my research. I will outline how Kokoras has influenced my work, in particular the composition *Disunity* for String Quartet.

Chapter III introduces the terminology of Spectromorphology developed by Denis Smalley, an approach to describing and analysing the listening experience looking at the shapes and transformation of sound, mainly applied to electroacoustic and acousmatic music. Spectromorphology is then explored further within the context of my own piece, The Berkeley Octet. I explore how Spectromorphology can be applied as a compositional tool using Smalley's word set as a point of departure for the composition of instrumental music, something which to date has been rarely explored.

In Chapter IV, I provide focus into Manuella Blackburn's research into the visualisation of Spectromorphology, which has proved to be an illuminating part of my research. Musical influence from Blackburn's visual approach is intended not to imitate her music but to use her conceptual ideas as a basis for my own composition. I seek to demonstrate how Blackburn's research has inspired my portfolio of works taking two of her visualisations and using them as the premise for two separate pieces, within *Turbulence* for Flute Trio and *Dissipation* for Quintet. In this Chapter I also bring in Lasse Thorsen's contributions to Spectromorphology including the adaptation of Schaeffer's typomorphology to practical analysis and use this as a tool for composition.

Chapter V summarises the key findings of my research and gives insights into Explore This!

## CHAPTER I

### Examination of 20th and 21st centuries textural relationships in instrumental music

Before embarking on our voyage of texture, we must first define texture and acknowledge how it has evolved over centuries of Western music instrumental tradition. A full definition of texture here is provided below from *The New Grove Dictionary of Music and Musicians*.

> A term used when referring to the sound aspects of a musical structure. This may apply either to the vertical aspects of a work or passage, for example the way in which individual parts or voices are put together, or to attributes such as tone colour or rhythm, or to characteristics of performance such as articulation and dynamic level. In discussions of texture a distinction is generally made between homophony, in which all the parts are rhythmically dependent on one another or there is a clear cut distinction between the melodic part and the accompanying parts carrying the harmonic progression (e.g. most solo song with piano accompaniment), and polyphonic (or contrapuntal) treatment, in which several parts move independently or in imitation of one another (e.g. fugue, canon). Between these two extremes is a free-part style (Ger. *Freistimmigkeit*), characteristic of much 19th-century writing for the piano, in which the number of parts can vary within a single phrase. The spacing of chords may also be considered an aspect of texture; so may the 'thickness' of a sonority as determined by the number of parts, the amount of doubling at the unison or octave, the 'lightness' or 'heaviness' of the performing forces involved and the arrangement of instrumental lines in an orchestral work.[1]

Although textural control has been a major consideration for composers since the Middle Ages, developments in the 19th century explore texture as more of a structural force and in the 20th and 21st centuries the role of texture evolved further and became an even more important feature of composition. This tendency can be seen particularly in works of Anton Webern, in works (especially aleatory music) of Charles Ives, Henry Cowell and of Edgard Varèse and in the distinctive textures of George Crumb and György Ligeti.

> The word does not have an exact equivalent in any other language; the etymologically related Italian 'testura' and 'tessitura' refer to the register of a single part, usually vocal. Only the German Satz, which in certain contexts denotes contrapuntal organization (*Dezimensatz* counterpoint round the interval of a 10th) or part-writing style (*Kantilenensatz* – in the style of 14th- and 15th-century song

[1] *The New Grove Dictionary of Music and Musicians*, 2nd edition, (Oxford: University Press 29 volumes, 2001) p. 322 - 323.

> with a melodic upper voice and more 'accompanimental' lower voices), approaches the meaning of texture.[2]

Grove's definition shows the complex, and multi faceted nature of texture. It is the "vertical aspects of a work or passage" that will be my focus, of which spacing of chords and the thickness of sonority and timbre will all be contributing factors.

In recognising the important leap that texture took in the last century, this chapter sets to examine its role in moving to the foreground of composition. With the exploration of electroacoustic music, the possibilities of texture expanded with total serialism, micropolyphony and sound mass music. Composers began to seek more from texture and sound, examples of which are touched upon within this Chapter under the guise of two overriding principles, fusion and stratification. The principles of fusion are texture simplicity whereby streams of sounds unite to form one sonic identity; stratification principles are texture complexity where individual voices are independent. Of course composers' outputs do not sit exclusively within one of these two categories and moments of stratification can become so extremely complex that the perceptual result is one of fusion. Furthermore, the results of some composer's textural explorations seem to be at odds with the sonic or perceptual results. Examples are intended to provide context for my research and have provided a compositional toolkit for me to draw upon in my own exploration of textural relationships within instrumental composition.

Relevant to this research is the music of Giacinto Scelsi (1905 – 1988) whose original approach to timbre and texture may have emerged from his non-traditional musical training. Scelsi's unique approach to texture and timbre was influenced by Schoenberg's concept of *Klangfarbenmelodie,* in which *"*tone colour melodies"[3] are shaped by timbral transformation of a single pitch achieved by sharing the melodic line between several different instruments. Scelsi's approach however took this concept further, giving equal status to timbre and texture in relation to the other musical elements. In his writings, Scelsi referred to a "third dimension

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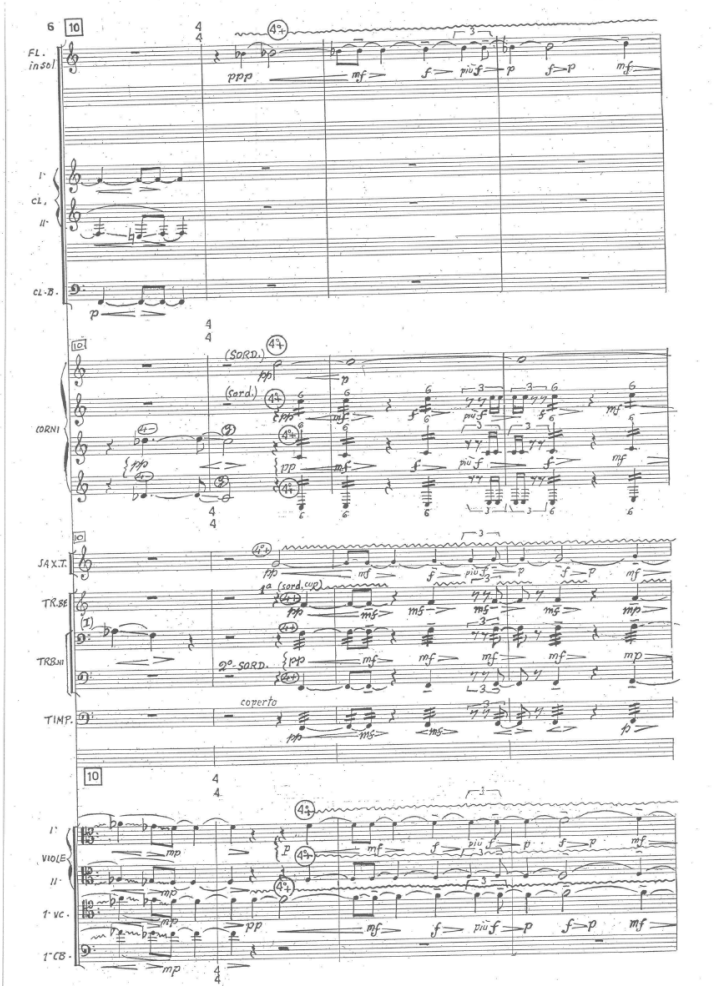
[2] *The New Grove Dictionary of Music and Musicians*, pp.322 - 323.

[3] Arnold Schoenberg, *Theory of Harmony* (Berkeley: University of California Press, 1978), p.421-422.

of sound"[4] whereby the first two dimensions are pitch and duration and the third dimension consists of all other musical parameters such as texture, timbre and extended techniques, instrumentation, dynamics and articulation. It is the third dimension that is the focus for Scelsi and his compositions.

His signature approach to instrumental composition concentrating on individual or small ranges of pitches provided a platform for imaginative sonic transformation achieved through pitch manipulation such as microtonality, pitch bends and glissandi and waves of dynamics and varying degrees of tremolo and vibrato. This is exemplified in Scelsi's 1959 piece *Quattro Pezzi su una nota sola* (Four Pieces on Only One Note), scored for 25 musicians. As the title infers, each movement is based on one single tone. The piece begins on a sustained low F played by nine instruments featuring two clarinets dovetailing in the Chalameau registers, horns, trombones and lower strings. The F is pitched at the same register or an octave above with similar timbral qualities giving the effect of one whole sound. The cello line brings some movement with an ostinato-like pattern alternating between E – F which evolves into wide vibrato on the reference note, joined by the viola and sax, transforming the colour. At the same time, the horn takes on tremolo and there Is a crescendo towards the clash of a Gb against the F, marked with the entry of the oboe. The instruments shift together in unison glissandi and dramatic waves of dynamics. In bars 11 – 15 the unity is broken for a moment and the music divides into two, with a sustained line in the flute, horn, sax and strings, against a block of fragmented tremolo in the horns, trombones and timpani. However, the sustained F prevails.

[4] Giacinto Scelsi, *Sound and Music*, ed. Luciano Martinis (Rome and Venice: Le parole gelate, 1981)




Ex.1.1 Scelsi's 1959 piece *Quattro Pezzi su una nota sola, bars 10 - 17*[5]

At times, for example, bars 28 – 33, the pitch shifts away from the reference note with conviction but the reference note soon quickly re-asserts itself again. The movement draws to a close and trails off with the viola, horn and timpani fading away to ppp.

Movement II is centred around the B tone, again in the same low register introduced this time by six instruments. It begins with a pizzicato in the double bass that helps break away from the previous sound world and immediately there is pitch ambiguity with B sharp set against B natural and a wide vibrato. Extreme surges of dynamics shape the pitch transformation towards B sharps and back to the central tone. Equally dramatic, growl-like tremolo effects in the brass push towards a C climaxing around bar 65 but shortly retiring back to a pulsating B around bar 67. A more rhythmic line is introduced through pizzicato in the strings and

[5]Giacinto Scelsi *Quattro Pezzi su una nota sola for 25 musicians (1959),* bars 10 - 17

percussion. The movement then settles to more sustained lines and a trumpet line shining an octave above.

Movement III centres around a pitch focus of Ab, again with constant pitch bends creeping to A and A sharp throughout. It is a brighter higher timbre contrasting with the rest of the piece. Repeated notes are set against sustained notes, with wide vibrato, flutter tongue and non-measured tremolo. Ab is reaffirmed by deliberate restatements which get slower and lower, still with pitch fluctuations around the Ab.

In the final movement, the concentrated tone moves to A, but sounding very different to movement III, the piece is set in the lower registers again. The pitch moves to down to G sharp and up to A sharp. The instruments buzz like bees through tremolo and wide vibrato. There is a more frantic move up an octave and this becomes polarised in blocks against the lower octave. The parts become rhythmically united moving back to the A mid register, grounded by an octave below and dovetailing parts.

Scelsi first launched his exploration into the third dimension of sound through composition for the piano. From his own accounts, following mental health problems, Scelsi would strike a piano key repeatedly, simply listening to the make up of the sound:

> Reiterating a note for a long time, it grows large, so large that you even hear harmony growing inside it... When you enter into a sound, the sound envelops you and you become part of the sound. Gradually, you are consumed by it and you need no other sound...All possible sounds are contained in it.[6]

Through *Suites n. 8 – 11 per pianoforte* composed in the 1950s, Scelsi explored the sonic possibilities of the piano. He explored the concept of music on a single note using oscillating repeated notes around a localised pitch; the pedal and clusters and sound masses based on a strong reference note. In the 1950s /60s Scelsi moved away from composing for the piano and turned his attention to other instruments that opened up a plethora of sonic possibilities. Scelsi's "*Trilogy: Triphon, Dithome, Ygghur"* for solo Cello (1957–61/65) is an example of how the composer achieves polyphony emerging out of monody through the extensive use of

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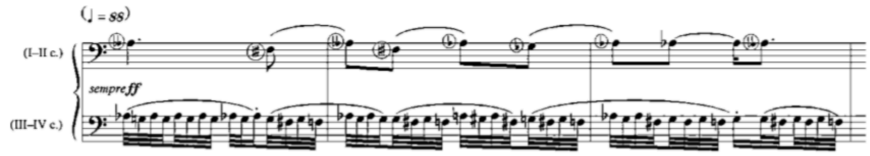
[6] Giacinto Scelsi, interview (1987) with Franck Mallet, "I*l suono lontano: Conversazione con Giacinto Scelsi,*" trans. Marco Montaguti [French to Italian] in *Giacinto Scelsi: Viaggio al centro del suono*, ed. Pierre Albert Castanet and Nicola Cisternino (La Spezia, Italy: Luna Editore, 1993), p.25.

precise microtonality movement and sustained oscillation or varying degrees of vibrato to activate static sounds.




**Example 9. Scelsi, *Triphon*, Movement I, p. 9.**



Ex.1.2 Scelsi, Triphon, Movement I, p.9[7]

As shown above in Ex.1.2, different voices and timbres are drawn out of the solo cello through double stops and quarter tone movement. Visually, Scelsi uses a stave for each string in the scoring to help signify this.

Distinctive timbral effects are achieved through the use of a steel mute creating a buzzing sound effect, pizzicato and harmonic resonance. His polyphony for example in *Triphon* for Solo Cello, draws influences from historical models, reminiscent of the different lines drawn out in Bach's solo violin partitas.

Scelsi has created a unique sound world and recognisable voice through his approach to texture. His innovative approaches to reinvent a single tone have been highly inspiring in my examination of textures. Namely, the focus on the interior of a single sound and its continuous transformation; the use of microtonality and pitch bends and the variation of timbral effects such as vibrato and tremolo. These can all be observed in my approach to composing *Disunity* for String Quartet where there are prolonged moments of pitch stasis and pitch obscurity.

Another composer who is relevant to the examination of texture is Xenakis (1922 – 2001). Unlike his contemporaries who were interested in a strict serialist compositional process that lead to complex linear polyphony, Xenakis' background in architecture and engineering may have allowed him to develop a bird's eye view of texture. Xenakis was interested in creating,

[7] Giacinto Scelsi, *Triphon*, Movement I, p.9

controlling and transforming 'clouds of sound'[8] through detailed stochastic construction. Influenced from his scientific background, Xenakis' stochastic music was inspired by the laws of probability theory where the following state of a sound is effected by its preceding state and where the law of averages drive the distribution of large-scale mass sounds. The large-scale properties of Xenakis' sound mass music are intrinsically linked to its intricate micro-makeup. 'Each sound-particle of the score is precisely defined, yet contributes to the overall sound impression in its own individual way.'[9]

Xenakis' fresh approach to composition, drawing in wider influences such as science and architecture, opened the door to wider experimentation and parameters for allowing texture to play a more predominant role in composition. Having looked at both a graphical and written score of this piece, the way Xenakis achieves sound space is fascinating with pitch seemingly unimportant. The pitch space is used as a continuous canvas to draw shapes, compress and dilate. Xenakis is highly effective in creating waves of sound, gradual and organic transformation and in creating a wholeness to a piece whereby the importance lies in the mass of sound rather than the individual strands. That said, Xenakis relies on the intricate detail of individual lines to make up the mass sound. A master of gradual transformation, Xenakis' use of block sounds, silence and moments of pure unison and clarity are highly effective devices and his use of glissandi to create timbral change covers a vast sound space.

In an article published in 1955 Xenakis rejected the idea of Linear polyphony expressing that 'its present complexity destroys itself' and 'What one hears is no more than a heap of notes in various registers.'[10] In the 1970s however, Xenakis explored a new approach to linear polyphony by designing 'arborescences' (coherent linear structures) whereby the texture would fan out from one single voice to many voices, from order to disorder, still calling on the traditional serial techniques such as transposition, inversion, retrograde, and retrograde inversion. In the compositional process, Xenakis would define the transformations looking at

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[8] *The New Grove Dictionary of Music and Musicians*, 2nd edition, (Oxford: University Press 2019)

[9] Ibid.

[10] Roger Reynolds, 'Xenakis:... Tireless Renewal at Every Instant, at Every Death…', *Perspectives of New Music*, Vol.41, No.2 (2003), p.4 - 64

the macrocomposition first and then the microcomposition, working out the stochastic relations. Characteristics of his music are mass sounds made up of smooth orchestral textures, the use of glissandi, free flowing rhythms and mass stacked chords.
Xenakis' *Pithoprakta,* written in 1955, is an apt example of sound mass or texture composition. It is scored for two trombones, 46 string instruments, xylophone, and woodblock. The piece is inspired by the movement of gas molecules through space whereby aggregates of pitches are likened to a collection of molecules in a gas. Xenakis draws from probability theory, for example the durations and the distribution of glissandi relating to the mean, referring to this as 'stochastic'; and kinetic theory of gases for transformation whereby molecules tend to a mean distribution in a space of constant temperature and pressure, likening this to the continuous gradual transformations and organic growth achieved in the piece; and by Poisson's Law, for example bars 250 – 268, the mass density distribution. Xenakis sets out his vision in the performance notes that the aim is "to lose the individual players' contributions in one single mass of sound, to fuse the individual sounds into a coherent whole. The individual sounds loses its importance to the benefit of the whole, perceived a block in its totality".[11] Sounds go through continuous change and gradual transformation, creating big, thick textures with timbral similarity and a buzzing rhythmic complexity. This approach played a big influence on my approach to my own portfolio of works, considering the macro impact as well as micro of my composition. Xenakis likens the mass movement to blood cells grouping together to form a blood clot. This reference has parallels to how I took visual stimulations from Manuella Blackburn's Spectromorphology and used as a textural structural framework for my pieces *Dissipation* and *Turbulence,* to be explored in Chapter III. In *Pithoprakta* the piece begins with a united timbre of mass of tapping on the body of string instruments. All the string parts are split up into individual players playing something slightly different, making the mass sound organically grow and die away with parts entering and stopping at different points. In bar 15 they then unite in mass quintuplet quavers set against triplet crotchets. Rhythmically, groups of five, four and three are set against each other creating a sense of continuous time only interrupted by rare

[11] Iannis Xenakis, *Pithoprakta*, 1967, *Performance notes,* 1955 (New York, London: Boosey & Hawkes)

moments of rhythmic clarity or blocks of silence. The introduction of arco and pizzicato grows in bursts against this pattering backdrop of tapping. Gradually the arco takes over with the tapping dying away and the arco culminating to a sudden silence; a block of pizzicato is then introduced bookended with dramatic silences before sustained lines and a xylophone marking the meter come in. All the strings are subdivided all holding a different pitch creating a mass cluster before the gradual introduction of high pizzicato like a smattering of sound. Gradually more pizzicato joins, building to another dramatic pause. Fragmented string glissandi lines then prevail across a wide sound space; another dramatic pause occurs before a mass smattering of col legno, glissandi and bursts of glissandi arco interjections. Col legno then takes over, gradually morphing into unison drawing to a very close sound space. This then transforms into pizzicato and becomes fused together; a dramatic pause occurs before more bursts of pizzicato, col legno, more pizzicato and then very soft glissandi spikes getting wider in sound space and bigger gestures. The piece comes to a close with harmonic tremolo becoming more sustained, still interspersed with moments of silence.
The piece gives prominence to textures and the clusters of sound although pitch and rhythm have an important part to play in the creation of polyphony. In bars 60 – 104 the strings are subdivided all holding a different pitch creating a mass cluster with the xylophone line marking the meter. These metric attacks break up the sustained strings, which then appear to move in opposition to the xylophone. As explained by Matossian, textural polyphony is the "result of highly specific instrumentation, control of frequency, durations and dynamics as well as precise deployment of numbers and proportions."[12] Thinking about how Xenakis controls these parameters, using blocks of sound with gradual transformations and sudden changes, the way he groups these different sound worlds through waves of sonic unison to moments of vast fragmentation has influenced how I have approached my research and how I planned out my compositions, particularly my piece *Explore This!.*

A contemporary of Xenakis, Ligeti is another composer whose work is highly relevant to my study into texture in instrumental composition.

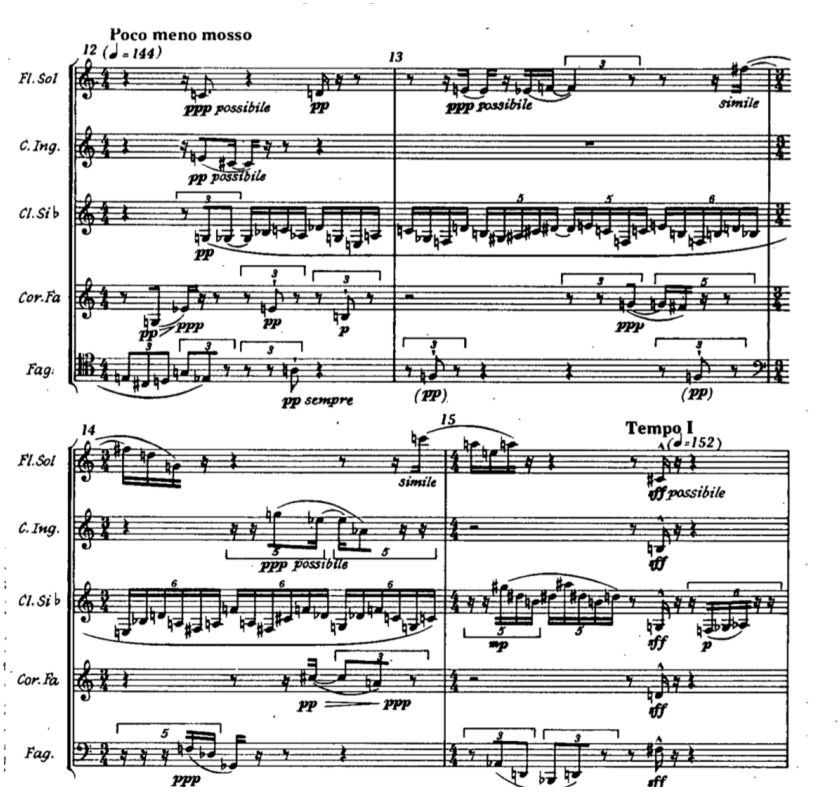
[12] Matossian, N. *Xenakis* Kahn & Averil, (1986) p.152

Ligeti's wild imagination created huge, vivid musical landscapes that not only captured the attention of his audiences but also of film producers too. Like Scelsi and Xenakis, Ligeti's approach was to make texture as much of a driving force in music as pitch and rhythm but he carved his own unique path to texture. His approach to texture was made famous in the 1960s, known as "micro-polyphony", a dense pile up of complex musical lines, so that the individual parts become lost in a complex web of sound. The music complexity disguised all sense of a pulse in Ligeti's music and resulted in a zooming out effect so that the listener perceives totalism rather than the individual parts. Influences such as Heinz Otto Reitgen's 1980s Chaos Theory can be seen in Ligeti's micro-polyphony. Chaos Theory, the mathematical concept of non linear dynamical systems, can be applied to music composition in a number of different ways, from rhythm, pitch and texture; figuratively being alluded to and on a formal level where music transforms for example from order to disorder. In Ligeti's solo piano sonata *Désordre* chaos theory translates on a formal level into music complexity whereby the pianist's left hand is set off against the pianist's right hand. The left hand - playing all black notes, and the right hand - playing all white notes, move at different rates in repetitive patterns and at different melodic lengths. At intervals both hands meet and align, but it is only for a moment before they go their separate paths again. The concept is one of a stratified texture with the auditory effect of fusion.

Around 1965 Ligeti continued to develop his micropolyphony style, drawing out the individual parts more and giving them more distinguishable features. Ligeti commented that "the polyphonic pattern is still complex, but the polyphony itself is less "micro" in that the possibility now exists of designing autonomous, divergent, mutually contrasted melodic processes, which lead an independent existence within the overriding contrapuntal network".[13] This new approach to texture can be seen in Ligeti's *Ten Pieces* for Wind Quintet *(1968).* The composition consists of ten movements. Each movement alternates between an ensemble movement and a soloistic one, giving each of the quintet a chance to take the lead. The analysis completed by Charles Douglas Morrison from the University of Mantioba, 1981, notes how Ligeti uses texture as a key characteristic to differentiate the ensemble from

[13] György Ligeti, 'Liner notes for *Melodien',* (1971)

soloistic movements. In the ensemble movements there are two types of textures present. It is either consistent in its given texture (for example remains polyphonic throughout) or features different types of textures consecutively. In the solo movements, there is either some sort of homophonic, accompaniment texture involving all instruments with a distinctive solo voice or a confused texture whereby you can hear the distinctive solo voice, but the accompanying instruments fail to establish a consistent texture; but they interact with the soloist creating an overall texture and numerous secondary components. This can be seen in Ex.1.3, in bars 12 – 15 of piece number 2, whereby the solo clarinet provides a continuous line with a fragmented polyphonic texture created by the flute, cor anglais, horn and bassoon in the way that they interact with the clarinet line.[14]




Ex.1.3 Ligeti's *Ten Pieces for Wind Quintet, bars 12 - 14*[15]

*Atmosphères* is an example of Ligeti's large-scale works where fusion can be seen in big instrumental forces rife with static blocks of sound and gradual sonic transformations.

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[14] Charles Dougles Morrison, 1983. *Aspects of musical language in Gyorgy Ligeti's Ten pieces for wind quintet,* (Vancouver: University of British Columbia Library, 1968) p.36 - 50.

[15] György Ligeti, *Ten Pieces* for Wind Quintet *(1968)*

*Atmosphères* is characterised by slow-moving progressions of sound; for example the piece opens with a dense cluster of 55 pitches over four octaves held for ten seconds. Another character of the piece is a contrasting textural landscape and juxtaposition and the transformation from density to diffusion or sparseness. Ligeti uses a number of techniques to transform his textures within *Atmosphères*, many of which have been informed by electronic music influences. Fluid transformation of textures from dense to sparse textures, using the entire orchestration to build textures through glissandi and the filtering of textures, where instruments tail off one by one are techniques that Ligeti uses to transform textures effectively, creating epic musical landscapes whereby the listener zooms out and hears the orchestra or smaller ensemble as one, homogenous sound.

In the 1960s, whilst Ligeti's micropolyphony was taking off, another composer was coming of age making his own impact on texture and timbre in instrumental music. This was Lachenmann (1935 -) who developed his own musical style influenced by electronic music coined *musique concrète instrumentale*. The instruments were treated as concrete physical entities, exploring their own acoustic possibilities. Lachenmann's *Guero* for solo piano, the pianist is instructed to explore the full body of the instrument including the vertical and horizontal surfaces of the piano keys and inside the piano on the strings and pegs. Relevant to his approach to timbre and texture is Lachenmann's theoretical study on *Sound-Types*. Lachenmann celebrated how sound had been liberated and *Sound Types* embraces this and calls for composers to examine the detail of the make up of sound. He categorises sound in two different ways with the aim of providing composers with a toolkit for the makings of new works. The first sound type is characterised as a sonorous process. This looks at the internal construction of the sound, how it builds or fades, its duration and unfolding of its innate time. Examples of a sonorous process are cadential sounds, impulse sounds, decay and attack sounds. Cadential sounds build or decay with a sloping internal movement. Impulse sound, Lachenmann cites as a sub category of cadential sounds, and is characterised by a decay process alongside another sub-category attack sound, which literally means transient- effect sound. The second sound type is by contrast stationary in

nature. The listener's ear perceives the "stable vertical sum"[16] and therefore the length of the actual sound becomes unimportant. The "characteristics of the sound are appreciable before the end of the sound".[17] Examples include Timbre Sound, Fluctuation Sound and Texture Sounds. Timbre Sound, as an object, has a short and static duration for example clusters. Lachenmann cites Ligeti's *Atmosphères* as an example of timbre sound:

> an initially stationary timbre-sound is increasingly modulated internally by a far- stretched development: one could say about *Atmosphères* that it is one single sound which is slowly transforming (although it is initially merely shifted in its contour).[18]

It is through Sound Types that Lachenmann delves into the DNA of each sound, its internal status and intrinsically this links to the texture of the music. Lachenmann's description of Ligeti's *Atmosphères* illustrates the slow transformation of timbre sound to achieve a fused, web of texture and a static sound world.

Fluctuation Sound is the repetitive patterns within a sound creating a static external shape, despite movement within the note. Similarly, Texture Sound has a static external shape but unlike the internal repetitive fluctuations within Fluctuation Sound, it has a more complicated internal structure of continuous change.

Outside of sonorous process and stable sounds, Lachenmann identifies Structure Sound whereby the micro status of the sound is continually changing. Sound and form merge and it carries an innate time. This is cited as an example of "sound in a palpably temporal space".[19] Layers of individual sounds unfolding make up the macro of the sound and they interact to transform into something new and a form of polyphony. The opening of Stockhausen's *Gruppen* for three orchestras (1955–57) and Boulez's *Structure Ia* for two pianos are two examples of Structure Sound. Lachenmann explains that In Stockhausen's *Gruppen:*

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[16] Helmut Lachenmann, *Sound-Types of New Music*, (1966 /91), trans Hans Thomalla, p.9

[17] Tsao, Ming, 'Helmet Lachenmann's Sound Types', *Perspectives of New Music,* Vol. 52, No.1 (2014) p.217 - 238

[18] Helmut Lachenmann, *Sound-Types of New Music*, (1966 /91), trans Hans Thomalla, p.10

[19] Helmut Lachenmann, *Sound-Types of New Music*, (1966 /91), trans Hans Thomalla, p.20

> measures 2 - 6 – does not simply communicate a statistical experience of time, which could be perceived before the entire process has ended; quite the opposite: each of the numerous details contributes an indispensable addition to the communication of a sonorous structural character, which needs for its communication precisely this process.[20]

Lachenmann's *Gran Torso* for String Quartet is a piece that really brings to life his concept of Sound Types. Sounds evolve, attack, dissolve and die away; ideas are passed from one to another and transform into something new. Each note is highly deliberate, requiring focus and attention to detail. But even within Lachenmann's very distinguished Sound Types classifications you can see how one sound type can turn into another depending on its context.

Lachenmann's approach to timbre and texture and in particular his theory on Sound Types, provokes thought on the intricate details of a sound; the start, the middle and the end of each single note, and how that, combined with gesture could make a great impact on the textural relationship in instrumental music.

Similar to Xenakis' approach to texture composition, Finnish composer Sarriaho (born 1952) composed with textures of mass sound and the gradual transformation of musical ideas. Explored in earlier works by Scelsi, Sarriaho makes use of harmonics and microtonality, moving from pure tone to unpitched noise and texture, characteristic of her music, ranges from dense orchestral masses to light, airy textures, often fusing electronics with acoustic instruments creating a halo-like effect and continuous sound.

Sarriaho's *Laterna Magica / Magic Lantern* (2008) scored for orchestra, is inspired by Film Director Ingmar Bergman's autobiography and his discussion around light. The title refers to the first machine to create an illusion of moving image by turning a handle – the individual images disappear to become one continuous picture. This analogy for me draws similarities to the idea of individual lines which then, when you zoom out, become one holistic whole. Here Sarriaho presents musical material at different tempi to represent the different images. Her rhythms represent different characters and then fade or lose their identity to become part

[20] Helmut Lachenmann, *Sound-Types of New Music*, (1966 /91), trans Hans Thomalla, p.20

of the texture. There are moments of strongly fused textures, whether it be sparkling shiny sustained strings or clusters of brass or six unified horns.

Éliane Radigue is another composer who brings an original approach to composition, interested in the subtle transformation of sound. Initially known as an electroacoustic composer using feedback and synthesizers, more recently she is known for writing music for acoustic instruments. Radigue's creative approach is through a living score whereby she develops her ideas and composes live through her interactions and collaborations with her performers. Instead of writing for an instrument, she writes for a performer, therefore the piece becomes a personal response. Her music therefore has the potential to evolve and grow each time it is performed; however the music is rarely recorded and never written down. Luke Nickel describes her pioneering approach to composition:

> Through interviews with the performers and Radigue, a composite understanding of their collaboration is reached, focusing on the emergent ideas of virtuosity, memory, images, scores, hospitality and non-hierarchy.[21]

For her composition *Occam Ocean*, a series of 22 solo pieces, 19 of which are for acoustic instruments, she would meet a performer in her Paris apartment for one to three days to start the process; this collaboration could continue for months or sometimes years. Her creative process is free but involves fundamental steps including informing the performer about the key tenants of the *Occam Ocean* series, selecting a water-inspired image together that will guide the work; this could be either photographic or a verbal description which determine the structure and the character of the piece. Through a process of improvisation, sonic ideas are formed to establish the sound world of the piece. It is at this stage that Radigue steps out, entrusting the performer to hone and craft their piece. The end piece is then performed to an intimate ensemble before its premiere. There is this idea of ownership - that the music belongs to the performer - which brings a unique level of intimacy to the compositional process; exploring the capabilities and limitations of their instruments and techniques. The performance space is also a large part of the process and important to the listening and resonating of her music. There is a physicality to her music which requires audiences to do more than just "listen". Being scoreless, her music not only requires intense concentration,

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[21] Luke Nickel, *'Occam notions: collaboration and the performer's perspective in Éliane Radigue's Occam Ocean*', *TEMPO (*Cambridge University Press, 2015) p.22.

memorisation and high levels of craftsmanship from the performer collaborators, but also the focussed and attentive listening from her audiences. The absence of a score removes a barrier between the performer and an audience; the performer displays a vulnerability, bearing all, bringing a physical and aural intensity to the experience. It also adds an element of surprise, unpredictability for the listener. There is a virtuosity that is associated with Radigue and her collaborators often remark on both the physicality of the performance and psychology of the music:

> She asks performers to forget traditional instrumental techniques as well as notions of complexity and control over musical material. In their place, she fosters a meditative approach to the continuation of singular ideas and explores new techniques based on controlling the natural properties of the instruments, such as resonance and vibration.[22]

The approach is both of freedom within parameters and empowerment to the performer on an unprecedented scale. There is a departure, on many levels, away from the fundamental aspects of Western Classical music; from the compositional process, to the techniques involved in tuning and the consideration of acoustics and the weather. Wind players are instructed to breathe in an organic way, going against traditional training and tuition. With such a focus on sound and subtle transformations, an attention to breath, pulsations and beating, pitch stasis is a predominant characteristic of her music and she proudly proclaims this break away from Western Classical music tradition:

> No acceptable intervals to tolerate or obey. No harmonic progression. No recursion or inverted series, no respect for rules of atonality tending toward "discordant." Forget everything to learn again.[23]

With a sense of ‘heart to heart’[24] the compositional process of Occam was more often than not carried out in her Paris Apartment and many of her collaborators have spoken of the importance and impact of this space on the music, which includes being hosted in the intimacy of her home and the rituals that this affords. Radigue’s music often uses “texture

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[22] Nickel, pp.26.

[23] Eliane Radigue, ‘The Mysterious Power of the Infinitesimal’, *Leonardo Music Journal*, (2009) Vol. 19, p. 48-49.

[24] Nickel, pp.33.

sounds" and micro details to deliver subtle transformations and there are some similarities in the way we both use slowly evolving processes in our music.

Another composer whose work was influenced by space(s) was Maryanne Amacher known for creating epic sound-design installations within specific locations; each area or room with specially selected psychoacoustic effects. Her music is a total and immersive experience. In similarity to Radigue, Amacher's music has a physicality to it: frequencies designed to target and vibrate the inner ear of the audience; composing for the entire body, not just the ear; and embodied listening where the focus is not just on the sounds, but how and where these sounds are being heard. In *Stain: The Music Rooms/In "Imaginary Landscapes*" Amacher's spatial approach to an ever-evolving texture is presented in an installation piece whereby the audience walk through the room, their steps creating an amplified aural experience, based on their own and shared movements through speakers placed precisely around the space.

Sofia Gubaidunlina is another highly relevant composer in my exploration of approaches to texture. Her music speaks to distinctive combinations of instruments, unconventional sounds and extreme contours. In her piece *De Profundis* for bayan, the instrument is heard in a completely new way with surges of frantic clusters. The waves of cluster chords vary in speed and dynamic, creating a sense of tension, urgency and anxiety. Out of this darkness emerges a very different sound world - moments of angular melodic flourishes with chordal accompaniment. There are also sweeping flourishes high up in the top registers and then descending to the lowest registers. Moments of drawn out single note glissandi make an incredible whine; Gubaidulina challenges us to look at the accordion and re-think this instrument and its capabilities. This shared interest in texture and sound with pitch and melody is an approach that has influenced my own composition portfolio.
Another solo instrumental piece of interest is Gubaidulina's Ten Preludes for Cello. According to Philip A Ewell in "The Parameter Complex in the Music of Sofia Gubaidulina"[25], the piece presents the idea of dichotomy with this showing up in many of the ten prelude titles, for example Prelude 1: Staccato - Legato; Prelude 3: Con sordino - senza sordino.

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[25] Philip A Ewell, *'The Parameter Complex in the Music of Sofia Gubaidulina', MTO A journal of the Society for Music Theory, Volume 20, Number 3, (2013), p.1*

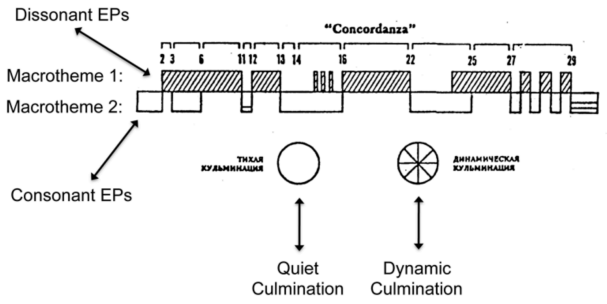
Her music consists of five Expression Parameters: articulation and methods of sound production, melody, rhythm, texture, and compositional writing (precisely notated or aleatoric). These five Expression Parameters show up in either Consonant or Dissonant forms. These are outlined below in Ex1.4.

| Consonant EPs | Dissonant EPs |
|---|---|
| 1. **Articulations and Means of Sound Production:**<br>• Legato<br>• Arco strings<br>• Cantabile voice | 1. **Articulations and Means of Sound Production:**<br>• Staccato, Accents, Tremolo, Trills<br>• Pizzicato strings<br>• Sotto voce, Sprechstimme, Sprechgesang |
| 2. **Melody:**<br>•Smooth movement<br>•Smaller intervals | 2. **Melody:**<br>•Leaps<br>•Wider intervals |
| 3. **Rhythm:**<br>•Monorhythmic | 3. **Rhythm:**<br>•Polyrhythmic |
| 4. **Texture:**<br>•Continuous | 4. **Texture:**<br>•Discontinuous |
| 5. **Compositional Writing:**<br>•Precise | 5. **Compositional Writing:**<br>•Aleatoric |

Ex1.4 Kholopova's Parameter Complex for Gubaidulina's *Concordanza*

Valentina Kholopova has identified a system of expression parameters that guides many of Gubaidulina's compositions. The expression parameters are:

> articulation and methods of sound production, melody, rhythm, texture, and compositional writing. Moreover, each EP has either a consonant or a dissonant function; rarely does Gubaidulina mix the two functions. These ten parameters—five EPs functioning as either dissonant or consonant expressions—form what Kholopova calls the Parameter Complex in Gubaidulina's music.[26]




Ex1.5 Kholopova's EP Analysis of Gubaidulina's *Concordanza* (entire piece, rehearsal numbers on top, with English annotations) (1999, 155)[27]

[26] Ewell, pp.1.

[27] Ewell, pp.2.

Kholopova claims that through EP Gubaidulina has established a new way of composing and approach to timbre and texture; she explains how she is able to navigate through extreme contours through modulations of consonant expression parameters and dissonant expression parameters.

Whilst this thesis seeks to explore texture in 20th and 21st century instrumental music with a focus on the compositional process, it is highly relevant to take note of Garth Knox's identification of the inadequacy in training of new techniques for musicians in Conservatoires. Having trained as a violinist, I can concur that the teaching of new techniques involved in contemporary composition was seldom introduced. As a performer you would often have to learn these techniques in orchestral and ensemble settings. Knox claims this is due to the focus on the techniques and repertoire from the Common Practice Period c. 1650 - 1900 and references that, in 2018, out of 32 exam pieces for Grade eight piano, only five of these were written after 1950. Knox identifies a gap in the exposure of many extended contemporary techniques found in compositions today and this consequently leads to poor performance practice:

> Consequently, players leaving the Conservatoire who come across pieces containing these techniques often have to find their own ways of tackling them, and the knowledge thus gained is not always transmitted to others. Worse still, due to a lack of experience with these techniques, many players lack the aesthetic judgment necessary for manipulating the sounds produced by these techniques, resulting in musically unsatisfactory performances of new pieces, which are then usually blamed on the deficiencies of the composer.[28]

Knox set out therefore to deliberately write concert pieces that were inspired by new performance techniques; this allowed performers to explore their instruments capabilities through this repertoire and also was a way for Knox to deepen his own knowledge of these sounds and techniques. In Chapter II, I will look at how Panayiotis Kokoras also develops

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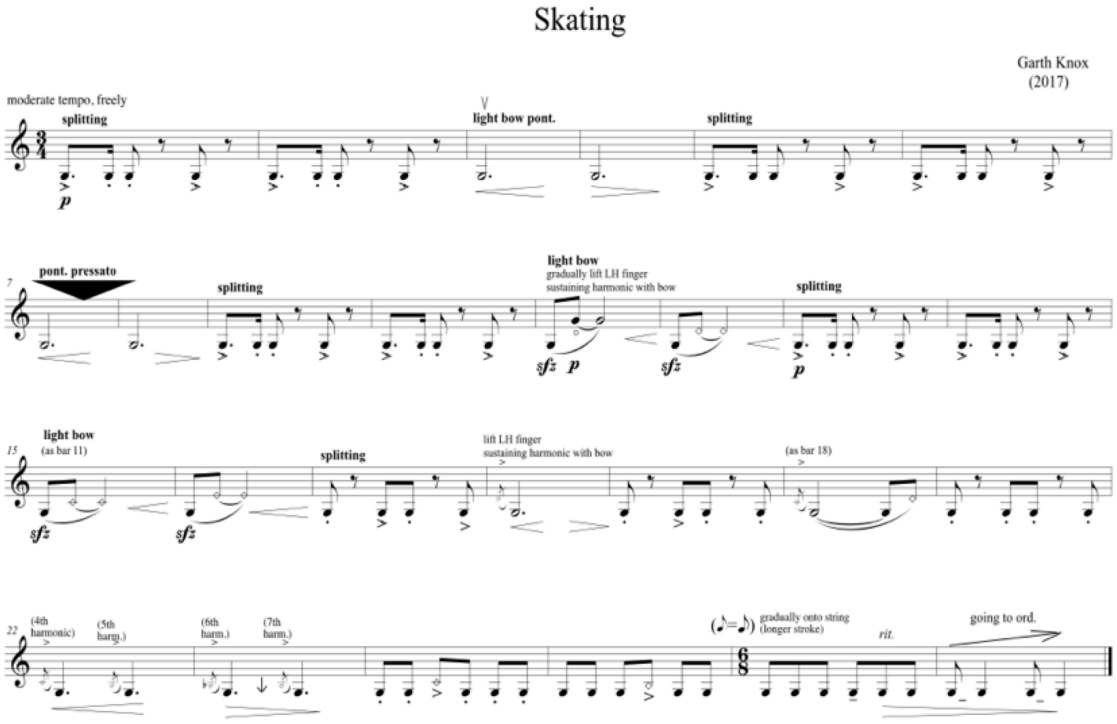
[28] Garth Knox, 'Stretching the String: Embedding Pedagogical Strategies in Extended Techniques Compositions for Strings', *A thesis submitted to Middlesex University in partial fulfilment of the requirements for the degree of Doctor of Arts, (*Middlesex University, 2018) p.8.

work in this area composing a Sound Scale model to lay out the timbral capabilities of acoustic instruments.

In his work Knox promotes the idea of ownership and the artistic responsibility of the performer who contributes towards the creative process rather than merely executing the composer's intentions. This step away from conventional notation to permit a level of freedom of approach to the music draws similarities to the works of Radigue.

Knox's methodology was to take a technique from the Common Practice Performance but which shows potential for more sonic capabilities and exploration, offering up pizzicato as an example of this. This technique is then subject to intense listening in its purest form, which forms the research stage giving the opportunity to imagine the potential and possibilities. Using a spectrograph the sounds are then visualised and explored further, followed by improvisation sessions with this sound material and then strategic notation, identifying how best to capture this technique and corresponding sound. This was then workshopped with a number of music conservatoires' student performers including the Royal Northern College of Music, Manchester, the Royal Academy of Music, London, MDX in Hendon, and the Royal Conservatory in The Hague, Holland.

Through this process Knox delves into harmonics and their notation, developing for example a vertical trill or trembling harmonics, a technique that I use in extensively in *Disunity* for String Quartet. Another example of Knox's deeper exploration into sound is sul ponticello (sul pont.) and from this he suggests it is helpful that the degrees of sul pont. (for example poco ponticello and molto ponticello) is specified to the performer and to acknowledge the subtleties of bow pressure, speed and angle of the bow, the pressure of the left hand and how this impacts on intended sound. Knox's exploration into sul pont. and overtones can be seen in his piece *Skating* for violin:




Ex.1.6 Garth Knox, *Skating* for violin[29]

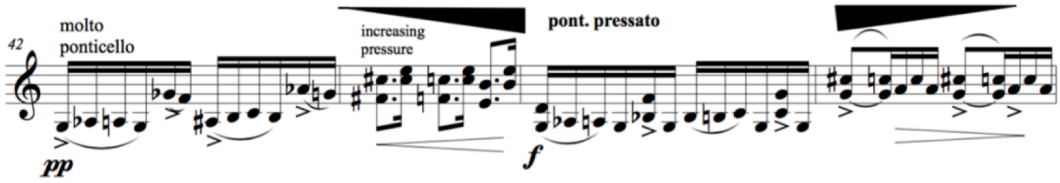
Here Knox presents several different techniques for ponticello:

> ‘splitting’ the fundamental and revealing one or more of its partials, from a sideways ‘slice’ with the bow (bars 1, 2), a fast light bow near the bridge (bars 3, 4), touching a node with the left hand then slowly taking it away using the bow alone to sustain the harmonic produced (bars 11, 12).[30]

There is a virtuosity again associated with such technique, a concentration on tone and overtones. In bars 42 - 45 Knox demonstrates further how increasing the bow pressure can have a dramatic effect on the sound, using the triangle notation inspired by Sarriaho and Grisey and calls the attention to the number of potential sounds available from one single note.

[29] Garth Knox, *Skating*, for violin (2017)

[30] Garth Knox, ‘Stretching the String: Embedding Pedagogical Strategies in Extended Techniques Compositions for Strings’, *A thesis submitted to Middlesex University in partial fulfilment of the requirements for the degree of Doctor of Arts, (*Middlesex University, 2018) p.32.




Ex.1.7 Garth Knox, *Skating* for violin, bars 42 - 45

Garth Knox continues to play a significant role in the contribution to the understanding of sounds and techniques in particular his exploration into stringed instruments and the importance of timbre in music.

In many of the composers identified thus far, the approach to texture has been to explore ways of achieving the outcome of one fused sound, where instruments lose individual identity and seek to achieve one whole sound. Common threads to achieve this include the raised importance placed on sound and timbre, performance space, detailed score writing, pitch similarity and the use of microtonality, mass sound and rhythmic complexity.

**Stratified Texture**

In a parallel exploration to the freeing up of sound and fusion of textures, composers were playing at the other end of the spectrum, exploiting the limits of stratification, giving total independence and importance to individual parts.

Elliott Carter's music is one of discourse and opposition often with conflicting simultaneous streams set against one another. Throughout Carter's career he develops his musical language and explores different ways to achieve the stratification of textural relationships. In the 1940s Carter's earlier style of writing was very much the "literal projection of contrasting strata" as demonstrated in *The Holiday Overture* (1944) where he layered different musical events on top of each other. [31] From the 1960s onwards, Carter explored a different style of strata in his music. "Simultaneous strands of the texture are distinguished by instrumentation, rhythmic profile, pitch interval, and set class content".[32]

[31] Elliott Carter, *Studies*, ed by Marguerite Boland and John Link, (Cambridge University Press, 2012) p.15.

[32] Carter, pp.15.

David Schiff claims that "from the Cello sonata onward, Carter's music sprang from a single idea: disconnection". [33] Examples of this can be seen in Carter's Double Concerto (1961) For Harpsichord and Piano with Two Chamber Orchestras. Within the performance notes, Orchestra No.1 and the harpsichord are instructed to sit on one side of the conductor with the piano and Orchestra No.2 positioned on the opposite side. A wide space is encouraged between the two different groupings.

> In addition to being isolated in space and timbre, the antiphonal groups are partially separated musically by the fact that each emphasizes its own repertory of melodic and harmonic intervals.[34]

Through an array of different speeds in the introduction, the two groups become progressively stratified. Carter uses metric modulation in his music to create systems of simultaneity whereby he develops parts with different speeds for example a fluctuating tempo in the Harpsichord cadenza in bars 109-114 of his Double Concerto for Harpsichord and Piano with Two Chamber Orchestras.

In String Quartet No.2 the performance notes state that "the separation of the instrumental characters is kept quite distinct throughout the first half of the work but becomes increasingly homogenized up to the conclusion, at which point the separation reemerges". Another piece where Carter stratifies the orchestration is in String Quartet No.3 (1971). The quartet is divided into two duos with contrasting part writing:

> Carter not only breaks with the idea of the equality and independence of the four participants…(and) uses this new dramatic concept to confront the virtual space of the self-contained movement that he had developed in the Second Quartet…Now the two duos interact as fixed groups. This should also be reflected in the seating arrangement.[35]

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[33] David Schiff, *The Music of Elliot Carter*, (Cornell University Press; 2nd edition 1998), p.34.

[34] Elliot Carter, *Double Concerto,* Program notes (1961)

[35] Elliott Carter, *Studies*, ed by Marguerite Boland and John Link (Cambridge University Press, 2012) p.175.

Each of the two groups within the ensemble has their own identity resulting from unique intervals and tempi. Carter refers to this as a matter of “agreement and disagreement in a simultaneous way”.[36]

Stratification of textures can also be identified in the complex works of Conlon Nancarrow. His compositions for the player piano are intended to be impossible to play, moving at speeds and using finger patterns far too complex for human capability. The left and right hand move independently using polyrhythms, polymeters and polytempos. At rare moments, parts momentarily meet, only to quickly disperse again. Nancarrow’s music was written in the form of the canon and he reinvents the traditional canon by direct pitch imitation rather than inversions or retrogrades, achieving a deeper level of stratification and a wide variety of textures. Nancarrow wrote “tempo proportion” canons whereby different parts move at different proportionally related speeds. This approach then developed to “sound-mass” canons whereby Nancarrow achieved even more complex textures. In the tempo proportion canons Nancarrow adopts four main principal temporal approaches to achieve the different tempi, described by Margaret E. Thomas in “Nancarrow's Canons: Projections of Temporal and Formal Structures” as converging, diverging, converging-diverging and diverging-converging[37]. This is demonstrated below in Ex.1.8. The horizontal lines represent the different voices and the vertical and angled lines show how they correspond to each other in the equivalent points. In the converging canon the point of synchronicity or fusion is at the end, compared to the diverging canon where the parts start in unison but split apart more and more through the different prescribed speeds. Within the converging-diverging example you can see the parts come together briefly in the middle before splitting off again at different speeds.

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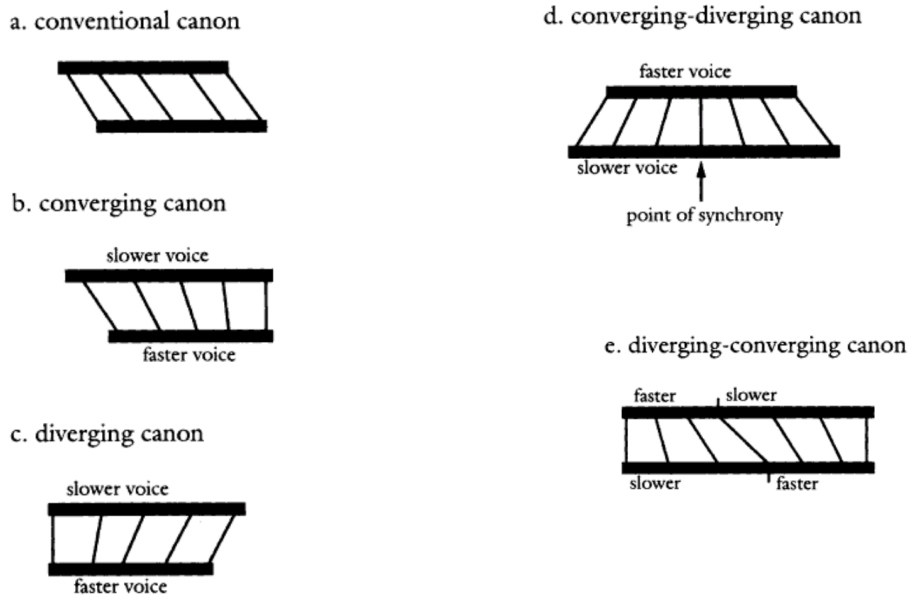
[36] Elliott Carter, *Studies*, ed by Marguerite Boland and John Link (Cambridge University Press, 2012) p.176.

**[37]** Margaret E. Thomas, 2000, *Nancarrow's Canons: Projections of Temporal and Formal Structures, Perspectives of New Music*, Vol. 38, No. 2, p.106-133.




Ex.1.8 Nancarrow's *Canons* [38]

In some canonic pieces of Nancarrow the canonic lines are perceptible and in others, the lines are too complex to perceive. The repeated melodic material shared among the parts within the tempo proportion canons help to accentuate the stratification and highlight the distinct voices of the temporal asynchronicity, aiding the audible perception of the different speeds. This is in contrast to Nancarrow's later approach. In the sound mass canons, the intention is for the discrete differences between the voices to be indistinguishable and creating new forms and new kinds of textures.

Nancarrow's approach to texture was inspired by Anton Webern. Webern, amongst many other things, was credited for developing a new type of texture, coined, "diagonal texture" in his serialist compositions. Serialism is constructed by matrix organisation and the linear polyphony often has the result of chordal texture. Diagonal texture is where the music is no longer heard with a leading voice vertically, nor heard horizontally as independent polyphonic lines - the lines in the music become blurred between the vertical and horizontal planes. An example of this is in Webern's Second Cantata, Opus 31, movement 5, bars 8 – 10.

> The chorus being written in four-part chords can generate four-part counterpoint, so that the chord is considered as the 'degree zero' of

[38] Margaret E. Thomas, *Nancarrow's Canons: Projections of Temporal and Formal Structures, Perspectives of New Music*, Vol. 38, No. 2, (2000), p.106-133.

> the counterpoint, when time has ceased to be successive and become simultaneous.[39]

With this, Webern is credited for introducing "a new dimension, which one might label diagonal, a kind of distribution of points, blocks, or figures, not so much in the sound-plane as in sound-space."[40] Kyle Gann acknowledges that whilst Webern has been accredited for the creation of diagonal texture – "texture in which harmony and counterpoint merge and cease to oppose each other as horizontal and vertical"[41], Nancarrow recreated a diagonal texture in a new way and created a continuous flow whereby the horizontal becomes the vertical and then flows back again through the diagonal.

Nancarrow's Study No.14 for Player Piano is a converging – diverging canon, made up of two distinct voices. Analysis by Margaret E Thomas[42] outlines that the first voice, a lower slower line at crotchet equals 88 is joined by a higher and faster voice, crotchet equals 110, the tempos relate by 4:5.

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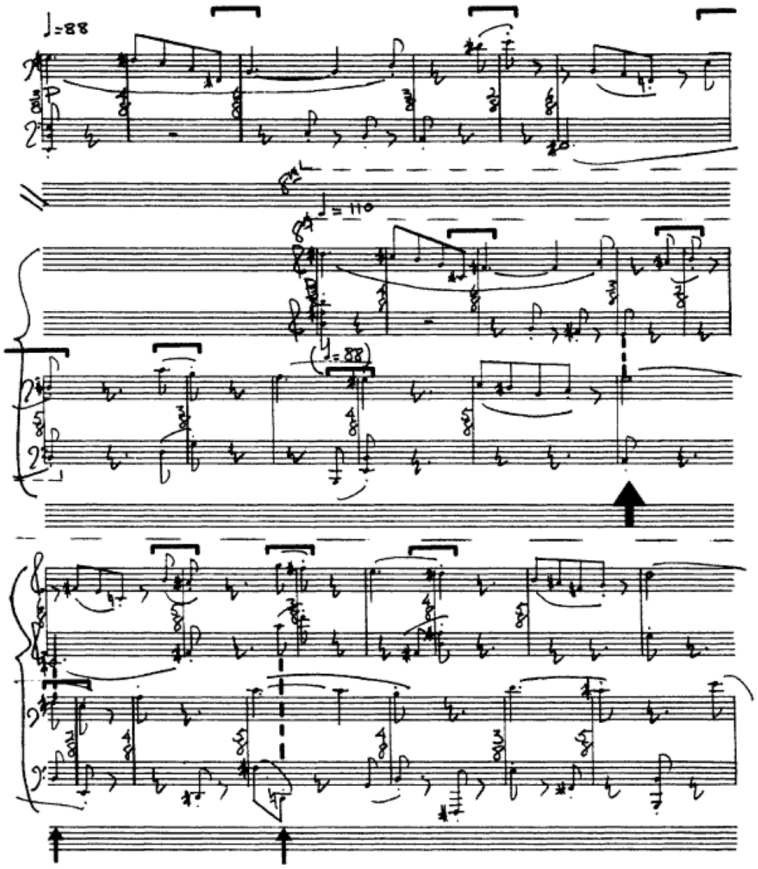
**39** Jonathan Goldman, *The Musical Language of Pierre Boulez: Writings and Composition*, general ed Arnold Whittall,(Cambridge: University Press, 2011) p.43.

**40** 'ibid.

41 Kyle Gann, *The Music of Conlon Nancarrow, Music In the Twentieth Century,* (Cambridge University Press, 2008) p175-176.

42 Margaret E. Thomas, *Nancarrow's Canons: Projections of Temporal and Formal Structures, Perspectives of New Music* Vol.38, No.2 (Perspectives of New Music, 2000) p.106 - 133.



Ex.1.9 Analysis by Margaret E Thomas of Nancarrow's 'Study No.14 for Player Piano' [43]

Whilst the two voices themselves are polyphonic, illustrated above in Ex.1.9 with voice one notated on two staves both in the bass clef and voice two entering on two staves, both in the treble clef, the piece retains textural clarity with these two compound voices.

In the middle of the piece the two voices meet a point of synchronicity and then diverge again, with the faster voice ending first. Stratification is achieved through register and temporal differences of the two parts and is clearly perceptible to the listener with textural clarity.

The source duration series of the study is based on <n, n+1, n+2, n+1> and as part of the canon there are 4 separate lines whose attacks are based on the duration series where n = 3,4,5 and 6 eight notes. Changing time signatures and irregular rhythmic patterns create this rhythmic complexity and polyrhythms with no exact repetitions throughout the piece.

[43]Conlon Nancarrow, 'Study No.14 for Player Piano', (c.1960)

Nancarrow's concept of converging and diverging lines prove very effective techniques for the gradual transformation from stratification through to fusion. While I explored many contrasting approaches to texture, not all of them influenced my work and I acknowledge that this is true of Nancarrow.

A feature of Pierre Boulez's music is stratified, dense and complex textures whereby the individuality and independence of the instrumental players is predominant. Boulez studied the music of Webern and developed his own *diagonal texture* through line thickening and timbral changes. This technique can be seen in Boulez's Organ works.
In 1951 Boulez composed Structures 1a, a piece of total serialisation. The structure of the piece is divided into 11 parts, each stratified with their own tempo. Boulez chose the basic series of row for the piece inspired by Messiaen's *Mode de valeurs et d'intensities*. There are four different forms of the pitch series, which are varied through retrograde and inverted retrograde. The music is made up of 3 different layers, with endless seemingly random notes all scattered all at different dynamics. Yet through the stratification, the piece flattens at the end and the listener zooms out to the totality hearing the wholeness. Although the music is conceived in terms of stratification, the consequence is that the aural reality is one of fusion. The listener is unable to follow all the complex individual lines.

An examination of 20th and 21st centuries textural relationships in instrumental music has illuminated on the capabilities, the subtleties and the extremities of sound production. Composers in this period are demanding more of performers and more of their instruments. Musical textures are asking more of their audiences, demanding a more active role of the listener. Composers in the 20th and 21st centuries free up and liberate texture in instrumental music, opening up new possibilities; they move away from the more formal structured role towards new, subtle and gradual transformations and the removal of scores enables the freedom of improvised performances. Despite this freedom, there were also levels of new precision and detail with greater rhythmic and textural complexity. Whether composers sought fusion or stratification, an enhanced level of consideration is given to sound production, timbre and texture. As a result, more detailed instructions for the

performers in the way of performance notes and new extended techniques offered up new sound possibilities.

The research in Chapter I has influenced my creative process in three main ways: firstly, I found that I gravitated towards the approaches of composers seeking fusion and I was particularly drawn to the slow transformations of sounds and pitch stasis seen in the works of Ligeti and Scelsi and this comes through significantly in my music. Whilst fascinating, the more stratified, precise approaches of Boulez and Nancarrow were less relevant to my creative practice. Secondly, I have a similar approach to that of Gubaidalina whereby the music can go from moments of clusters and focus on sound to moments of melodic lines coming through - the importance of melody breaking through moments of expansive pitch stasis is important to me and becomes a feature in all my music. Thirdly and crucially, I have drawn upon the performance practice and sound scales of both Knox and Kokoras, the former having made a particular impact on my creative approach, as I discuss in Chapter II.

## CHAPTER II

## IN FOCUS: PANAYIOTIS KOKORAS AND HOLOPHONIC TEXTURE

### *Disunity* for String Quartet

Panayiotis Kokoras is a Greek composer and researcher, born in 1974 whose work and studies give substantial focus to texture in electroacoustic and instrumental composition. His recent work has proved highly relevant to my research and provides an inspiration to my portfolio of work. This chapter discusses Kokoras' key contributions to the development of sound composition and in the interests of my research, remains focused on his output for instrumental pieces rather than electro acoustic.

I pay particular attention to Kokoras' work in writing instrumental sound composition, challenging the traditional role of the western instrumental performer, the development of the sound-scale model and the coining of the new type of texture in 20th and 21st century music trends, Holophony. Through this chapter, I demonstrate how I apply concepts from Kokoras' work in my piece *Disunity* for String Quartet.

Kokoras defines "sound composition" as a process where sound and timbre act as the driving force of the piece, or "the only form-bearing musical element".[44] Sound is the starting place: "First, it is essential to emphasise the significance of a single sound only and then its relationship with two or more sounds"[45]. Sound Composition is built upon sound-to-sound structures and developed through transformation strategies from one sound to another, replacing the musical note as the fundamental structural unit and the salient musical parameter. With timbre being the main element of form, Kokoras champions a "virtuosity of sound" whereby the production of a sound and its transformations give shape and structure to a piece of music.

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[44] Panayiotis Kokoras, 'The Sound is the Music - From Shamanism to Quantum Sound', *Continental Thought & Theory,* Vol 3:3, (2021), p.279.

[45] Ibid.

> Sound-based composition requires a different type of virtuosity, a virtuosity of Sound, a concentration not on the precise rhythmic motives at the exact tempo and intonation, but instead on the minutiae details of each sound.[46]

In his writings on “sound composition”, Kokoras draws strong references to the work of Schaeffer, the founder of “musique concrète” but does not acknowledge Lachenmann’s “musique concrète instrumentale”, as touched on in Chapter 1. This is somewhat a missed opportunity as Kokoras’ sound world envelops both electroacoustic and instrumental landscapes. As a renowned figure in contemporary classical music today, Lachenmann’s expansion of the instrumental palette could add more weight and depth to Kokoras’ work.

**The Sound Scale model**

As explored in Chapter I, the focus on sound in composition is not a new concept but Kokoras expands on these ideals by developing a Sound Scale model that further classifies types of sound by instrumental timbral capabilities. In the way that diatonic scales are taught and practised to instrumentalists, Kokoras proposes that the Sound Scale is developed in a similar way as a useful tool for composers and performers; this enables them to learn their craft and instrument capabilities and help musicologists better understand and organise sound material. This idea of classification is a helpful toolkit for teachers to educate student composers on different instruments and their sound capabilities, for students to learn the different techniques and possibilities of their instrument and for composers to be able to approach composition with a framework of thinking about sound. It helps determine selection of instrumentation for a piece, the combination of instrumentation during the piece and the sound possibilities available to create interesting textures from fusion to stratification. “This method can be applied for specific structural uses such as fusion or separation in sound texture and similarity relationships in sequential movement.”[47] This draws parallels with Garth Knox’s contributions to exposing musicians in conservatoires to new repertoire exploiting the capabilities of extended techniques as discussed in Chapter I.

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[46] Panayiotis Kokoras, ‘The Sound is the Music - From Shamanism to Quantum Sound’, *Continental Thought & Theory,* Vol 3:3, (2021), p.280.

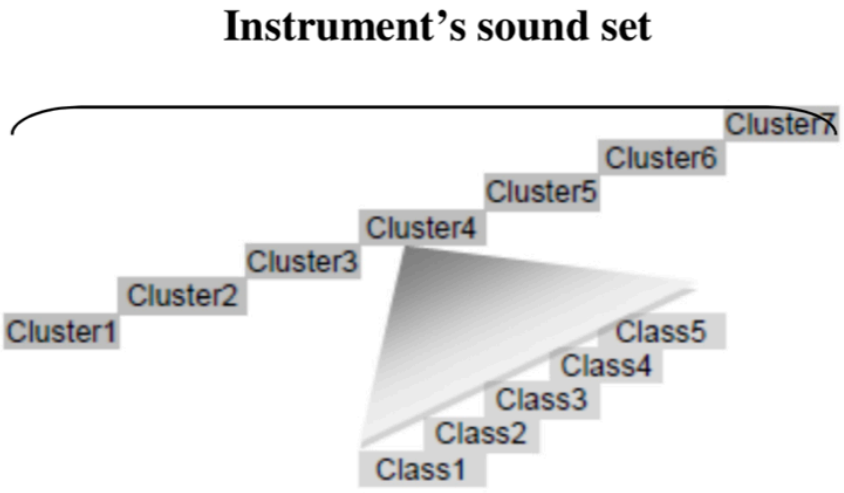
[47] Panayiotis Kokoras, ‘A Functional Classification of one instrument’s timbres’, *(Proceedings of the* EIMAS – Revista do Encontro Internacional de M*ú*sica e Arte Sonora, Juiz de Fora / Brazil) Vol. 2, n. 1, (2011), p.1.

The Sound Scale model prescribes an individual sound scale for each instrument, which is made up of a *Set* of sounds, consisting of *Classes* and *Clusters.* A *Class* is each unique sound within a single instrument's *set*. A *Cluster* is a set of *classes* that have similar audio features multiphonic sounds. Kokoras's choice of terminology (set, class etc.) could be confusing with associations with established terms already associated with serialism. For the purposes of this thesis however, I shall use Kokoras' Sound Scale terminology for consistency.

In comparison to Lachenmann's *Sound Types,* which provides sketches of sonorous models, Kokoras' Sound Scale is a more granular, detailed approach intended to be written for each individual instrument. Kokoras' sound scale is a work-in-progress, where he has established a proposal paper on the Flute (*Sound Scale: Perspectives on the contribution of flute sound classification to musical structure,* 2008). Whilst Kokoras strives for a common language, Lachenmann comments "The goal of such categorisation can clearly not be the creation of a conclusive terminology describing a generally binding musical syntax. Since tonality has been seen off, such a general binding syntax does not exist anymore."[48] I lean the other way and feel that, despite the encouragement of freedom, there still exists a desire and gravitational pull towards a common language, something that can be expressed, taught and passed on and would argue that without a general binding syntax, music can become to remote and misunderstood. Lachenmann acknowledges that his categorisation of Sound Types are "makeshift terminology, assisting in fathoming the large territory of available sonorous material with one goal: to make use of our empirical acoustic possibilities in the realisation of new and current sonorous concepts, on a level where the dualism of "sound" and "form" no longer exists." [49]

[48] Helmut Lachenmann, *Sound Types of New Music,* (1966/91) translation Hans Thomalla, p.1.

[49] Helmut Lachenmann, *Sound Types of New Music*, (1966/91) translation Hans Thomalla, p.22.




Ex.2.1 A paradigm of a Sound Scale with seven clusters and the five classes of cluster four.[50]

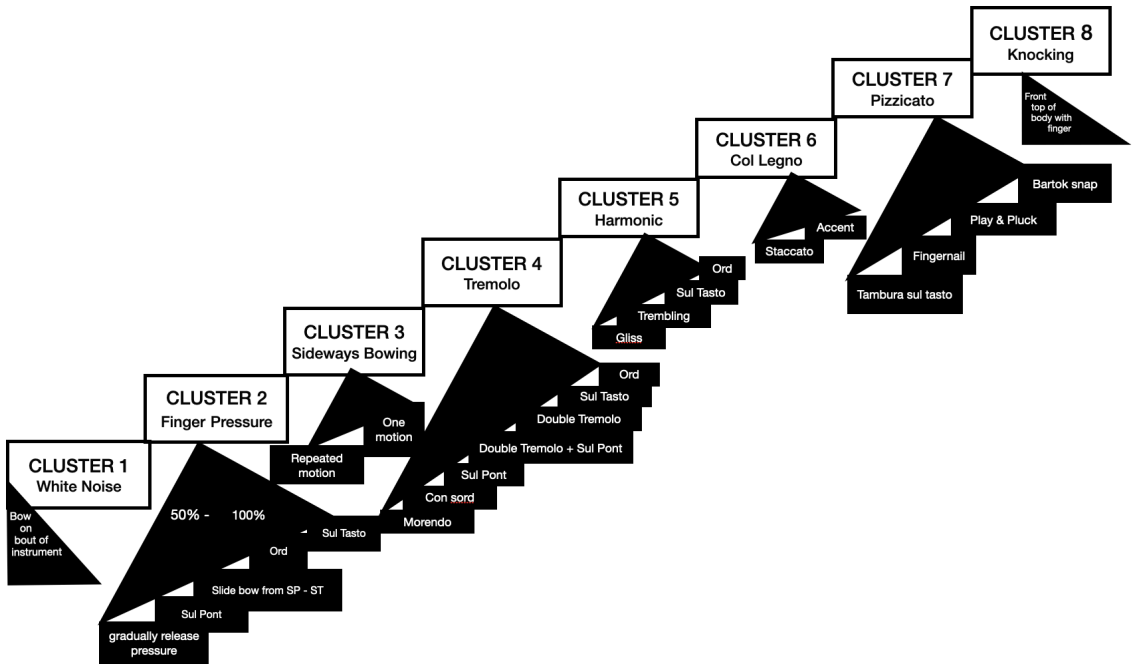
The starting point to any cluster, across all instruments, is white noise. This is intended to provide consistency and Kokoras then uses an automatic classification computer system to define the order of the clusters. In instrumental composition I would argue that the starting point to any cluster could and should be different, depending on the instrument's own sound capabilities and the desires of the composer. In the composition of *Disunity* for String Quartet I created my own Sound Set based on Kokoras' model. For this I decided to align with Kokoras' model starting with white noise as I wanted to exploit the sound capabilities of the string instruments and I found this a provoking way to approach composition for the string quartet. This is explored in the next section.

**The Sound Scale model within *Disunity* for String Quartet**

Taking Kokoras' Sound Scale model as a source of inspiration I have developed my own, bespoke sound scale for the composition of my String Quartet *Disunity*. Where Kokoras uses a computer system to identify the order of the Sound Scale, my approach is through subjective judgement based on my own listening experience and my own experimentation on the violin, as well as calling upon the extended techniques used by Kokoras and other

[50] Panayiotis Kokoras, *A Functional Classification of one instrument's timbres*, *n (Proceedings of the* EIMAS – Revista do Encontro Internacional de M*ú*sica e Arte Sonora, Juiz de Fora / Brazil) Vol. 2, n. 1, (2011), p.2.

composers discussed in Chapter I. This included my own exploration into the parameters of Tremolo and Pizzicato. Rather than creating a sound scale for each individual instrument within the piece, as the string quartet instruments belong to the same family group, there is enough familiarity to apply one sound scale for all instruments and this provides a consistent language for the composition process, the performance notes and an analytical vocabulary. This one Sound Scale also gives weight to the idea that the individual four instruments are intended to fuse together to form one whole.




Ex.2.2 Sound Scale for *Disunity* for String Quartet

Within the performance notes in the score, the Sound Scale is illustrated visually as a graphic for the musicians to demonstrate the desired different sounds and then a table with descriptions is provided to explain the technique as shown on the next page:

## Sound Scale for Disunity for String Quartet

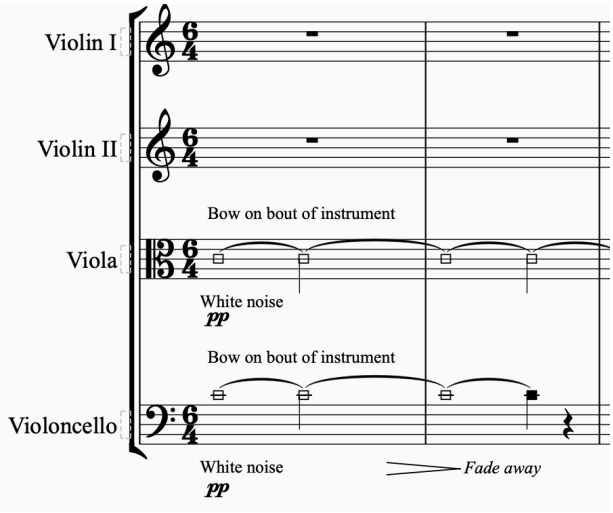
| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Set one: Arco** | | | | **Set two: Percussive** | | |
| **Cluster 1** | **Cluster 2** | **Cluster 3** | **Cluster 4** | **Cluster 5** | **Cluster 6** | **Cluster 7** | **Cluster 8** |
| **White Noise** | **Finger Pressure** | **Sideways Bowing** | **Tremolo** | **Harmonic** | **col legno** | **Pizzicato** | **Knocking** |
| Bow on the bouts of instrument | 100% (ord.) | One motion | ord. | ord. | Staccato | Pizz | Front top of body with finger |
| | 50% | Repeated motions | sul tasto | Trembling harmonic | Accent | Tambura Sul Tasto | |
| | sul tasto | | Double Tremolo | sul tasto | | Bartok snap | |
| | sul pont. | | Double Tremolo + sul pont. | Gliss | | Fingernail | |
| | sul pont. - sul tasto | | sul pont. | | | | |
| | gradually release pressure | | con sord | | | | |
| | | | Morendo | | | | |

Ex.2.3 Sound Scale table developed for *Disunity* for String Quartet[51]

In Example 2.3 I have created two distinctive “sets” in the Sound Scale: Arco set one and Percussion set two. These represent two fundamental different approaches to performance practice and sound within the string family. My approach is an adaptation of Kokoras' practice who speaks of one instrument set. I found this sub division a helpful tool when considering the Sound Scale and sound selection.

Set one of the sound scale, “Arco” is made up of four different clusters. These include Cluster one: white noise notated with a square note head and can be made by playing on the bouts of the instrument. White noise opens the piece in the lower strings and after the transformation through the other clusters and classes, finally returns to close the piece.

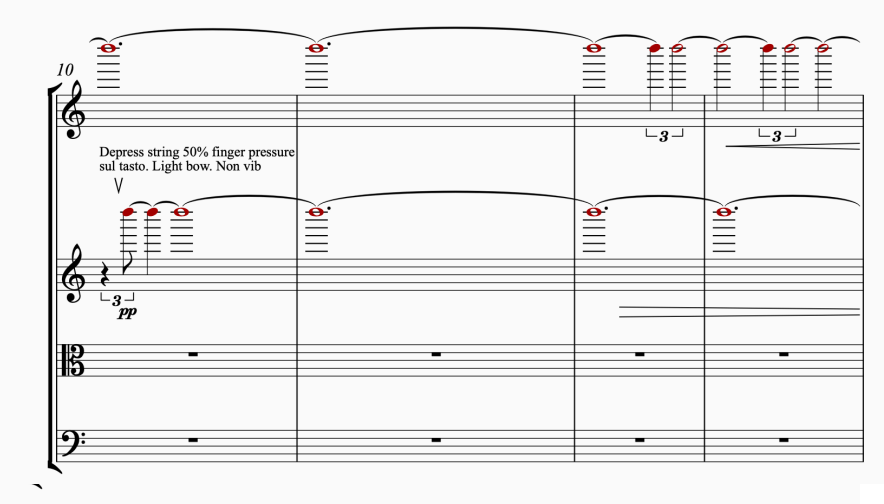
[51] Elizabeth Black, *Disunity* for String Quartet, (2016), Performance notes




Ex2.4 The opening bars of *Disunity* for String Quartet, notating white noise[52]

Cluster two: Left hand finger pressure refers to a variation of pressure to applied to the string from a scale of 50% - 100%. The guidance of 50% or 100% is not a precise calculation but more a judgement from the individual musician, as this is challenging to calculate and prescribe. 50% represents roughly half the amount of left-hand finger pressure stringed instrument performers would normally apply which results in pitch obscurity and multiphonics, and 100% references standard ordinario performance practice. Within these sub divisions Finger pressure is made up of five different classes: sul tasto; sul pont., transitioning from sun tasto to sun pont.; ordinario (ord); and gradually release pressure. The opening of *Disunity* for String Quartet is dominated by Cluster two and discreet but ever-changing audio transformations through the different classes. I wanted to create a sense of unpredictability and instability and allow space for the clusters to establish themselves and for the audiences to become attuned to the different sounds. The transitions from one sound to another are marked by entrants of new instruments split between the upper and lower strings. As the piece progresses, the transitions through the different clusters become more rapid.  Altered finger pressure is shown in Ex. 2.5.

[52] Elizabeth Black, *Disunity* for String Quartet, (2016), bars 1 -2

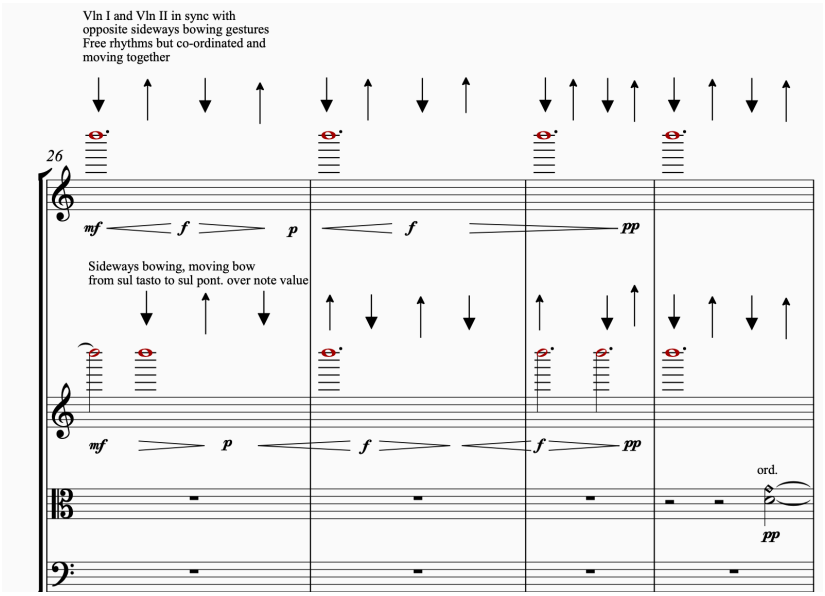



Ex.2.5 Bars 10 - 17 of *Disunity* for String Quartet, showing cluster 2 Left Hand Finger Pressure[53]

Cluster three: Sideways Bowing, is a bow technique used by Kokoras transitioning from sul tasto to sul pont. producing a swiping sound or spazzolato by moving the bow sideways along the string from bridge to nut and back signified by up and down arrows. The Quartet performers can decide which arrow indicates bridge to nut so long as this is a consistent and unified approach. Mauro Godoy Villalobos uses different terminology and notation to describe this technique, “wind sound” and notating it with a wave line above the stave[54]. Other composers use a line above the stave in between s.t. ————— s.p. to notate the transition; however this tends to be a singular motion and/or sustained transition from sul tasto to sul pont. (or vice versa) as opposed to continuous motion like Sideways Bowing. For the purposes of *Disunity* for String Quartet, I used Kokoras’ Sideways Bowing notation referenced through up and down arrows. Two classes make up Cluster three which requires one singular motion in one direction, or repeated motions transitioning from sul tasto to sul pont. Speed of the Sideways Bowing should be decided by the performers and co-ordinated moving together in opposite directions.

[53] Elizabeth Black, *Disunity* for String Quartet, (2016), bars 10 - 17

[54] Godoy Villalobos, Mauro, *Moods Para Arcos* for Quintet or 9 Musicians, (University of California, 2016)




Ex.2.6 bars 26 - 29 showing Sideways Bowing notation in violin I and II in *Disunity* for String Quartet [55]

Cluster four: Tremolo, in Kokoras' Sound Scale model is categorised as a Control Parameter:

> Control parameters include cases that cannot be considered as independent clusters in the sound scale. The control parameters cannot change the timbre quality of the sound at a significant level to consider them as independent sound clusters in the scale. The main control parameters are: dynamics, trill, tremolo, glissando and microtones, other articulations.[56]

I however have categorised Tremolo differently as a cluster of it's own, because of the number of variations in application that the piece requires and the significance of the impact on the timbre. It has provided a rich palette for me within my compositional toolkit and I have found it helpful to elevate to cluster status to fully explore the sound possibilities that can be achieved through Tremolo. Similarly Trill and Tone colour trills I consider a significant part of the instrument set and have included it within the relevant Clusters such as Double Tremolo a class of Tremolo and Trembling Harmonic a class of Harmonic. In addition I recognise that

[55] Elizabeth Black, *Disunity* for String Quartet (2016), bars 26 - 29

[56]Panayiotis Kokoras, '*A Functional Classification of one instrument's timbres'*, *Proceedings of the* EIMAS – Revista do Encontro Internacional de M*ú*sica e Arte Sonora, Juiz de Fora / Brazil, (2011) Vol. 2, n. 1, p.3.

a Trill is not only a Pitch controller as Kokoras outlines below but it is a time controller, a parameter that can be varied either faster or slower like vibrato.

Below is a list that Kokoras regards as the main control parameters (Ex.2.7) and the type of controller, compared to my own control parameters within *Disunity* for String Quartet (Ex.2.8).

| | |
|---|---|
| Attack time | Dynamics controller |
| Trill | Pitch controller |
| Tremolo | Dynamics controller |
| Glissando, Portamento, Vibrato | Pitch controller |
| Microtones | Pitch controller |
| Tone color trills (bisbigliando) | Changes of timbre |
| Other articulations like staccato, accent, legato, etc. | Changes of timbre |

Ex.2.7 Kokoras' main control parameters and the type of controller[57]

| | |
|---|---|
| Attack time | Dynamics controller |
| Glissando, Vibrato, Wide and slow Vibrato, Non Vibrato | Pitch controller |
| Microtones, Tune G String down to F# | Pitch controller |
| Other articulations like staccato, accent, slur, con sord, | Changes of timbre |
| Ties, Free rhythm, rhythm complexity | Time controller |

Ex.2.8 The main control parameters used for *Disunity* for String Quartet

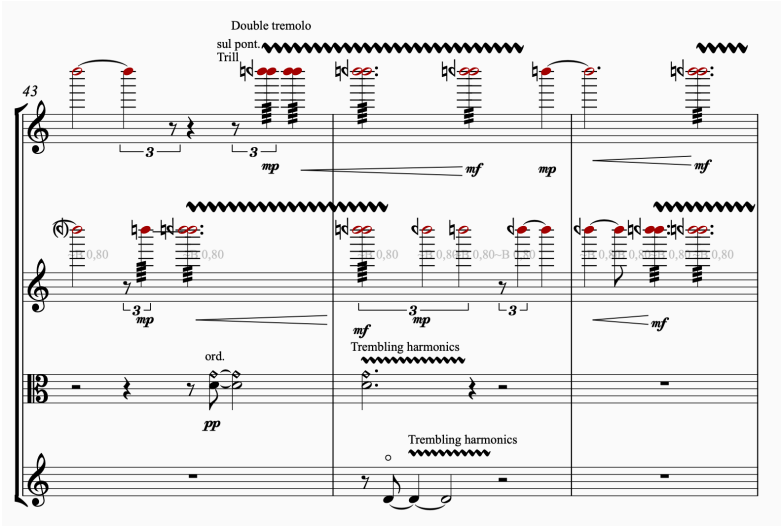
Within *Disunity* for String Quartet in relation to Kokoras' approach, I use Microtones and the addition of Tuning the G String down to an F# in Violin I, glissandi and varying approaches to Vibrato as the main pitch controllers; I use different articulations to provide a change of timbre and vary the attack time as a dynamics controller. I have also added in Time as a type of controller, with the parameters of ties, free rhythm and rhythm complexity which can obscure time.

Within the main Instrument Set for *Disunity* for String Quartet, Cluster four includes seven classes: sul tasto; sul pont.; ord.; con sordino (con sord); fade away; double tremolo; and

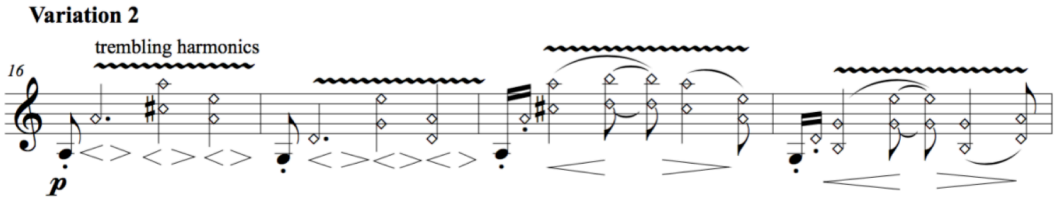
[57] Panayiotis Kokoras, '*A Functional Classification of one instrument's timbres*', *Proceedings of the* EIMAS – Revista do Encontro Internacional de M*ú*sica e Arte Sonora, Juiz de Fora / Brazil, (2011) Vol. 2, n. 1, p.4.

double tremolo + sul pont. Double tremolo is another technique inspired by Kokoras in his *Holophony* for String Quartet, whereby a wide trill rapidly alternates the pivot note with the secondary note, resulting in a complex blend of sound with timbre changes. The trill is combined with a fast bow tremolo effect.

The fifth Cluster: Harmonics consists of four classes: ord.; glissandi; sul tasto; and trembling harmonics, inspired by Garth Knox's *Up and above our heads.*




Ex.2.9 bars 43 - 45 of *Disunity* for String Quartet, showing double tremolo and trembling harmonics notation[58]




Ex.2.10 Garth Knox, *Up and above our heads*, Violin Spaces No2., bars 16 - 19[59]

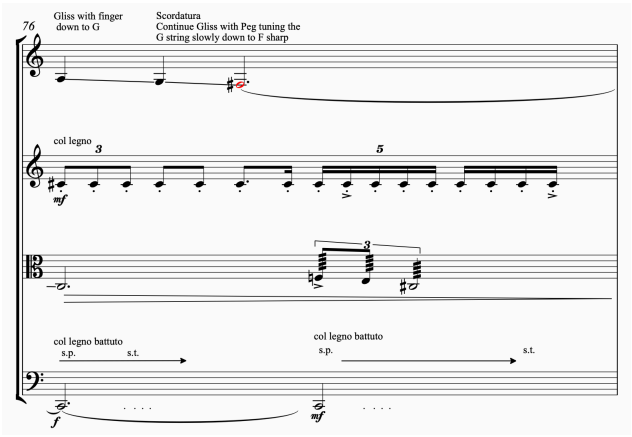
The technique requires an irregular vertical tremolo of the left hand, (like a vertical vibrato) on a nodal point. Alternating between harmonic pressure and even lighter pressure so the open string beneath is sometimes heard gently. The audio result is a complex sound palette. Knox

[58] Elizabeth Black, *Disunity* for String Quartet, (2016), bars 43 - 45

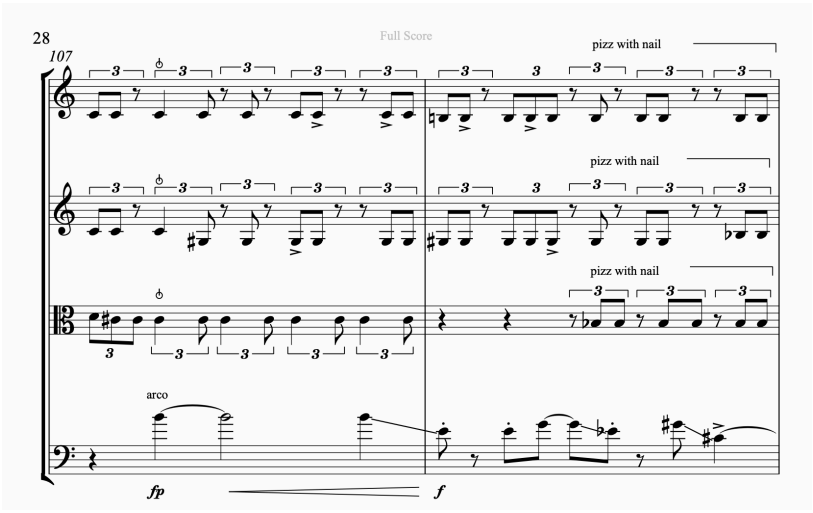
[59] Garth Knox, 'Up and above our heads', *Violin Spaces No2*. (Schott Music, 2017)

was inspired by this technique through collaboration with Kaija Saariaho and her piece *Vent Nocturne*, which was written for Knox in 2006.

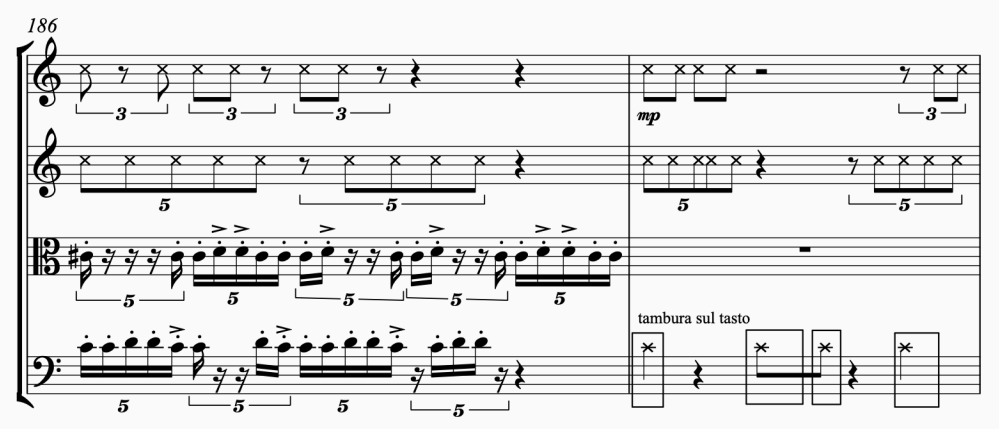
Set two of my sound class is Percussion, a move away from the more traditional role of the bow and more into a percussive sound world using the wood of the bow and the fingers of the performer to pluck the strings and knock on the body of the instrument. Three clusters include Cluster six col legno made up of two classes, staccato and accent; Cluster seven: pizzicato consisting of four classes bartok pizz; Tambura sul tasto whereby, with the bow placed away, slap on all the strings, sul tasto on the fingerboard; and Pizzicato with the fingernail. Cluster eight: Knocking has one class for this sound scale, knocking on the body with fingertips which is paired with tambura sul tasto in the cello in bar 187.




Ex.2.11 Bar 76 showing col legno and col legno battuto against Scordatura and tremolo in *Disunity* for String Quartet.



Ex.2.12 Bar 107 showing Bartok pizz, pizz with nail in *Disunity* for String Quartet[60]




Ex.2.13 Bar 186 -187 showing knocking and tambura sul tasto in *Disunity* for String Quartet[61]

The Sound Scale table served as a useful tool for composing the piece. It provided clarity for the range of sounds I wanted to explore. One area I considered in depth was how to include "Ordinare" within the Sound Scale. Whether this should be a cluster on its own or whether it should sit as a set within each cluster. As a guiding principle, I took the view that because sound is the most salient element in my approach, that ordinaire should sit within each cluster where relevant; for example, Finger Pressure, Tremolo, Harmonic, Pizzicato where it adds to the different sounds available within each cluster. Rather than ord. becoming assumed, it becomes a guided practice which immediately promotes the art of extended technique in both the mind of the composer and mind of the performer. In the creative process of developing the sound-scale it gave me a focussed starting point for sound selection within my composition in the same way Kokoras used white noise as a starting point. It also gave me a framework to consider how to structure the piece, whereby I progress through the clusters as the piece unfolds.

The opening of the piece emerges with cluster one, white noise in the viola and cello. This effect is incredibly quiet, in a live performance the audience, whilst will see the motion of the musicians, will be straining to hear the white noise. Out of this mist, Violin I and Violin II

[60] Elizabeth Black, *Disunity* for String Quartet, (2016), bar 107

[61] Elizabeth Black, *Disunity* for String Quartet, (2016), bar 186 - 187

appear with a still and eerie sound-world with Cluster two: 50% Left hand finger pressure and cluster three, sliding from sul tasto to sul pont., fading away in pianissimo. In bar 21 the viola enters with a sul tasto D harmonic giving more pitch clarity (Cluster five) and the violins respond with 100% finger pressure entering in unison for the first time. This moment is marked by a change of timbre and a forte-piano, the loudest moment of the piece so far, but this quickly evaporates back into ppp and sideways bowing.

Bar 30 sees the introduction vibrato for the first time, slow and wide, a pitch controller which builds to trembling harmonics (cluster five) in the lower strings in bar 32. The violins in turn respond with a faster and more frantic vibrato which builds to cluster four Tremolo, Double Tremolo. By bar 38 we are in a totally different sound world to the sparse, delicate opening, with a frantic fortissimo tutti. This dissipates quickly, becoming once again the fragmented, quieter sound of cluster two and cluster five. From bar 50 there are a series of restatements of harmonic glissando in the cello line.

The pitch controller glissando is used to exaggerate the descent in all four parts to the lowest registers.

It is on the lowest note of the Cello in bar 73 that the piece enters the percussive set two of the sound scale of Cluster six, col legno which all parts adopt by bar 80, the first tutti moment of any given cluster. Here the lowest registers of the instruments' capabilities are explored with scattered accents, a range of pitch proximity and rhythmic complexity featuring fragmented quintuplets against triplets and tremolo creating a busy frantic texture. Within this, dynamics reach heights of of fortissimo but in the context of the cluster of col legno, whereby the dynamic impact is limited. The mass percussive, fragmented sound is a stark contrast to the sound scale in the sparse, legato opening. A sustained, glissandi melodic line soars above the col legno in bar 98 and the percussive col legno then transitions to cluster seven, pizzicato in bar 100. At letter E, bar 118 the sound world changes abruptly with unison arco five (lower strings) against four (upper strings) with brief moments of rhythmic unity emerging from rhythmic complexity. Here I use rhythm to articulate form. The semiquaver septuplets morphs back to cluster 4 tremolo, slowing dying, fading away to make way for Cluster eight, knocking. Abrupt timbre changes are characteristic of the piece which moves through clusters in the sound scale and layers clusters on top of each other; for example,

knocking and col legno combine in bars 183 - 186. Textural blocks are representative of large-scale rhythm. In bar 189 the piece reaches its climatic dynamic moment with fff pizzicato and tremolo which rapidly descends and fades away to white noise.

**Holophonic Musical Texture**

In the opening of Chapter II, there is reference to Kokoras's Holophony, his theory of a new era and approach to texture which is highly relevant to my area of research. Holophony is how Kokoras aspires his portfolio of work to be perceived, providing a compositional framework that promotes the idea of simultaneous sound streams contributing to one whole. Each independent sound within the simultaneous sound streams plays an equal contribution to the make up of this total.

In his theory Kokoras draws on insights from science, in particular Stephen McAdam's work in Psychoacoustics, and from music perception, cognition and electroacoustic music. Kokoras also explains examples of where composers have expressed the intention of Holophony in their own theories. He cites Pierre Schaeffer's book *Traité des Objects Musicaux* (1966). The Schaefferian theory defines a *sound object as a*ny sound phenomenon and event, which is perceived as a whole. Kokoras recognises Denis Smalley's examination of Schaeffer's theory, whereby he develops his own concept of integration out of a spectral and morphological perspective. The definition of integration is "a sonic physiognomy within which the distribution of spectral components or subgroups of components in spectral space, and their behaviour over time, should not be perceived as independent entities"[62], except that it is practice to break them down to compose with them. Jean-Claude Risset uses the term *spectral fusion* to describe the quality of sound consisting of a number of integrated components into a single sonic entity that is attributed to a single real or imagined source.[63] There are currently a lot of similar ideals but no common language and through Holophony Kokoras forges a new way to align these sound focussed ideals under one categorisation. He does this by analysing other composer's works, composing his

[62] Panayiotis Kokoras, 'Towards a Holohphonic Musical Texture', *Journal of Music and Meaning* (2007), University of Southern Denmark. p.2.

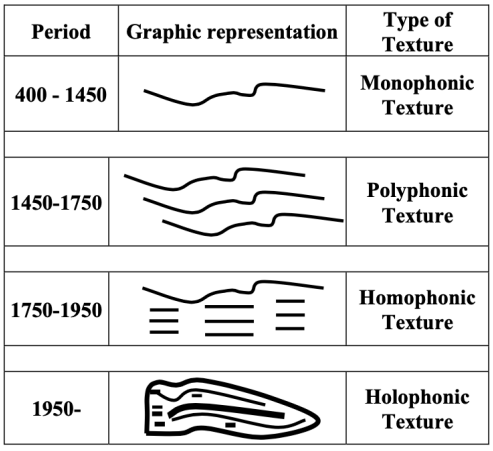
[63] Risset, J.C."Timbre et synthèse des sons". *Le Timbre, métaphore pour la composition*. ed. J.-B. Barrière (1991), Paris: IRCAM/Christian Bourgois, p. 39-60.

own Holophonic pieces and has created the Holophony Ensemble Project, an ongoing program which he initiated in 2003 to promote the writing, performing and recording of exploration of sound possibilities, challenging the traditional performance practice.

Providing pre-existing evidence of Holophony, Kokoras cites Xenakis' *Pithoprakta* as an example, referencing the performance notes where the players are instructed that the individual sounds are to lose their individual importance to the benefit of the whole and are perceived as a block in its totality.[64] Kokoras identifies a global trend in composers' approach to texture and the structural process since the 1950s and attempts to summarise this into one definition in line with the established types of texture which have been associated with different musical periods. Kokoras' demonstrates this in the table below and graphically shows the evolution of texture in Western music in the figure below.

| Era | Texture | Form | Structural process |
|---|---|---|---|
| Middle ages | Monophony | Gregorian Chant | Text setting |
| Renaissance/Baroque | Polyphony | Canon, Mass | Sectional variation |
| Classicism/Romanticism | Homophony | Sonata | Developmental variation |
| 1950-present | Current textures [4] | Current forms | Morphopoiesis |

Ex. 2.14. Kokoras's layout of structural processes according to their historical period, musical texture and form.[65]




[64] Panayiotis Kokoras, *Towards a holophonic musical texture*, (Technological and Educational Institute of Crete Department of Music Technology and Acoustics (2005) p.2.

[65] Panayiotis Kokoras, 'Morphopoiesis: A general procedure for structuring form' *Electronic Musicological Review (2005) Vol IX*

Ex. 2.15 Kokoras' graphic depiction of the evolution of musical textures from Middle Ages to present day.[66]

Ex 2.15 is a simplification of the development of texture over time, from the single line of texture in monophony, to the more complex layers of polyphony, the simple melodic and accompaniment lines of homophony culminating in Holophony which encompasses all sorts of independent and dependent lines of texture that are bound together by this holistic band with the perception of just one sound. This graphic representation is also very partial and shows only textural developments in Western music.

Unlike the previous types of conceptualisations, which see texture as a secondary element to musical elements such as harmony and rhythm, Holophony focuses on texture as the primary concern. Certainly this has been an approach that unifies all the composers examined so far, in their search for fusion. As a concept this is not anything new, as explored earlier in Ligeti's sound world and Xenakis' mass sound but Kokoras provides a new way of talking about this approach to texture.

In *Holophony* for String Quartet (2002 – 2003) Kokoras presents the concept of Holophony in an instrumental composition. The individual parts within the quartet fuse together to contribute to the wholeness of the sound and Kokoras notates this through a diffusion score, a generative model whereby the shape of the note heads indicate the change in timbre and performance technique.

In this ten minute piece, Kokoras explores Holophony through a number of techniques, to enable each independent part to contribute to the whole sound which goes through constant transformation.

Kokoras is influenced by the Doppler Effect[67]; as sound approaches the listener it is perceived at a higher frequency than when it departs and Kokoras uses this as inspiration for his music in relation to the instruments and the concert hall. In the composition, sound builds

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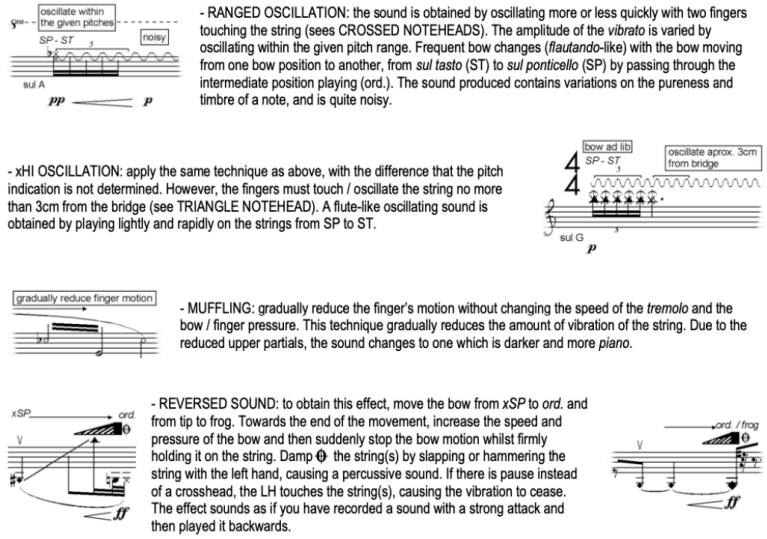
[66] Panayiotis Kokoras, 'Towards a Holophonic Musical Texture' (2005) , p.2.

[67] The Doppler Effect is a physical phenomenon whereby the perception of a moving sound varies according to its position in relation to the listener.

and dies away through extended bow technique such as reversed sound, muffling and oscillation, all explained in the figure Ex.2.16 below from the performance notes.




Ex.2.16 Performance notes from *Holophony* for String Quartet, Kokoras[68]

The continuous flow of sound between parts, morphing from one event to another, effectively focuses the listening process on the macro with moments of internal micro interest points. Kokoras achieves an intricate and intriguing sound world characteristic of acousmatic and electroacoustic music through an amplified string quartet instrumentation and Kokoras uses different shaped note heads to indicate further timbre techniques and precise performance guidelines.

A second example of Kokoras' holophonic writing is his piece *Susurrus* (2001) which means whispering or rustling, for amplified piano, violin and cello. A significant part of the Trio is written in a holophonic texture where Kokoras describes "creating a complex network of sounds where the functions as a whole are superior to any other subtotals."[69] Directed as "Swordplay", the composition is percussive in nature. Kokoras states that "the combination of the instruments as a single meta-instrument reveals, creates and processes in great detail and precision, most of the sound palette of the instruments. Before and during the

[68] Panayiotis Kokoras, 2003, *Holophony* for string quartet, (York, 2003) Performance notes

[69] ibid.

composition of the project more than 600 audio units from violin cello and piano (were) recorded in a studio and analysed on a computer in order to systematise them on a sound-to-sound logic."[70] The focus on sound and timbre is paramount here as Kokoras states that the piece challenges the performers to move outside of the comfort zone of western tradition to redefine the relationship between the performer and instrument.

**Holophonic principles in *Disunity* for String Quartet**

*Disunity* for String Quartet is a piece of gentle evolution with an overriding principle that explores tonal fusion and stratification with growth driven through texture motion.
Kokoras identifies five main characteristics of Holophony whereby sound enteritis fuse together to form texture: these are granularity- rhythmic complexity; density; timbre similarity and homogenous sound; space singularity; and sound continuity. I have used these five holophonic principles to guide my piece *Disunity* for String Quartet.
Considering Density, I create moments of extreme from the sparse, light density of the opening and close of the piece through white noise, 50% finger pressure and harmonics to highly contrasting moments of compact density in tutti col legno, heavy density with tutti staccato arco at bar 118 and thick density with clusters layered on top of each other; for example, bar 169 cluster six col legno against cluster seven pizzicato and glissandi against col legno in bar 180.[71] A characteristic of the light density in the opening features very high sounds, mostly indistinguishable pitch, the aim is for the players to fuse and for the listener to perceive this sound as a whole. Pitch clarity and toneness is unclear using varying finger pressure and bowing techniques, sideways bowing for example in bars 23 - 29.

Rhythmic complexity is used throughout the piece, with rare moments of unison and rare moments of a strong sense of time signature. There are tutti moments where parts lock and unlock through granular rhythmic complexity and using the sound-scale I developed, as a resounding characteristic of the piece, I strive for units of timbre similarity by often having the

[70] Panayiotis Kokoras, *Susurrus,* Performance notes (All rights reserved Thessaloniki, 2011) commissioned by Pharos Foundation New Music Festival. Nicosia / Cyprus

[71] Elizabeth Black, *Disunity* for String Quartet, (2016) bar 74-75, p.19.

different parts paired in the same clusters with the gradual introduction of other clusters and sound transformations. For example, at the beginning, cluster two dominates, with the gradual introduction of clusters three, four and five. The piece is a slow transformation through timbre similarity where one instrument moves from one cluster to another and the others follow suit.

Another example of homogenous timbre similarity are the trembling harmonics in bars 30 - 33. The trembling harmonics are used as a timbral effect one octave (viola) and three octaves (cello) below the violin line. The trembling harmonics consist of a wide vibrato on a harmonic, dampening the sound and pitch and trapping the sound by not allowing the harmonic to ring. The double tremolo also is a fast simultaneous trill and tremolo that creates a complex timbre. These two classes are used in a way to create one whole sound, a fusion of complex rhythms, which the listener may perceive as one sound.

Regarding space singularity, the pitch space is narrow throughout the piece, often focusing on sustained unison pitches. Pitch proximity and the concept of fusion is polarised with the peeling away of voices through quarter tone movements. The single line becomes broken by a pulsing effect which then triggers further pitch separation. As the pitch separation widens it becomes more Pseudo-polyphony, fusion is more difficult to maintain. Harmonically it moves from white noise to a sustained D to C / C sharp / B and then back to D ending on D a quarter-tone flat and back to white noise. The shifts in pitch involves subtle transformations, microtonal movements to more subtle exaggerated statements such as wide glissandi, and whilst the focus is on sound, continuity and transformation, pitch and moments of traditional melodic lines do play a part within *Disunity* for String Quartet. The piece is inclusive of both of these ideals, rather than one approach or the other.

## CHAPTER III

## IN FOCUS: DENIS SMALLEY'S SPECTROMORPHOLOGY

### *The Berkeley Octet*

Kokoras' contributions on Holophony and sound composition explored in Chapter II draws on Denis Smalley's theory Spectromorphology, among other disciplines. This will be the focus of Chapter III.

### An introduction to Spectromorphology

Smalley defines Spectromorphology as **"**the temporal unfolding and shaping of sound spectra"[72] - the relationship between sound spectra and how they change through time. He developed this methodology as a tool to aid the process of describing and analysing the listening experience of electroacoustic music whereby the live performance is either partly or totally acousmatic, to provide focus for listeners and to determine what can actually be perceived in the listening experience. It recognises that the intentions of the composer are not always necessarily perceived by the listener. Whilst Smalley acknowledges that Spectromophology can be a helpful aid to composers, he claims that this is not a compositional system:

> Spectromorphological ideas are useful as a basis for musical discussion, commentary and analysis, for compositional thinking, and for teaching. However, I would not go so far as to claim spectromorphology as a compositional "system", or as a stand-alone approach to analysis.[73]

Through this chapter I will aim to demonstrate how Spectromorphology is a powerful tool for both listeners and composers alike for instrumental music; how it brings a language born out

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[72] Denis Smalley, 'Spectromorphology and structuring processes', *The language of Electoacoustic music (1986),* p61 - 93.

[73] Denis Smalley, 'Sound, Morphologies, Spectra: spectromorhplogy in instrumental music', translation of 'Klang, Morphologies, Spektren: Spektromorphologie in der Instrumentalimusik', in *Klang Perspective* ed. Lukas Haselbock, Wolke Verlag Hofheim, (2011), p.34.

of electroacoustic that is transferable to my own instrumental portfolio and how I use Spectromorphology as a compositional tool.

**Listening ontologies**

"The problem is not to search for new sounds, but for a new way of listening, of perception." Lachenmann, 2003

In Chapter I, discuss a new type of concentrated listening that has come out of much of the contemporary music scene in the works of Radigue and Lachemann for example. Acousmatic music, source bonding, the perceptions of sound and motion, the subtleties of sonic transformation, prolonged listening of pitch stasis all present challenges and an intense concentration for the listener both in electroacoustic music and instrumental music alike. In relation to the listening experience for electroacoustic music, Denis Smalley recognises a "technological listening"[74] whereby the listener perceives the technology rather than the music itself. Smalley acknowledges this is a barrier and a challenge for composers and audiences to overcome when adopting Spectromorphical thinking:

> Spectromorphological thinking is based on criteria which can potentially be apprehended by all listeners. In electroacoustic music, the separation between the act of sound-making and perception, combined with the specialised nature, proliferation and transience of methods and devices, indicate that technological knowledge cannot be part of any method founded on perceptual consensus.[75]

Another challenge associated with listening and Spectromorphology is associated with gesture and motion within instrumental music. Such a challenge occurs when a gesture as a consequence of the performance contradicts the listening experience. The idea that individual streams make up the whole fused texture may be more challenging for the listener to appreciate if they are distracted by the rate of individual bow strokes for example.

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[74] Denis Smalley, 'Spectromorphology: explaining sound-shapes', *Organised Sound 2,* (1997) Cambridge University Press, p.109.

[75] Ibid.

The idea of gesture in the production of sound is associated with Source bonding. Source bonding is the instinctive association of sounds to sources and causes and "how sounds relate to each other because they appear to have shared or associated origins."[76] Source bonding bears a relationship to Kokoras' development of sound scale and how similar sounds are categorised into clusters (albeit by the composer as a compositional tool rather than for the listening experience.) Denis Smalley views source bonding as as barrier to instrumental music and Spectromorphology, throwing off perception from the overall sonic experience.

"Source-cause texture" is a theory applicable for both electroacoustic music and instrumental music. Here I shall draw examples from only instrumental music. David Hirst outlines how "Source-cause texture" is made up of four levels:

> *Imminent level* - the ongoing, intrinsic musical context where we encounter the instrument (eg. the violin). Associated with the imminent level is *registration* - the articulation of note objects and their chaining in phrases over a continuum of registers.
> *Cumulative level* - which includes our previous experiences of violin sources in the hands of other violinist-causes who articulate the same music and other genres and styles.
> *Extended level* - extends the source-cause base to include the immediate family of stringed sources. (eg. viola, 'cello, double bass)
> *Dispersed level* - spreads over the widest possible range of source-causes to include all bowed and plucked (string) instruments and the (string) instruments of other cultures. [77]

The more active role of the listener is paired with more freedom in approaches to instrumental music as seen in Radigue, Knox and Kokoras. Spectromorphology, therefore, provides a helpful tool for listeners of instrumental music where sound and textures are the salient elements to guide them through this freer landscape. For Denis Smalley "the quest always aims to sensitise listening", in order "to better understand music and our experience

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[76] Denis Smalley, 'Spectromorphology: explaining sound-shapes', *Organised Sound 2,* (Cambridge University Press 1997), p.107 - 126.

[77] David Hirst, *Developing Analysis Criteria Based on Denis Smalley's Timbre Theories,* (2003) p.3.

of sound and listening"[78] whereas Lasse Thoresen speaks of "reductive listening...the intention is to hear a sound simply as a sound".[79]

**Spectromorphology and instrumental music**

In 1997 Smalley developed Spectromophology initially specifically for electroacoustic music to assist composers and audiences to understand and talk about the music. In this, he acknowledges that the steps away from traditional Western Classical music require this need for a new language and approach to listening:

> The art of music is no longer limited to the sounding models of instruments and voices. Electroacoustic music opens access to all sounds, a bewildering sonic array ranging from the real to the surreal and beyond. For listeners the traditional links with physical sound-making are frequently ruptured: electro-acoustic sound-shapes and qualities frequently do not indicate known sources and causes. Gone are the familiar articulations of instruments and vocal utterance; gone is the stability of note and interval; gone too is the reference of beat and metre. Composers also have problems: how to cut an aesthetic path and discover a stability in a wide-open sound world, how to develop appropriate sound-making methods, how to select technologies and software. How are we to explain and understand electro- acoustic music? Music is not created from nothing. If a group of listeners finds a piece of electroacoustic music 'rewarding' it is because there is some shared experiential basis both inside and behind that music. We need to be able to discuss musical experiences, to describe the features we hear and explain how they work in the context of the music.[80]

Later in 2009, in his paper *Sound, Morphologies, Spectra: spectromorhplogy in instrumental music* Smalley recognises that this methodology could be applied to instrumental music, where sound and texture were the salient musical elements and dedicated a paper to this methodology. It is to this day however, a fairly unexplored area and I aim to contribute towards a greater understanding of Spectromorphology in an instrumental landscape. Manuella Blackburn and Lasse Thoresen are two composers who have made significant contributions to this field and this will be looked at in Chapter IV.

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[78] Denis Smalley, 'Sound, Morphologies, Spectra: spectromorhplogy in instrumental music', translation of 'Klang, Morphologies, Spektren: Spektromorphologie in der Instrumentalimusik', in *Klang Perspective* ed. Lukas Haselbock, Wolke Verlag Hofheim, (2011), p.45 - 71.

[79] Lasse Thoresen, 'Spectromorphological Analysis of Sound Objects: An Adaptation of Schaeffer's Typomorphology', *Organised Sound, (*Cambridge University Press, vol 12, issue 2, 2007), p.129-144.

[80] Denis Smalley, 'Spectromorphology: explaining sound-shapes', *Organised Sound 2,* (Cambridge University Press, 1997), p.107.

Smalley identifies what he sees as an inherit limitation of instrumental music and Spectromorphology which is rooted in the expectations of the listener. He states:

> Composing with timbre, composing within timbre, means confronting and enjoying its dissolution. This can only be really pursued in an *acousmatic* electroacoustic music. In contrast, adventurous contemporary instrumental music, and works which mix instruments with acousmatic element, are rooted in the umbilical security of instrumental source- cause coherence and directly apprehended sound-making gesture. This equates not with a burning desire to explore timbre, but with a hesitant reserve about cutting loose in order to pursue a freer exploration. (Smalley 1994:47)[81]

This directly differs from writings by Lachenmann in which he specifically refers to freeing the composer and listener from the expectations of the instrument.[82] It also contrasts with Radigue who asks performer collaborators to abandon their training and preconceptions and intently explore the sonic capabilities of their instruments. Garth Knox also endorses these ideas by writing specifically to help educate performers on extended technique and to stretch any preconceptions through a portfolio of compositions that speaks to this. From my exploration of instrumental twentieth and twenty-first century music, I take issue with Smalley's findings that "composing with timbre…can only be pursued in an acousmatic electroacoustic music" and this observation leads me to consider instrumental approaches to Spectromophology in my own portfolio of composition.

**Spectromorphology: the basics in instrumental music**

In *Sound, Morphologies, Spectra: spectromorphology in instrumental music* Smalley identifies three temporal phases that give way to three Spectromorphological archetypes:

> ...the three temporal phases
> The spectromorphology of a sound, or a note in instrumental music, is defined by the relationship between three merged temporal phases:
> 1. The **onset** phase - the energy that sets off a spectromorphology. This can vary from a sudden attack, to a gradual entry that fades in from silence.
>
> 2. The **continuant** phase - the manner of continuation. Most commonly this is a phase of sustainment. It can be pressured or relaxed, and have a

[81] Denis Smalley, *Defining Timbre, Refining Timbre*, (Harwood Academic Publishers GmbH, 1994), p.47.

[82] Paul Steenhuisen, *Interview with Helmut Lachenmann*--Toronto, (2003)

sense of direction depending on how energy is applied.

3. The **termination** phase, which can vary between an abrupt halt to the sound, and a gradually fading away.

. ..the three archetypes

Configurations of the three temporal phases give rise to three archetypes:

1. The ***attack alone*** - a momentary energetic impulse. Awareness is focused on the attack phase and there is no continuant phase: energy quickly or instantaneously dissipates. Short staccato notes are an example.

2. The ***attack-decay*** (or attack-resonance) - the attack is extended, and there is of a continuant phase decays towards termination. A cello pizzicato, or a gong, are examples. The aural focus is initially on the attack that instigates the resonance, but there is enough time for the ear to be drawn into following the progress of the sound as the energy dissipates.

3. The ***graduated continuant -*** onset and termination are gradual. In between, the sound continues for a time: continuing energy is needed to maintain the sound. The onset and termination phases can be subject to varieties of pacing that vary from subtle emergence to more pressured swelling. A sustained string or wind note is an example. The aural focus is more directed away from the onset towards the continuity of the sound, which forms the bulk of its duration.

The beginning-middle-end relational framework is a helpful way to think about the resources both in how to listen and discuss instrumental timbre-concerned music. It is universal that every sound has a beginning, a middle and an end and thinking through these temporal phases gives a raised platform to consider the intricacies of each sound. Even with dovetailing, overlap, any new entrant sound will have a beginning, however discrete or hidden. Whilst composers' and performers' intentions can be at times to fully fuse sounds together with instrumental music, there is always a gesture that needs to be made that marks the beginning of a sound. Smalley's archetypes above are then subject to numerous possible variants that come out of the subtleties of performance practice.

As part of his consideration of Spectromorphology in the instrumental music landscape, Smalley provides an examination of Ferneyhough's Second String Quartet. Here's an extract from this commentary where he notes the beginning, middle and ends of sounds becoming blurred:

> *Spectromorphologies* range from the smallest attack-impulses, to graduated continuants that are stretched over a maximum of around nine seconds.

> Attack-impulses can be extended into chains of iterations, into textures, or flicker in the termination-release phase. The longest graduated continuants are slowish glissandi threads, in single or multiple lines, ascending and descending, and more rarely bi-directional; these are the spectromorphologies with the least energy. A spectromorphology may be formed into a single unit (either synchronized, or fractured in some way), or be regarded as an amalgam of collaborative or competing gestures, viewed as a collective texture rather than as individual gestures, but sometimes finely balanced between gesture and texture.[83]

The language in the commentary is very descriptive and powerfully visual. It provides clear signposts for listeners to look out for and could be a powerful tool to help make contemporary classical music more accessible to new audiences, offering trails to aid concentrated listening and active participation.

**Spectral Components**

Smalley provides vocabulary for spectral components that adds to this toolkit to empower the conversations and thinking about the intricacies of sound in instrumental musical.

> o ***Boundaries / extent*** (upper / lower limits / intervening space).
> o ***Framing***: activity framed within continuing high and low boundaries.
> o ***Grounding / suspending***. Suspended spectral space is unsupported from below, and may give an impression of levitation. Grounding implies that spectral space has its foundation in the bass.
> o ***Registration***: spectral distributions, regions, spreads, concentrations, layers, gaps; registration focus (attention drawn to particular regions or points).
> o ***Fusion / fission***: how far the spectrum of a spectromorphology or a structure/texture is unified over the extent of its spectral space
> o ***Density*****:** lines, bands, clumps, masses, layers = points or regions + extent and compactness of spectral fill. Maximum density blocks spectral space.
> o ***Weight***: heaviness / lightness: spectromorphological type + registration + density.[84]

I have used the spectral components both in the macro and micro compositional processes and in the description of The Berkeley Octet which is featured later in this chapter.

**Motion**

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[83] Denis Smalley, 'Sound, Morphologies, Spectra: spectromorhplogy in instrumental music', translation of 'Klang, Morphologies, Spektren: Spektromorphologie in der Instrumentalimusik', in *Klang Perspective* ed. Lukas Haselbock, Wolke Verlag Hofheim, (2011), p.45 - 71.

[84] Denis Smalley, 'Sound, Morphologies, Spectra: spectromorphology in instrumental music', translation of 'Klang, Morphologies, Spektren: Spektromorphologie in der Instrumentalimusik', in *Klang Perspective* ed. Lukas Haselbock, Wolke Verlag Hofheim, (2011), p.45 - 71.

Within Spectromorphology in instrumental music, motion contributes to the morphological evolution of sound. This includes the directionality and growth of the music: is it planar - flat lined; unidirectional - simple ascent or descent; reciprocal - balancing of upwards by downwards motion incl. oscillation and undulation; centric and rotational - through cyclic repetition; accumulating / dispersing (multiple spectral directions); expanding / contracting (multiple spectral directions).

Smalley considers the temporal rates and variance: whether the spectral state is static, linear, accelerating / decelerating or (in)stability. Smalley also outlines ways to think about and listen out for energy and texturing in instrumental music:

> ...energy & (im)mobility
> The mobility of energy can be defined by amalgamating attributes – a mixture of: spectromorphological type(s), combinations and scale + occupancy + directionality + temporal rate + extent + velocity + diagonal force + texturing
>
> ... texturing
> o Texture as spectromorphology itself / textured mobility within an outer spectromorphological shape[85]

The suite of terminology Smalley provides from “occupancy of spectral space” and “contiguity or non contiguity of diagonal force”[86] arms audiences and analysts with clear ways to think and talk about timbral instrumental music.

**Spectromorphology as a compositional system**

Throughout his work, Smalley insists that Spectromorphology is not a compositional system and he reveals concerns that it could hinder if used in that way. Yet whilst making this disclaimer, Smalley acknowledges that Spectromorphology can be a helpful aid to composers. Here Smalley talks about the inevitable unconscious influence of Spectromorphology on his own compositional process in his electroacoustic piece *Wind Chimes written in 1987*:

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[85] Denis Smalley, ‘Sound, Morphologies, Spectra: spectromorhplogy in instrumental music’, translation of ‘Klang, Morphologies, Spektren: Spektromorphologie in der Instrumentalimusik’, in *Klang Perspective* ed. Lukas Haselbock, Wolke Verlag Hofheim, (2011), p.45 - 71.

[86] *Ibid.*

> The writings started as a consequence of being asked to write a paper. I wanted to articulate what it was like in working with electroacoustic music. I also wanted to re-articulate and develop Schaefferian concepts to consider a wider variety of music. To explain to others what electroacoustic music was about…
> Now, as far as influencing my own work, well once you become conscious of something, you've worked out some sort of way of understanding, it is going to influence you. But all I'm doing, is bringing out these notions.
> Doing Spectromorphology and Structuring Processes [Smalley 1986] I think it was there unconsciously, it was a question of organising and articulating as one does have to do for written work in a way which might be called 'action in prose'.
> So you can say that it already influenced my thinking, my composition, before I even wrote it. Having written it, since it is there in the unconscious, it doesn't destroy my composition process because I don't notionally think about these things when I'm composing. I just do it.[87]

It is interesting that Smalley warily views Spectromorphology as having a potential damaging impact on the compositional process. Using Spectromorphology in parallel with instrumental music is fairly unchartered and something I seek to expand on through my own portfolio of music, using it not only to talk about or in the listening stages but as a compositional tool. *The Berkeley Octet* is a case study for this approach.Three dimensions of Denis Smalley's work will become especially applicable to my approach to instrumental composition: Spectromophological scenario, Reverse-Attack Decay and Noise-Focussed Spectromorphologies.

**Spectromorphology in *The Berkeley Octet***

*The Berkeley Octet* is a c. 15 minute piece written for String Quintet, Clarinet, Bassoon and French Horn. I use Smalley's Spectromorphology theory and language to shape its development in various ways.

From Smalley's examination paper of Spectromorphology and instrumental music[88], I took an example of a Spectromorphological scenario and developed music directly out of this. The

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[87] David Hirst, *From Sound Shapes t o Space-Form: investigating the relationships between Smalley's writings and works,* (2011) p.2.

[88] Denis Smalley, 'Sound, Morphologies, Spectra: Spectromorphology in instrumental music', *trans of Klang, Morphologien, Spektren: Spektromorphologie in der Instrumentalimusik, in Klang Perspektiven (ed. Lukas Haselböck, Wolke Verlag Hofheim 2011),* p.45-71.

Spectromorphological scenario Smalley describes that I used to guide my music is as follows:

Single graduated onset

↓

Further graduated onset entries accrue and grow in the continuant phase, increasing the spectral richness and broadening the spectral range

↓

Decreasing spectral richness, but moving downwards towards a lower spectral region; continuant phase starts to decay

↓

Elision into an onset surge as spectral richness and dynamic level increase (as if heading for a reversed attack-decay)

↓

At the peak of spectral brightness and richness, release into a rich continuant structure with different spectral weighting

↓

Eventual decay, with motion of elided pitches pushing upwards towards a high region of spectral space, where the unity of the sound breaks up into a granulated stream of textured impulses

Ex. 3.1 A Spectromorphological scenario from Smalley's paper *Sound, Morphologies, Spectra: Spectromorphology in instrumental music*[89]

I have plotted how I used the scenario in the table below and described how it informed the composing of the opening music:

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[89] ibid. p.45-71.

| Spectromorphology scenario 1 | Bar Numbers | Activity |
|---|---|---|
| Single graduated onset | Bars 1 - 5 | Molto sul ponticello, ppp in the Db., with presence of white noise. Lowest region. Grounding. |
| Further graduated onset entries accrue and grow in the continuant phase, increasing the spectral richness and broadening the spectral range | Bars 6 - 9 | Slow emergence from Vc. and vla. fade in. Unison and pitch space close proximity. Unified sound of Molto sul ponticello. |
| | Bars 10 - 20 | Accumulating, spectral richness grows moving from multo sul pont. to poco sul pont. to ord. and extreme tasto and with introduction of trembling harmonics in Vln I and II. and flutter tongue in Cl. |
| | Bar 21 | Denser with triplet viola and heavier, tremolo starts to slow down |
| Decreasing spectral richness, but moving downwards towards a lower spectral region; continuant phase starts to decay | Bars 22 - 24 | Continuant dominated with air noise forming substance of the sound through white noise (Bow on bout), sul tasto flautando and blow air through reverse mouthpiece on Horn. |
| | Bars 25 - 40 | Parts gradually drop out leaving a stable continuant in the lower region Db. |
| Elision into an onset surge as spectral richness and dynamic level increase (as if heading for a reversed attack-decay) | Bars 41 - 42 | Noise-focused spectromorphologies surge from pp to fff. Tutti orchestration with scratch tone in the strings and breath noise with some pitch in the woodwind. Spectral concentration. |
| At the peak of spectral brightness and richness, release into a rich continuant structure with different spectral weighting | Bars 43 - 51 | Flourish ascents, rich palette with different spectral weighting from ord. forte, tutti sideways bowing in the strings, sul tasto flautando, |

| | | |
|---|---|---|
| Eventual decay, with motion of elided pitches pushing upwards towards a high region of spectral space, where the unity of the sound breaks up into a granulated stream of textured impulses | Bars 52 - 56 | Unidirectional ascent to higher region, fission streams: con sordino, breath noise with some pitch, multo sul pont., tremolo, glissandi |

Ex.3.2 Spectromorphology scenario 1 in The Berkeley Octet, bars 1 - 56

I then used the same scenario to create new music from bars 106 - 126 to different effect. The scenario progresses at different rates, the first 56 bars in length, the second only 20 bars. Different orchestration, boundaries and registration are selected with the first scenario more fusion focussed and the second statement of the scenario more fission. Despite being in a much lower region, the first scenario is lighter in weighting and is less dense.

| **Spectromorphology scenario 2** | **Bar Numbers** | **Activity** |
|---|---|---|
| Single graduated onset | Bar 106 - 108 | Vln II, senza via, sul tasto, higher region. Suspended spectral space. |
| Further graduated onset entries accrue and grow in the continuant phase, increasing the spectral richness and broadening the spectral range | Bars 109 - 116 | Continuant-dominated. Staggered emergence of noise-focused spectromorphologies: white noise Vla, circular bowing Vln I, breath with as little pitch as possible Cl. |
| | | Suspended, high region, close spectral distribution. |
| | | Cl. morphs to breath noise with some pitch, multi phonics and trem in Vc. |
| Decreasing spectral richness, but moving downwards towards a lower spectral region; continuant phase starts to decay | Bar 117 - 120 | Parts gradually drop out. Vln I and II descend two octaves in glissandi circular bowing. |
| Elision into an onset surge as spectral richness and dynamic level increase (as if heading for a reversed attack-decay) | Bar 121 | Surge from tutti woodwind, from pp to fff, noise focused spectromorphologies breath noise with some pitch. Spectral concentration. |

| | | |
|---|---|---|
| At the peak of spectral brightness and richness, release into a rich continuant structure with different spectral weighting | Bars 122 - 124 | Flourish ascent in Vc spectral spread of three 8ves, flutter tongue, trembling harmonics, circular bowing, oscillating lines in French Horn and Vln I. |
| Eventual decay, with motion of elided pitches pushing upwards towards a high region of spectral space, where the unity of the sound breaks up into a granulated stream of textured impulses | Bars 124 - 126 | Unidirectional ascent to higher region, trill glissandi in Vln I and II. French horn fades away. |

Ex.3.3 Spectromorphology scenario 2 in *The Berkeley Octet*, bars 106 - 126

Composing within the framework of the Spectromorphology scenario, I found myself drawn to an idea I wanted to explore further: the fourth step of reverse attack decay. Outside of the two statements of the scenario (bars 41 - 42 and bar 121) this Spectromorphology makes an appearance three more times in the piece. The first reverse attack decay statement is outlined below:

| **Bar Numbers** | **Reverse attack decay** |
|---|---|
| Bar 162 | Woodwind onset surge, breath noise with pitch culminating in screech, high region. |
| Bars 163 - 165 | Lower strings onset surge, increase bow pressure into scratch tone, 8ve gaps in registration, lower regions. Staggered termination marked by sfz. |
| Bar 165 | Dovetailing with Lower strings, onset surge from woodwind and upper strings, high region, spectral concentration. Noise-focussed spectromorphologies of screech and scratch. |
| Bar 166 | Woodwind and Lower strings, flipped to attack decay including noise-focussed spectromorpholoiges and staggered termination. Spread of spectral distribution. |

Ex. 3.4 Reverse attack decay in *The Berkeley Octet*, Bars 162 - 166

In the above example, I create three waves of onset surges, each with different spectral components and then flip to an attack decay to surprise the directionality.
The two other reverse attack decays feature towards the close of the work and is the final temporal phase that ends the piece. The second, bars 219 - 221 are composed of three onset surges; they are in the same register and region as the first statement in

Spectromorphology scenario 1 (bars 41 and 42). The final reverse attack decay consists of a single instrument, the double bass, prolonged across three bars.

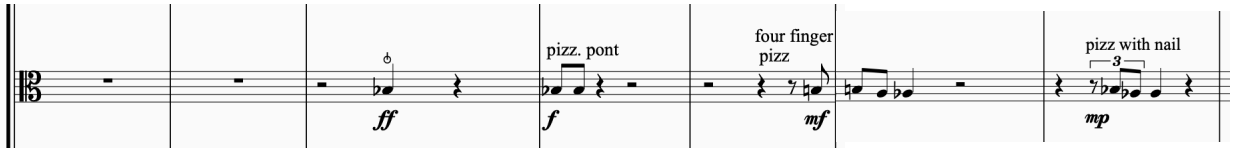
After each reverse attack decay there are varying degrees of silence after the termination to allow for resonance.

Spectromorphology also led me to explore the capabilities of the attack-decay archetype through the means of pizzicato. I do this through varying degrees of noise-focused Spectromorphology with Bartok snap pizzicato, pizz pont, pizz with nail and a lighter weight pizzicato, four finger pizzicato which dampens the resonance.The introduction of pizzicato in bar 57 follows the first statement of the Spectromorphological Scenario One (bars 1 - 56) and is plotted out in the table below:

| Pizzicato | Bar | Type of decay |
|---|---|---|
| **Bartok Pizz** | Bar 57 - 58 | Snap against fingerboard, maximum resonance |
| **Pizz pont** | Bar 59 - 61 | On the bridge creates minimum decay |
| **Four finger pizz** | Bars 61 - 62 | Right hand using four fingers to pluck the string mutes the sound |
| **Pizz with nail** | Bar 63 | High pitch and brittle |

Ex.3.5 *The Berkeley Octet*, cello exploration of Pizzicato and degrees of attack-decay

Through these bars the cello resonance is fully exposed with space surrounding the pizzicato to ring to its full potential. The introduction of these different spectral colours within pizzicato extended technique then informed a pattern for the other string parts to imitate, cyclic in motion: Bartok pizz - pizz pont - four finger pizz - pizz with nail progression. This is illustrated in the viola part below, bars 68 - 72.

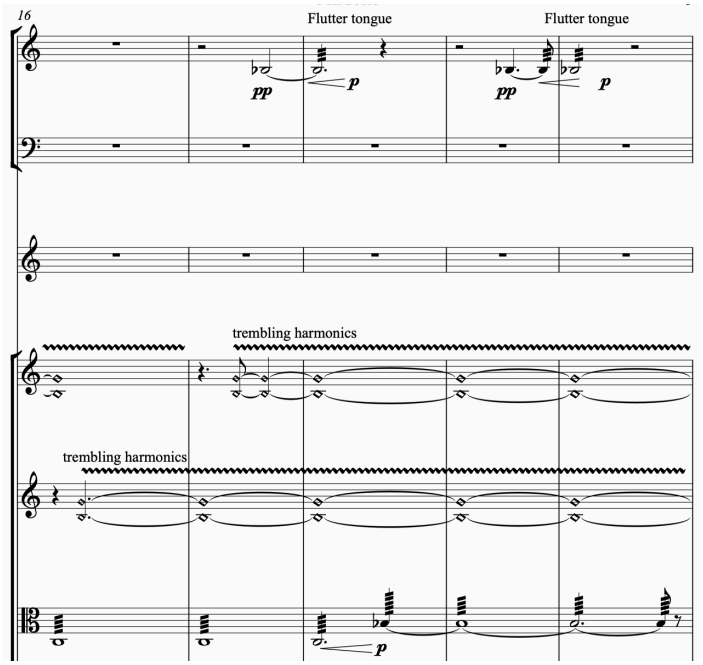



Ex.3.6 Composing with Noise-Focussed Spectromorphologies, bars 68 - 72, *The Berkeley Octet*

Approaching the composition with a Spectromorphological mindset and focusing on the internal intricacies of sound, I was afforded the opportunity to explore and exploit a full range of extended techniques and Noise-Focussed Spectromorphologies in the piece.

In the woodwind this included breath noise with as little pitch as possible or some pitch. In the French Horn I used the affect of blowing through the reverse mouthpiece which produces a rich air sound. This has a lightness when used in the opening, bars 22 - 27, compared to a much heavier density in bars 114 - 118 with contours from piano to forte. On the bassoon the removal of the reed and blowing is also an effect that creates a gust of soft wind in bars 26 - 27.

Noise-Focussed Spectromorphologies are used to create fusion, for example flutter tongue in the clarinet with trembling harmonics and tremolo in the strings.




Ex.3.7 *The Berkeley Octet*, Bars 16 - 20, flutter tongue, trembling harmonics and tremolo

Slap tongue in the Clarinet is paired with pizzicato with nail producing a brittle effect in bars 89 and 91.

Noise-Focussed Spectromorphologies are also explored in the string section including bowing on the bout to create a soft white noise. This appears very subtly in the violin in the opening, and to greater impact in bars 151 - 154 with tutti strings and at the end in bar 227 in

Violin I, II and Viola. Sideways bowing and circular bowing are used in continuant-dominated phases with granular instabilities, inspired by Garth Knox's *Satellites* for string quartet, effects I enjoyed in person at the Barbican in 50 for the Future with the Kronos String Quartet.[90]

Whilst the piece explores Spectromorphology and pitch clarity is often obscured by Noise-Focussed Spectromorphologies, there are moments of traditional melodic writing and moments of harmony but the melody is more linear. Like in *Disunity* for String Quartet and in contrast to Kokoras, I chose to embrace moments of melodic writing and pitch alongside other boundaries of Noise-Focussed Spectromorphologies. In this way, the melody I write seems to emerge out of unexpected places which I find adds a sense of playfulness or surprise to my music. This is true in bars 41 - 42 a surge of breath noise and scratch tone to breaking out into a melodic line which is shared amongst the octet in bars 43 - 47.

Smalley's Spectromorphology language has been an insightful toolkit for me to approach instrumental composition and focus on the intricacies of sound. Whilst Smalley cautioned using Spectromorphology as a compositional system, my approach to this differs, as does the approach of composers like Manuella Blackburn. As a composer of electroacoustic and instrumental music, Manuella Blackburn has researched into applying Spectromorphology as a compositional process and has enjoyed great success. This will be examined in Chapter IV.

[90] Performance of Garth Knox Satellites for String Quartet at the Barbican, 9th May 2016

## CHAPTER IV

## IN FOCUS: MANUELLA BLACKBURN'S VISUALISATION OF SPECTROMORPHOLOGY AS A COMPOSITIONAL TOOL

### *Turbulence* for Trio of Flutes and *Dissipation* for Quintet

Where Chapter III is my own exploration of Spectromorphology as a compositional tool, Chapter IV takes inspiration from the recent work of Manuella Blackburn and her research into the subject. Blackburn has studied Spectromorphology through the lens of her own music in the field of electroacoustic and acousmatic music and became curious as to what the results could be if this was used as a compositional tool to help composers make critical decisions on how to begin and progress the compositional process. In her initial investigation "Composing from a spectromorphological vocabulary: proposed application, pedagogy and metadata" Blackburn proposes that:

> The use of this descriptive tool (spectromorphology) need not stop here. Fortunately, and often unconsciously for the composer, it does not, since all composers create music that is spectromorphological with or without an awareness of its presence at work.[91]

In all his writings on the matter as cited in Chapter III, whilst he refers to it being applied to "compositional thinking", Denis Smalley clearly stated that Spectromorphology was not intended as a compositional process. Similar to my approach, however in the electroacoustic and instrumental music world, Blackburn suggests Spectromorphology can be used beyond listening and analytics, as a toolkit to help composers craft their sounds and make creative choices for their compositions. Blackburn's research empowers composers of today with a helpful guide to inspire the compositional process, much like Garth Knox's '*Stretching the String: Embedding Pedagogical Strategies in Extended Techniques Compositions for*

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**91** Manuella Blackburn, *Composing from Spectromorphological vocabulary: proposed application, pedagogy and metadata,* (2009) p.1.

*Strings'*[92] is intended to empower musicians on contemporary performance practice and extended technique:

> The research involved the exploration of spectromorphology categories outlined in diagrammatic vocabulary sets. These word-sets address qualities that sounds inherently possess, comprised from commonly used language. Application of the sets can occur individually, each the focus of a new piece, or in combinations, allowing investigation of vocabulary functionality as informers upon sound material. Through this vocabulary implementation, compositional strategies can be discovered and developed.[93]

Blackburn uses Smalley's table of word sets for onsets, continuants and termination in three composition strategies within her own composition portfolio.

| ***onsets*** | ***continuants*** | ***terminations*** |
|---|---|---|
| departure | passage | arrival |
| emergence | transition | disappearance |
| anacrusis | prolongation | closure |
| attack | maintenance | release |
| upbeat | statement | resolution |
| downbeat | | plane |

Ex.4.1 Structuring Processes, Denis Smalley (1997)

**Ways of initiating the choice of sound material**

Blackburn's approach includes three methodologies: firstly the onset of the sound; secondly the way the sound develops; and thirdly, the wider context of the sound as a sound unit. Methodology one is the selection of the sound with an onset of either emergence or disappearance:

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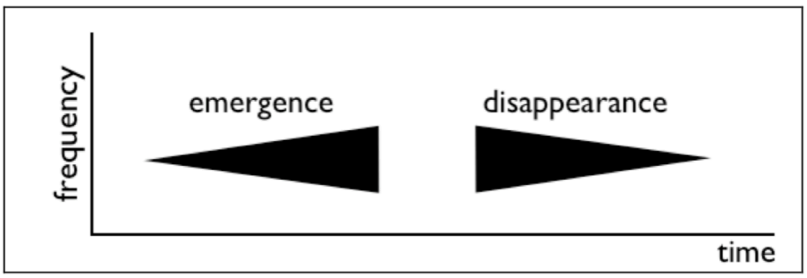
[92] Garth Knox, *Stretching the String: Embedding Pedagogical Strategies in Extended Techniques Compositions for Strings*

[93] Manuella Blackburn, *Composing from Spectromorphological vocabulary: proposed application, pedagogy and metadata,* (2009) p.1.

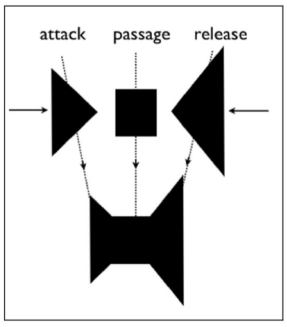



Ex.4.2 Visual equivalent of either emergence or disappearance onset[94]

In a second methodology, Blackburn uses the language of Spectromorphology to inform the development of the sound, how it emerges or disappears through their onset:

> Vocabulary can also inform shaping and manipulation of single sounds. Choosing *attack*, *passage* and *release* can dictate the sculpting of a single sound through the accentuation of onset abruptness, (*attack*), duration extension (*passage*), and emphasis upon a 'letting go' of tension (*release*).[95]

Thirdly, Blackburn uses the vocabulary of Spectromorphology to assemble the sound into larger units.




Ex.4.3 Unit of sounds in construction, Manuella Blackburn, 2009, *Composing from Spectromorphological vocabulary*

Referencing back to Smalley's "morphological strings" (1986), these sound units can be strung together and through this process, sound units can double up; for example, terminations can also mark the onset of a new sound unit strung together. I used this

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[94] Manuella Blackburn, *Composing from Spectromorphological vocabulary: proposed application, pedagogy and metadata,* (2009) p.1..

[95] Blackburn, pp.2.

methodology in *Dissipation* on a micro level, to form phrases, and macro to form structures as explained in Chapter III.

A way of selecting sound material put forward by Blackburn is by taking one word as the inspiration, rather than the precise technical task, to inform the shape, the manipulation of a single sound or an entire piece. I did this with *Disunity* for String Quartet, knowing that I wanted the idea of both tensions between fusion and stratification coming through the piece; this is true of my pieces *Turbulence* and *Dissipation* also where the single word informed the macro composite of the piece.

Through Blackburn's exploration in this area she argues that Smalley's Spectromorphology motion and growth vocabulary can be realised sonically either as singular or composite.

| Word type | Examples | Definition |
|---|---|---|
| Singular | *Attack, ascend, plane, emergence* | Words informing the creation of a single sound |
| Composite | *Multidirectional, turbulence, flocking, streaming* | Words requiring multiple or 'composite' sounds working in conjunction with each other |

Ex.4.4, Word types[96]

Blackburn noted that the processes of creating textures and motions from composite words is challenging and complex and recommends using the singular categorisation to generate ideas and to inform material choice.

In the examples below this is illustrated with a single singular attack figure 9 and in figure 10 (Ex.4.5) a micro-composite attack, made up of stacked layers.

[96] Manuella Blackburn, *Portfolio of Electroacoustic Music Compositions A thesis submitted to the University of Manchester for the degree of Doctor of Philosophy in the Faculty of Humanities,* (2010) p.25.

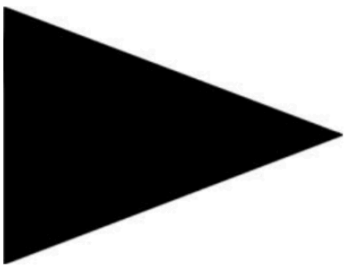


**Figure 9.** Singular *attack*.

**Figure 10.** Micro-composite *attack*.

Ex.4.5 Single singular attack figure 9 and in figure 10 a micro-composite attack, made up of stacked layers, Blackburn *Portfolio of Electroacoustic Music Compositions A thesis submitted to the University of Manchester for the degree of Doctor of Philosophy in the Faculty of Humanities,* (2010)

Macro-composites are similar to micro-composites but sustained for longer periods ranging from phrases to whole compositions. Examples include visualisations of dissipation, taken from Smalley's Motion and Growth processes, bi/multi directional which I used as inspiration for my composition *Dissipation* Quintet for Flute, Clarinet, Marimba, Violin and Viola. Blackburn illustrates other macro-composites such as Turbulence and crossover.

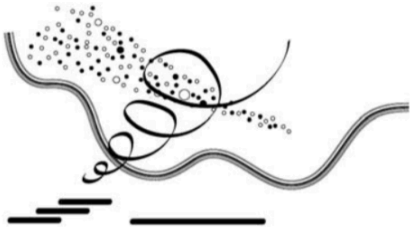


**Figure 17.** *Turbulence.*

**Figure 18.** *Turbulent* wind and leaves.

**Figure 19.** *Crossover*. [97]

Ex.4.6 Further visualisations from *Portfolio of Electroacoustic Music Compositions A thesis submitted to the University of Manchester for the degree of Doctor of Philosophy in the Faculty of Humanities,* (2010)

She explains that these visualisations should be inspirational rather than prescriptive and restrictive. “In fact the composed result is often far removed from the initial text or visual inspiration.” [98]

For *Turbulence* I took Blackburn’s visualisations and composed my own sound sculptures from this using my own ear and intuition in the composition. I chose to use a macro composite word type - turbulence - to initiate the compositional process in my Trio of Flutes piece, where each flute is stacked to become a mass composite, wanting to take the explore this in the context of the stratification and fusion of texture.

**Visual Sound Shapes**

In 2011 Blackburn published the paper *The visual sound shapes of spectromorphology: an illustrative guide to composition.* The focus remains on electroacoustic and acousmatic music and it takes her exploratory work in her paper on Spectromorphology to expand on the idea of visualisation and builds a toolkit for fellow composers to apply to their own compositional process. Blackburn reaffirms in this the usefulness of Spectromorphology in developing compositional strategies and in this text Blackburn creates “visualisations of Smalley’s vocabulary to illustrate the techniques of sound creation and assemblage” and uses this to develop her own compositional portfolio further.

[97] Manuella Blackburn, *Visual Sound-Shapes of Spectromorphology: an illustrative guide to composition*, (2011) p. 11.

[98] Manuella Blackburn, *Portfolio of Electroacoustic Music Compositions A thesis submitted to the University of Manchester for the degree of Doctor of Philosophy in the Faculty of Humanities,* (2010) p.29.

> More specifically, my intention is to use the visually tangible to impact upon the aural sound image through establishing a new graphical vocabulary based on spectromorphology for compositional use. [99]

Blackburn asserts that "If as listeners we are able to describe or visualise something as rewarding in acousmatic music" (as intended by Smalley), "why not use this same vocabulary and/or imagery to inform our own compositional intentions?"

From a pedagogy perspective, the visualisations are intended as possible starting points for composers to develop and decide on their chosen sound. This is something that Blackburn trialled, tested and successfully proved with Undergraduate students at Manchester University: the practice using the vocabulary of Spectromorphology and her new visualisations to be a practical guide and to influence the compositional process.

> Composition students were presented with a collection of sounds, categorised as starts, middles and ends (onsets, continuants and terminations), and then asked to build their own sound units from this pre-determined pool of sounds. Images were used to introduce structuring processes (figure 6). [100]

[99] Manuella Blackburn, *Visual Sound-Shapes of Spectromorphology: an illustrative guide to composition*, (2011) p.1.

[100] Manuella Blackburn, *Composing from Spectromorphological vocabulary: proposed application, pedagogy and metadata,* (2009) p.6.

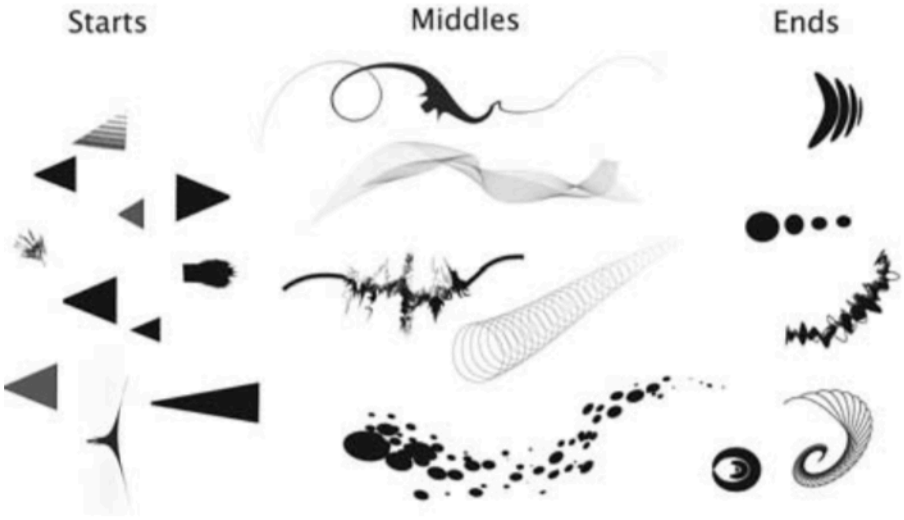



**Figure 6.** Starts, middles and ends.

Ex.4.7 Figure 6 from Blackburn, *Visual Sound-Shapes of Spectromorphology: an illustrative guide to composition*, (2011)

Blackburn found that by following a method based upon fundamental vocabulary, 'students developed a strong awareness of sound function due to the categorisations presented to them, while also displaying a greater sensitivity for sound positioning within their final compositions".[101] In my composition of *Turbulence* for Trio of Flutes and *Dissipation* for Quintet, I tested this as an approach.

**Inspiration for my own compositional portfolio**

Blackburn influenced my approach to the composition of two works in particular within my portfolio, whereby I took her visualisations and interpreted them. I deliberately did not listen to musical references of Blackburn's own music during this process to ensure I approached my composition without bias with just the stimulus of the visual representation.

*Turbulence* for Trio of Flutes, is based on the macro-composite structure of Turbulent Wind and Leaves (demonstrated below).

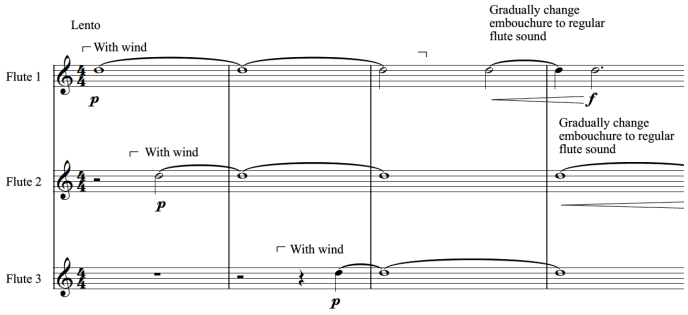
[101] Manuella Blackburn, *Visual Sound-Shapes of Spectromorphology: an illustrative guide to composition,* (2011) p.8.

Ex.4.8 Turbulent wind and leaves, Figure 18, Manuella Blackburn[102]

The image helped to inspire the instrumentation, the macro-composite structure of the piece and the timbral choices.

The instrumentation was selected based on the descriptors of Blackburn's visualisation – wind and leaves felt like a good match to the fleeting, soft, breathy characteristics of the flute. Timbral similarity was achieved by selecting three Flutes.

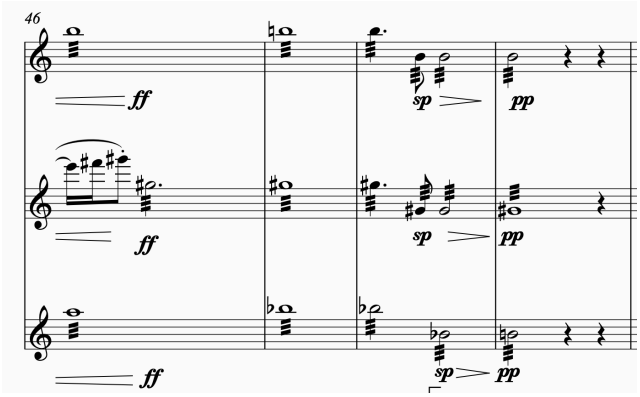
The piece explores four key sounds that gradually transform: starting with with breath, flutter tongue, keyclicks, returning back to 'with breath' and jet whistles. At the close of the piece keyclicks are paired with Lip pizzicato, a technique inspired by Aaron Einbond *Without Words*[103]. These sounds were selected for the appropriateness of the subject matter.



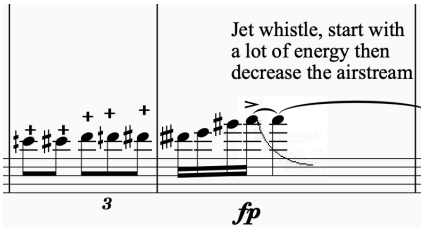

[102] Manuella Blackburn, Com*posing from spectromorphological vocabulary: proposed application, pedagogy and metadata* (2009)

[103] Aaron Einbond, *Without Words for soprano,* eleven instruments and electronics (Edition Graves, 2012)

Ex. 4.9 With wind, gradual change embouchure in *Turbulence* for Trio of Flutes, bars 1 - 4



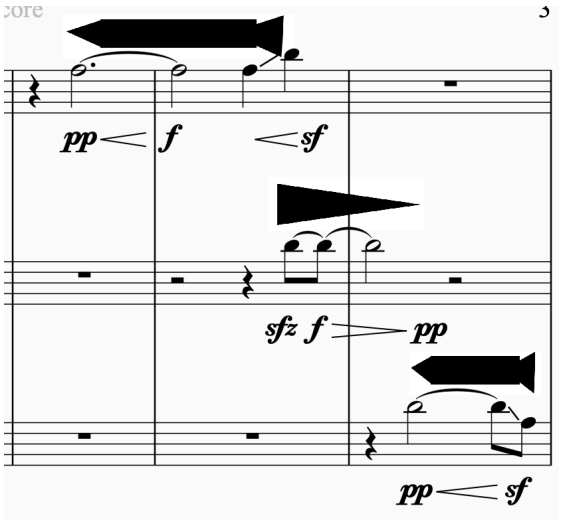

Ex. 4.10 Flutter tongue in *Turbulence* for Trio of Flutes, bars 46 - 49



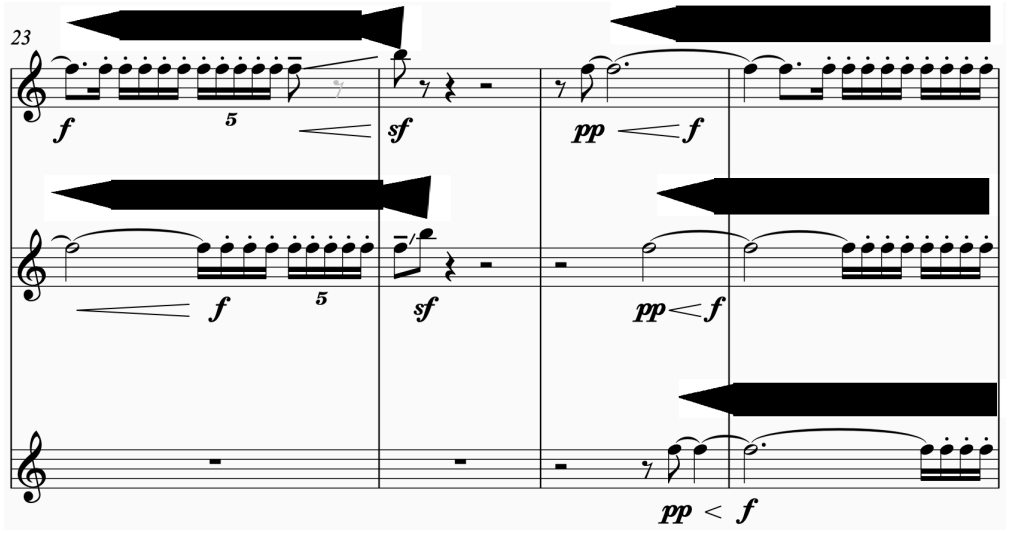

Ex. 4.11 Key clicks and Jet Whistle in *Turbulence* for Trio of Flutes, bars 90 - 91

The shape of each part takes direction from each of the three lines of wind / leaves that is blown out of the wind, but my music is not an exact representation. There is no anchor or fundamental note to establish the texture, motion is based on floating and drifting. I found composing with Blackburn's visual inspiring providing a starting place for the sonic world I was trying to create and a framework for guiding creative decisions. I combined Blackburn's toolkit with Smalley's Spectral Components setting out the intention for a suspended continuant occupancy of spectral space that becomes more dense as the piece progresses, with a idea that the leaf and the music becoming heavier as it transcends down.

In the table and musical excerpts overleaf, I have tracked some key examples of sound units and morphological string of sound units inspired by Blackburn's research.




Ex.4.12 Sound Units in *Turbulence* for Trio of Flutes




Ex.4.13 bars 23 - 26 Elizabeth Black, *Turbulence* for Trio of Flutes: Emergence, passage, release

| Sound Unit | Bar Number | Activity |
|---|---|---|
| **Emergence - transition - release** | Bars 19 - 20 | Onset gradual emergence, into temporary plane of stability, into forward surge, glissandi release |
| **Attack - passage - release** | Bar 21 | Attack onset with forte piano, sustainment into forward surge, glissandi release |
| **Emergence - transition - release** | Bars 22 - 24 | Two graduated onset entries across Flutes I and II, transition is made up of repeated short reiterations, into forward surge, glissandi release |

| | | |
|---|---|---|
| **Emergence, prolonged transition, release** | Bars 25 - 27 | Three graduated onset entries emerging, oscillating transition into tutti forward surge glissandi release |
| **Morphological string of sound units: Emergence - transition - release - attack - disappears - emergence - transition - release** | Bars 29 - 31 | Onset emergence Flute I followed by transition and release; dovetails with Flute II attack and disappearance; dovetails with Flute III onset emergence followed by transition and release |
| **Emergence - transition - release across three voices** | Bar 43 | Attack onset with flute I; transition emerges out of flute II; forward surge release, descending glissandi in Flute III |
| **Micro-composite attack** | Bars 95 - 97 | Flute I attack descends from the highest region, semi-tone movement to disappearance, at the same time Flute III attack ascends in key clicks from the lowest region to disappearance, at the same time Flute II emerges with triplet oscillating, contours to disappearance |
| **Micro-composite release** | Bars 99 - 100 | Reverse of bars 95 - 97 |
| **Morphological string of micro-composite attack, passage and micro-composite release** | Bars 95 - 101 | Three sound units form one morphological string of attack, passage and release, as activity above. |

Ex 4.14 Sound units and morphological string of sound units from *Turbulence* for Trio of Flutes, Elizabeth Black

***Dissipation*, Quintet for Flute, Clarinet, Marimba, Violin and Viola**

Inspired by two Spectromphology visualisations by Blackburn, *Dissipation* Quintet for Flute, Clarinet, Marimba, Violin and Viola explores both the diversion of sound inspiring a macro-composite structure and individual sound units. In movements I and II visualisations are used to guide the macro-composite structure, sourced from Blackburn's paper *The Visual Sound-Shapes of Spectromorphology*: an illustrative guide to composition[104].

Movement I is based on the below macro-composite which starts as a mass and gradually dissipates to nothing. Single words taken from Denis Smalley's Spectromorphology structural functions to guide my sound selection are onsets of attack and disappearance for termination.

[104] Manuella Blackburn, 'Visual Sound-Shapes of Spectromorphology: an illustrative guide to composition', *Organised Sound*, Vol 16, Issue 1, (Cambridge University Press, 2011) p. 5 - 13.

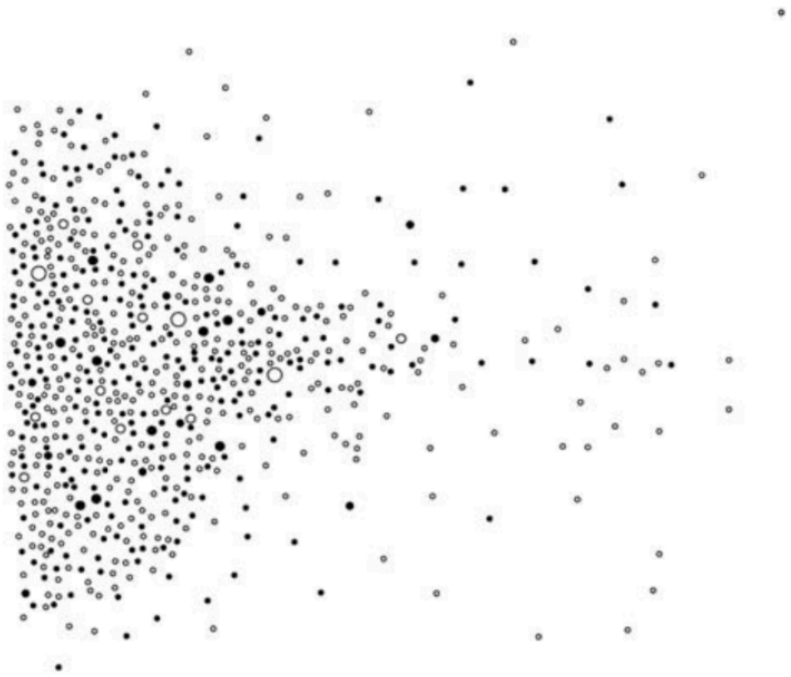


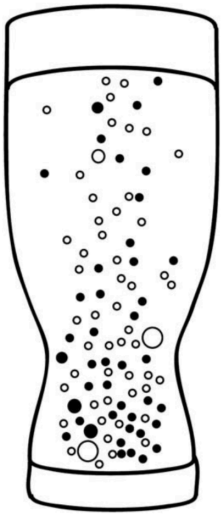
**Figure 11.** *Dissipation.*

Ex.4.15 Manuella Blackburn's visualisation of Dissipation[105]

Inspired by the visual, the sound world in Movement I is intended to represent bubble-like entries that are in a mass cluster that gradually dissipates over a minute. Staccato strings and woodwind and dead strokes in the marimba give a percussive effect. The pitch space spans from high woodwinds to lower registers in the strings with the marimba occupying both registers. Each pairing of instruments – the woodwind and the strings - explore their own pitch set with the marimba interjections of Cs that do not belong to either set. I enjoyed the challenge of matching the marimba timbre to that of the winds and the strings. A more percussive effect is achieved using the mallet shaft to strike directly on the bar to match the col legno in the violin and viola and in the opening, the dead strokes to match the staccato in all instruments. In bar 9 timbral similarity is achieved with the pairing of con sord in the strings with mallet dampening on the Marimba and 'with wind' in the Flute and Clarinet.

[105]ibid. p.10

Movement II is vertical dissipation, inspired by the visualisation of the beer glass with bubbles representing a carbonated drink. Prepared marimba, pizzicato, slap tongue and keyclicks in the woodwind are sounds selected for their bubble-like quality. Attack onsets and disappearance termination are again used to inform the sound selection such as dry slap tongue, key clicks, snap pizzicato and a rubber band wrapped around the marimba bars to give a Bartok pizzicato effect.



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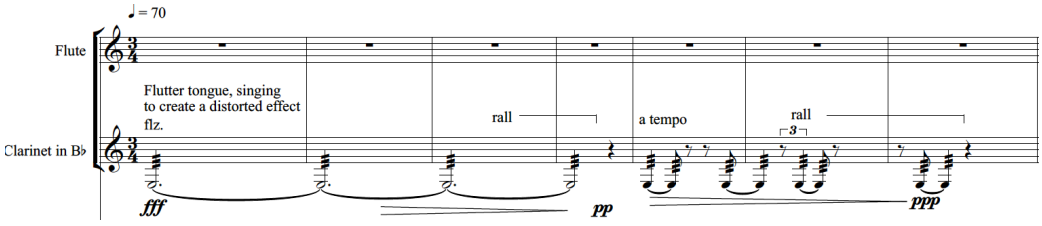
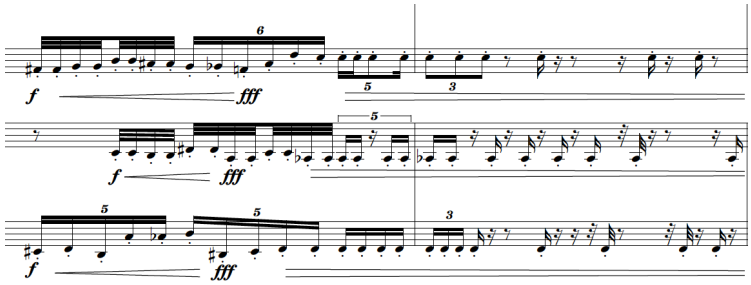
Ex.4.16 Manuella Blackburn's visualisation of carbonated drink in glass

In Movement III the idea that dissipation can inform individual sound units is explored. These are at the beginning in isolation and as the piece progresses, strung together to form morphological strings.




Ex.4.17 Dissipation as sound units in the opening of Movement III, *Dissipation* for Quintet

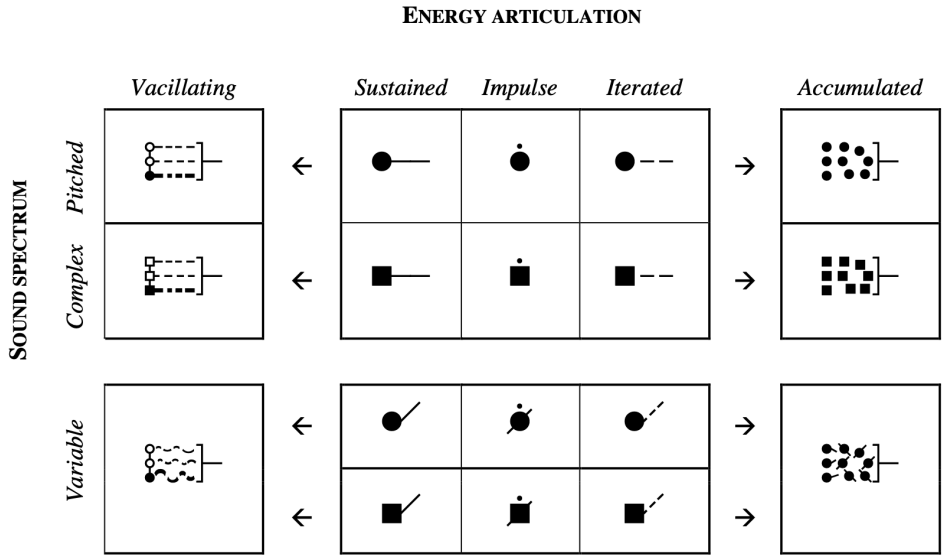
106 ibid. p.10




Ex.4.18 Dissipation as morphological strings, Movement III, bars 75 - 76 in *Dissipation* for Quintet

Timbral similarity is sought at the opening with the gradual layering of flutter tongue + singing to create a distorted effect. The idea that each sound unit starts off with a mass sound that gradually dissipates is achieved via repetition through tremolo and pizzicato that slows down, diminuendos and becomes more sparse.

In *Dissipation* for Quintet I also turn to the works of Lasse Thoresen who examines Spectromorphology as an analytical tool and provides an adaptation of Schaeffer's Typomorphology. This in it's most minimal representation is illustrated in the figure below:



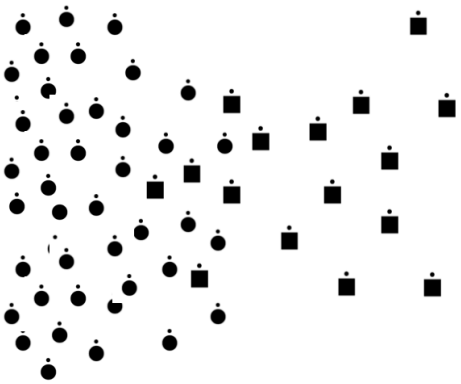
Ex.4.19 Typology minimal representation, Lasse Thoresen, Spectromorphological Analysis of Sound Objects: An Adaptation of Schaeffer's Typomorphology.[107]

In Movement I alongside the illustration (Ex4.15) I used Thoresen's typology to inform my sound selection. Thoresen developed this as an analytical tool. Here, as with Spectromorphology vocabulary, I applied it as a compositional process, to help guide the selection of sound objects within my music. This is detailed in the table below:

| | |
|---|---|
| **Sound Spectrum** | Contains both pitched and complex sound objects |
| **Impulse** | Short thrusts of energy |
| **Accumulation** | Unpredictable iterations |

Ex.4.20 Sound objects used within *Dissipation* for Quintet

I used the above typology to select staccato impulses to dominate the piece and dead strokes on the marimba as pitched sound objects. These are interspersed with complex sound objects such as "with wind" in the woodwind, col legno and mallet shaft on the marimba. Guided by the shape of the Dissipation illustration the sound objects form as an accumulation of unpredictable iterations. The typology also inspired in me to move from pitched sound spectrum to more of a complex sound spectrum as the piece progresses. To help me visualise this, I re-imagined the Dissipation visual using Thoresen's graphic symbols:



Ex.4.21 My own graphic symbol visualisation of *Dissipation* for Quintet, Movement I

[107] Thoresen, Lasse, *Spectromorphological Analysis of Sound Objects: An Adaptation of Schaeffer's Typomorphology. Organised Sound,* (2007) p.129–149.

Similarly in Movement II to match the visual aid of a carbonated drink I opted for a mixture of pitched and complex sounds, impulse dominated and an accumulation of sound objects. Pitch space starts off close in the lowest registers and ascends as the “bubbles” rise to the top of the glass and become more dissipated. The bubble-like effect informed the percussive timbres of slap tongue and key clicks in the woodwind, pizz and snap pizz in the strings and a Bartok pizz effect from a prepared marimba wrapped in rubber bands. Through this exploration, I have taken another analytical tool to help guide the compositional process and have found it a useful and successful practice.

Blackburn has opened up Spectromorphology as a tool for composers and expanded on it with additional vocabulary, creating methodologies and visual representations to aid the compositional process. Her work concludes that the descriptive tool of Spectromorphology applied to compositional practice does indeed successfully inform sound material choice and creativity in her own portfolio of work and that of students. I have expanded on Blackburn’s visualisations by applying it to instrumental orchestration and by taking the analytical work of Thoresen and using the typology and graphic representation as an aid in the compositional process. The combination of ideas and methodologies I use in these pieces makes for an interesting approach and gives a breadth of musical results. I found that the creative process of selecting sounds through graphic representation was a significant step away from my instinctive musical style which was an interesting personal development.  In Chapter V, I draw together key learnings and describe how I use these methodologies more freely in the composition of *Explore This!*

## CHAPTER V

## KEY FINDINGS & CONCLUSIONS

### *Explore This!* for Explore Ensemble

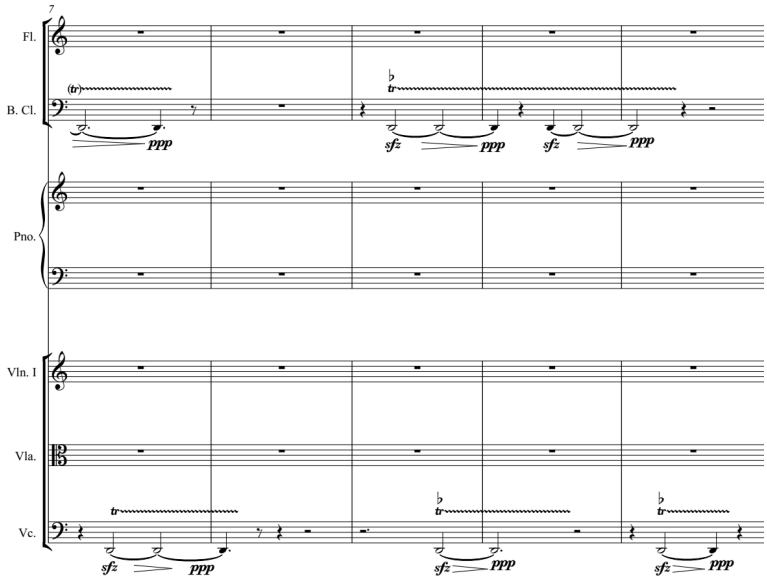
In this thesis I have surveyed different approaches to textures in 20th and 21st century music and have looked at electroacoustic analytical and listening models to explore how they can successfully apply to the compositional process for instrumental music.
I have found that there are many shared synergies between electroacoustic music methodologies and the composing process for instrumental music where sound and texture are the most important elements.

The culmination of the research is showcased in *Explore This!*, the final composition in my portfolio. I used the knowledge and insight from my research and composed freely with this; no visualisations or prescribed Spectromorphological words applied. The intention was to see what impact my research had on me subconsciously as a composer. I fundamentally feel that the research has influenced my creative process. From the very genesis of the musical idea for *Explore This!* I was thinking in a new way of the sounds that I wanted to select and how these sounds would transform. I draw similarities to Smalley's perspective referenced earlier in Chapter III regarding *Wind Chimes, "…*you can say that it already influenced my thinking, my composition, before I even wrote it. Having written it, since it is there in the unconscious, it doesn't destroy my composition process because I don't notionally think about these things when I'm composing. I just do it."[108]
*Explore This!* was written for the Explore Ensemble, to be performed at City University in June 2021. I knew that I wanted to compose a piece that keeps the listener and performer curious, further exploring the idea of fusion and stratification in texture. I wanted a piece with impact, to contain startling and contrasting sound worlds. From my studies into texture, I developed a unrestful opening with repeated bass clarinet trill entries deliberately chosen to

[108] David Hirst, *From Sound Shapes t o Space-Form: investigating the relationships between Smalley's writings and works,* (2011) p.2.

grab attention and create a feeling of agitation and angst. Using moments of silence and repetition the texture is built when other entrants join, with a blurring of onsets and terminations.

The idea of the piece started with the instrumentation, setting out timbral similarity within the ensemble. For example the extreme rumbling in the lowest registers of the piano in a rapid trill, paired with the lowest registers of the bass clarinet and cello trills:

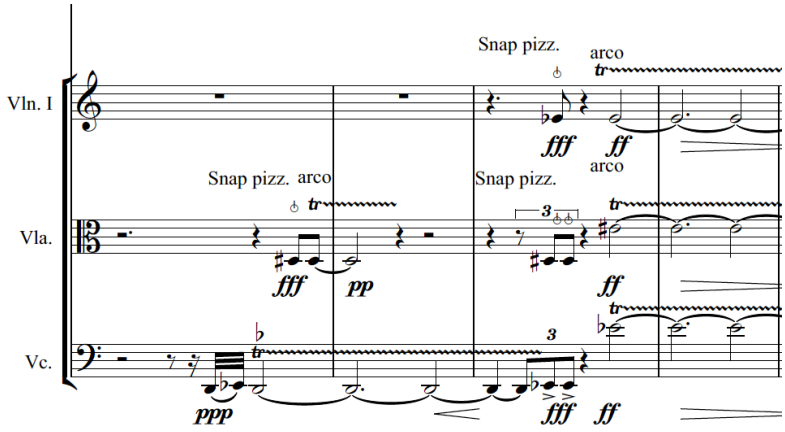



Ex.5.1 *Elizabeth Black, Explore This! Bars 7 - 11.*

Staccato chord strikes on the piano could be paired with block chords or double stops in the strings. Pizzicato in the strings matched with staccatissimo and slap tongue in the woodwind and exploring the inside of a piano, muting the strings. Moments of extremities are pushed to the limits starting the piece on the lowest note of the bass clarinet and exploring piercing top registers in the flute in passage F.

Varied attack times of low trill entries and dovetailing of attacks from sfz down to ppp is contrasted with glassy, transparent held notes and trills in the highest registers of the flute and violin. This builds to an explosive Presto at letter B with staccato sound units and chord strikes in the piano and strings. At letter C the dovetailing entries of the lowest registers returns with varying onset entries. Rather than attack onsets like the opening, the emergence

of trills contrasts with snap pizz entries. In bar 57 there is a rare moment where all parts enter together, in close pitch proximity.




Ex.5.2 Elizabeth Black, *Explore This!* Vln I, Vla, Vc, Bar 57

Letter D sees a change with an ostinato in the piano, staccato and slap bass clarinet and pizzicato cello contrasted with high-sustained flute, violin and viola lines. Letter F sees the top registers piercing out of the piccolo cutting through the rest of the ensemble, paired with the high registers of the clarinet and the percussive accompaniment of the pizzicato strings and muting the inside of the piano. The sound world of the opening returns to close the piece in the rumbling registers of the bass clarinet, cello and piano.

In this piece I feel that I explored freely the extremities, capabilities and registers of the instruments of the ensemble and that my transitions from moments of fusion to stratification are executed successfully; and it felt like the most natural compositional process drawing from the knowledge of my research but not bound by rules.

## Conclusions

I will now draw together key concepts from the preceding chapters.

### Holophony

Kokoras's Holophonic texture is an attempt to map a unified path of progression in texture in 20th and 21st Century Western Classical Music from its clearly defined heritage

(monophonic, holyphonic, polyphonic for example). In this Kokoras oversimplifies what has been an explosion of different artistic approaches and movements to texture and compositional methodologies. It cannot be simplified and consolidated in the way that Kokoras claims and it does not take into enough consideration the full spectrum of outputs in 20th and 21st Century Instrumental music. However, it does provide a well-defined approach that is relevant to many composers treatment of texture and provides a unified language to be able to discuss this approach. One critique of Kokoras' Holophony and research to date is that it does not seem to take account of the important outputs of Lachenmann's contribution to this field. Further questions and areas of exploration could be to look at incorporating Lachenmann's *Sound Types* with Kokoras' research and seeing if there are helpful lines of similarities to draw from. However, Kokoras makes vast contributions to the understanding of texture encompassing successfully both electroacoustic and instrumental music.

**Sound Scales**

I found Kokoras' Sound Scale a focused approach and practical compositional tool for organising sound because it challenged me to fully explore the capabilities of instruments and sound possibilities from an instrument first approach. I created my own sound scale for *Disunity* for String Quartet and found it helpful in the compositional process; it also informed the performance notes allowing the musicians to immerse themselves in the *Disunity* sound world.

To date, Kokoras has developed a sound scale for the Flute. Further areas of development could be to expand on this concept of Sound Scales, developing a scale for each instrument that explores the full palette of possibilities and extended technique guidance. As highlighted through this thesis there is a parallel between Knox's *Stretching the String* and Kokoras' Sound Scale that both speak to a lack of resources and education in conservatoires to equip the performers of today with the skills and confidence and know-how to tackle 20th and 21st century instrumental music. Kokoras' sound scale is a considerable contribution and could be significant in the way extended technique is taught to both performers and composers in the future. My work has extended Kokoras' ideas, building a sound scale for the string quartet which inspired the composition of *Disunity* for String Quartet.

**Spectromorphology**

Denis Smalley's concept of Spectromorphology has grown since its initial conception of bearing relevance to electroacoustic music alone and Smalley has taken steps to acknowledge its significance to instrumental music. Whilst Denis Smalley seems reluctant to promote the discipline of Spectromorphology as a compositional process, Manuella Blackburn makes a strong case for it providing a compelling tool chest for the composer. Alongside her own portfolio of works, Blackburn tested her methodology applying ideas around Spectromorphology as a compositional tool with student composers at the University of Manchester; this lead to a greater awareness of their own sound compositions, how they selected sound material and how each sound began, continued and ended.

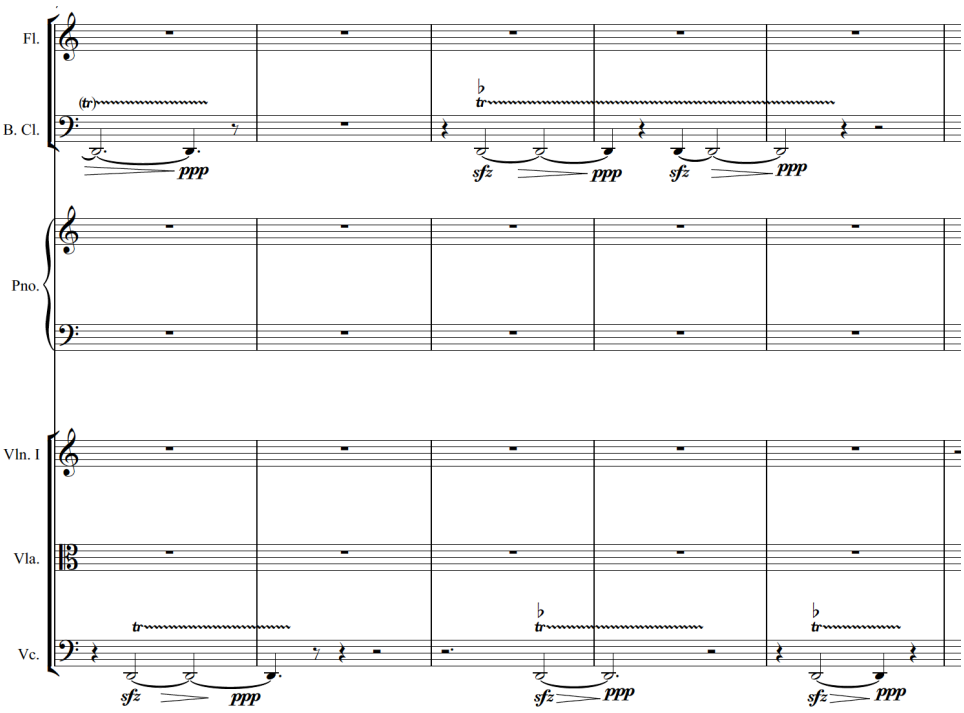
In my exploration of Spectromorphology as a collection of ideas and tools within my own instrumental composition I found it a helpful guide and this can be predominantly seen in *The Berkeley Octet.* Using Smalley's language as a starting point for *The Berkeley Octet* helped shape both macro and micro decisions; for example the motion of individual movements to the onsets, continuants and terminations of individual sounds.

Having discovered Blackburn's substantial research in this field and applying aspects of her methodology in *Turbulence* for Trio of Flutes and *Dissipation* for Quintet, I found that whilst most illuminating, if used alone as a composing tool, Smalley's Spectromorphology vocabulary  and approach may limit the compositional process, as Smalley warned from the outset. However, Blackburn's additional resources to Spectromorphology in composition including additional vocabulary and visualisations, provide a richer palette and stimulus for composers to draw from. Similarly Lasse Thoresen has made interesting developments in the analysis of music using Spectromorphology and I applied these to the compositional process. There is much more scope for further exploration into Spectromorphology as a compositional process particularly in the field of instrumental music. I hope that my initial investigations through this thesis provide helpful guidance to composers looking into this practice.

Through this research I have developed and expanded my creative approach as a composer of instrumental music. I have taken much from electroacoustic practice and applied it to the methodologies of instrumental composition.

These methodologies are both highly relevant, provocative and helpful when applied to the practice of composition. Whilst there is no need to be bound by terminology or methodologies, in the Western Tradition, composers have often composed to ‘rules’. In the 20th and 21st century this has opened up and the choice can sometimes be overwhelming for composers with such a broad canvas of possibilities and a rich palette of approaches. Therefore ‘rules’ or guidance can help in the compositional process. In my thesis I hope to have approached this with an open mind, to have learned from electroacoustic analytical models, applying them to instrumental music and given myself the freedom to compose with this knowledge but not bound by a rigorous process. The models discussed in my thesis have facilitated a full exploration of sound and textures of the 20th and 21st century and inspired my portfolio of original composition.

Through writing music, you learn to listen in new ways and to think in new ways. You often discover personal feelings through the process that are not always obvious at the surface; these appear in both your approach to writing music and the end result. I conveyed feelings of unrest through the sounds I select and their emergence and appearance, such as unstable, fluctuating notes in the Bass Clarinet in the piece *Explore This!* that begins with unpredictable but startling entry points punctuated by corresponding cello entries.




Ex.5.3 Elizabeth Black, *Explore This! bars 7 - 11.*

A sense of unrest is also created through unpredictable rhythms including waves of quintuplets and sextuplets, unco-ordinated snap pizz and slap tongue.

Writing music is both a deeply personal journey and a shared collaborative one, with the performers and the audience; it becomes a shared experience.

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