Towards An Integrated Art Music

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Abstract

This thesis consists of a portfolio of compositions in acoustic and electronic media with an accompanying commentary. The central theme of these works is the development of new strategies for the integration of diverse sound sources, styles and performance aesthetics. Key topics include the fusing of dramatic structures from classical and popular music, the blending of acoustic and electronic instruments, performance strategies for electroacoustic music with live musicians, how concert music can engage with the idea of "the mix" from commercial music, the creation of sound worlds that interpolate between conventional 'musical' ingredients and environmental sound.

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1. The reactive improvisation passages of the **Interlude** are absent in the flute part, as these were set down later
2. The flute's blown-air gesture at 561 is absent, as this section was added later
3. Bars 566-567 omit the pizzicato accents in the flute part
4. Bars 681-699 present an earlier, less virtuosic version of the flute part

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1.0 INTRODUCTION

Central to my music is an engagement with familiar styles, some contemporary and some historic. This way of working often invites the label of Postmodernist, a phenomenon that has been discussed at great length by critics on the arts. J.D. Kramer (2002 p.15) describes some key aspects of the approach:

> Postmodern music readily accepts the diversity of music in the world. ...wide-ranging quotations are readily included in postmodern works and are easily understood by postmodern listeners because – thanks to recording technology – music of all times and places can be a living force for composers and listeners alike**.**

Of course, this practice of inter-musical referencing or quotation is not new. From Mozart's *Rondo alla Turca* (1783) to Debussy's *Pagodes* (1903), composers have long employed elements of other styles, either in order to exploit an audience's pre-existing associations, e.g. as exoticism, or simply as a source of fresh inspiration. What Kramer is describing – the label of 'Postmodernism' – has come about simply as a matter of degree, i.e. the diversity of music available to a particular audience and therefore the number of meaningful connections a composer can make. Compared to Mozart's time, this degree is staggering, and contemporary composers have exploited it to great poetic effect. Schnittke's *String Quartet No. 3* (1983) plays on many (often simultaneous) references to the music of Lassus, Beethoven and Shostakovich (himself a prolific manipulator of musical quotations).

An audience's awareness of these references is vital for appreciation of such a work, and would have been nigh unattainable in a time before recording technology – the quoted works span a period of around 400 years. Defined in opposition to Modernism, which insists on constant progress towards new discovery, Postmodern music reaches forwards and backwards in disregard for the arrow of time.

As an introduction to this portfolio, I would like to begin by exploring my own inspirations for taking this approach, which have been shaped over years by a variety of musical experiences. In my career as a musician I have been a trumpeter, a jazz and orchestral trombonist, a choral pianist, an acoustic then electroacoustic composer. I wrote fugues at Clare College Cambridge, studied micropolyphony at the Guildhall School of Music and Drama (listening to Aphex Twin in my spare time), and realised musique concrète with BEAST[1] at The University of Birmingham. The result of this tour through the past and present is that I find myself in love with musical ingredients from many different worlds, with a strong desire to unite them in my compositions. This pluralism stems from the culture that we live in – one that strives to hold on to its past, preserving musical history through continued performance of ancient styles, even working to rediscover lost practices through drives such as the Historical Performance movement[2]. From recent styles – jazz, pop and rock – hits from every era continue to be played, adopting an on-going place in our culture. Powering this process is the engine of information technology, which lets us voyage through time and space via the radio, television and browser. A listener can cue up Berlioz, Daft Punk and Parmegiani on their

[1] The Birmingham Electroacoustic Sound Theatre.
[2] The movement is championed by ensembles such as the Orchestra of the Age of Enlightenment, Tafelmusik and Apollo's Fire.

computer at the touch of a trackpad – brought together through realisation with the same loudspeakers.

Every day, we drink a heady cocktail of music from past and present, all of it alive and full of present meaning, and my belief is that we, as composers, should embrace this in our works. But what does this mean, in a practical sense? How can these influences be knitted together, and what form should the end result take?

Answering these questions in my own music is the central goal of this thesis.

1.1 Postmodern Dilemma

> They seek originality in the postmodernist acceptance of the past as part of the present, in disunifying fragmentation, in pluralism, and in multiplicity (Kramer, 2002 p. 23).

Later in his essay, Kramer suggests a by-product of composing pluralistically: the resultant fragmentation, a 'lack of connection, lack of linear logic' (2002, p. 20), of the music. If accurate, this is a potentially problematic statement. On initial analysis it seems clearly false, as one can think of many examples where an overall sense of unity is formed from assembling dissimilar components[3]. Beneath the surface, each movement of Schnittke's *String Quartet No. 3* has its own arc and musical trajectory, with the quotations flowing together into a meaningful tapestry. However, regardless of any large-scale unity, a sense of fragmentation is present at the *surface level*; stylistic 'gear shifts' regularly break the musical flow. There appears to be an

[3] Stravinsky's *Symphonies of Wind Instruments* (1920) is perhaps the most influential example.

inherent trade off: surface consistency is sacrificed in favour of stylistic diversity and poetic interplay.

For me, this situation is a significant source of conflict, as unity in all forms is central to my thinking as a composer. Underpinning each piece is a single melodic strand – the 'Grande Ligne' of Nadia Boulanger (Pollack, 2000 p. 49) – that flows without a break from beginning to end. In order to engage with diverse styles is it necessary, at some level, to sacrifice unity? To address the challenge head on, I will attempt to demonstrate that this fragmentation is only one of the available expressive choices, and that an approach exists where disparate elements are united to produce something cohesive on multiple levels – a true integration. Launching from this proposition, I will now present my portfolio of compositions in the form of a narrative: the evolution of a style and my search for this 'integrated art music'. Theoretical, technical and expressive concepts will be discussed as they are encountered.

2.0 FIRST FUSIONS: Song for Piano Trio and Electronics

This trio was my first substantial composition at Birmingham, performed in workshop by the Hermes ensemble of Belgium on the 1st of May 2013. The piece was initially conceived as a textural process, taking inspiration from Ligeti's work for chamber orchestra, *Melodien* (1971). In the performance notes section, the composer describes:

> Three dynamic planes: a "foreground" consisting of melodies and shorter melodic patterns; a middle plane consisting of subordinate, ostinato-like figurations; and a "background" consisting of long sustained tones (Ligeti 1971, p. 2).

Ligeti's method of superimposing planes of contrasting yet connected material seemed a promising tool for integrating diverse elements. Building on this idea, the piece is composed of several discreet sound layers, which I shall describe in turn.

2.1 Sound Layers in the Song

Rhythmic Melody

Voiced by the piano in the opening passage (up to A), this strand takes its inspiration from the syncopations of Latin Jazz, in particular the music of Chick Corea. Its pitches are drawn from a multi-octave mode (Fig. 1).

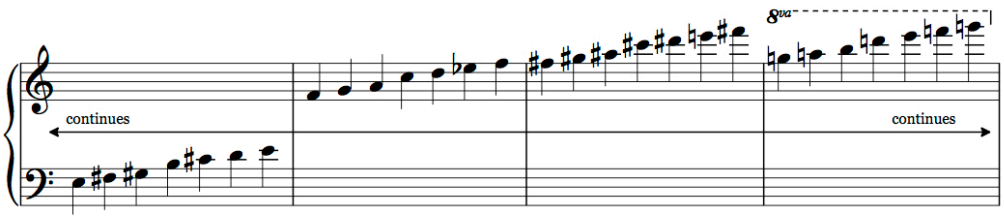

Fig. 1 – Multi-octave Mode from *Song for Piano Trio and Electronics*

A set of seven pitches is transposed by an octave plus a semitone to form the next iteration, for a total of 12 iterations (the complete chromatic). The mode has a colourful character due to the pentatonic scales contained within, yet remains chromatically distinct from the mixolydian flavoured modes of the other layers.

Drum Machines

This strand is voiced in the electronics and is composed of short, percussive sounds: classic[4] drum machines joined by gongs and bird tweets. The rhythmic feel was inspired by the song *Mookid* (1995) from the Aphex Twin album *I Care Because You Do*. This layer locks together with the Rhythmic Melody (coordinated via click track).

Song Melody

Before embarking on this Ph.D. I released an album of songs without words *For Now* (2012), taking inspiration from the works of Felix Mendelssohn. In doing so, I discovered a kind of instrumental melody that was direct and emotional – an important expressive vehicle. For this composition, I wanted

[4] Although contemporary advances in software synthesis allow for more and more convincing modeling of acoustic drums, the timbres of certain hardware drum machines from the 1980s and 1990s continue to be a source of character and expression in popular music. Examples include the Roland TR-808 and Yamaha RX-15.

to incorporate such a melody as part of a larger framework. Initially, I composed a single line (Fig. 2).

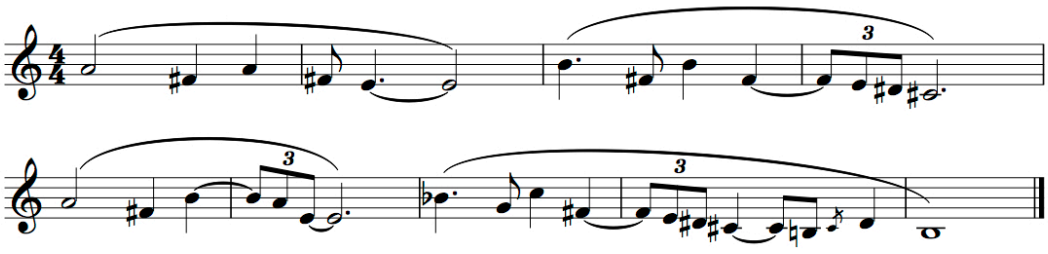

Fig. 2 – Song Melody from *Song for Piano Trio and Electronics*

To distinguish this strand from the rhythmic layers, I wanted to create the impression that it was occurring in a different realm altogether. Thus, it is stretched in both time and pitch (spread between high violin and mid-range cello), lasting the whole of the first passage. Its phrases inform the rising and falling patterns of the Rhythmic Melody.

Harmonic Layers/ Pads

Voiced largely in the electronics by a range of sampled and synthetic instruments, these sustained chords take their pitches from both the multi-octave mode and the mixolydian flavour of the Song Melody, working to bridge them together harmonically.

Vocoders

These devices create 'in-between' sounds from the live instruments (carrier) and the sounds of birdsong (modulator). Processing is performed live within Ableton Live using the built in vocoders, with the parameters automated in the sequencer.

Reversed Delays

These buffer-based effects are realised with Max for Live patches of my own creation – **DI_Buffercomposer** and **DI_Buffers**. Instructions for their use are included as Appendix 1. They are employed in key moments to sample, process and playback the ensemble in the manner of reversed delays, creating blurrings and rhythmic counterpoints. At the very end, they come into the foreground – at bar 296 the ensemble plays the theme backwards, which is then sampled and 'righted' by the delay. Again, parameters are automated in the sequencer.

2.2 Reflections on the Song

Performing this piece in the Hermes workshop was a stressful experience due to the number of previously untested dimensions in the composition. With time to reflect, however, this experience turned out to have very positive results as it provided a long laundry list of challenges to address in future compositions.

- **Amplification.** Clear from the recording, is that it was very challenging to keep the ensemble and the electronics balanced. Whilst the acoustic instruments have a wide dynamic range, the electronic drums do not – they are square, compressed, constant. Much of my work at the mixer went into essentially undoing the dynamic range of the players so that they sat well with the drums – a less than ideal situation.

- **Timbre.** The timbral combinations in this work are not well planned. On the contrary, I was eager to put sounds together in an exploratory way to

see what worked. In hindsight, I am not satisfied with the combination of acoustic and electronic timbres. The biggest issue is the *perceived loudness* of the electronic drums, i.e. even when low in volume, they always seem loud and forced due to their spectral content. When combined with the instruments at a soft (or even medium) dynamic, it is an unnatural sounding combination, even with amplification.

- **Samples**. Many of my choices of electronic sounds seem a touch arbitrary to me now. There is little timbral connection between these layers and the ensemble, i.e. the synthetic and the acoustic. Also, the electronic samples range widely in quality, as I did not have an organised plan for recording them – rather, I would find each sound as needed.

- **Mix.** Perhaps the biggest disappointment was the overall mix of the final piece. It sounds 'hollow' to me – the opposite of the 'full' sound of the popular electronic styles that inspired its creation. A detailed study of mixing and mastering in pop music is clearly necessary in order to capture this impression – see Chapter 5.

3.0 EXPLORING TIMBRE

Kettle Sampler, Piano Poems

Having identified the main obstacles to my research, I planned a series of projects designed to build a style from the ground up. The first step: looking closely at timbre in two acousmatic compositions. To gain an objective viewpoint on timbre, it was vital to strip away the 'preconceived sound abstractions' (Schaeffer, 1952) of existing styles, i.e. the melodic, harmonic and rhythmic structures that permeate our everyday music. Ultimately, my musical goals hinge on working closely *with* these structures, but in order to gain a fine control over timbre, they would have to be temporarily set aside. Instead, each sample would be treated as a 'discrete and complete sound object' (Schaeffer, 1952), stripped of context, leaving only its sonic properties. In this way, I would be able to focus on timbre as an independent force for creating character, cohesion and narrative.

3.1 Kettle Sampler

This piece is simple study in musique concrète, a genre of music that frees sounds from preconceived abstractions – information relating to their origins, cultural significance and pre-existing musical function – and treats them as self-contained (or 'concrete') sound objects, to be combined and manipulated in accordance with their timbral qualities. My composition draws all of its material from the sound of a boiling kettle, recorded with a pair of AKG 414 microphones in cardioid polar pattern.

3.1.1 Sound Layers in Kettle Sampler

Hissing

Dominating the upper frequencies of 10 kHz+ are sounds of hissing steam, treated with an extreme high pass filter. An enhanced sense of stereo is created via a 'ping-pong' delay[5], with a slowly wandering delay time of 1-7 ms that creates new frequencies in the manner of a comb filter.

Boiling

This layer consists of samples of bubbling getting more and more intense, and is used as the foundation for the piece's several crescendo passages. In the second half of the work, they are treated with resonant filters in order to bring out a focused pitch at around 1.1 kHz, which wanders and gradually rises for the final climax (the click of the switch).

Subwoofer Bubbles

In order to access the extreme low register, it was necessary to modify some samples, as insufficient low frequency content had been picked up by the microphones. The sound of bubbling is shifted down in pitch and treated with EQ to leave only the frequencies below 100 Hz.

3.1.2 Reflections on Kettle Sampler

Drawing all of the sound material from a single source can help to build a strong sense of timbral cohesion to the work (although it can be easy to undermine this – see Chapter 6). Variety then becomes the challenge, but with

[5] A ping-pong delay alternates the delay taps between the left and right channel.

a sufficiently interesting source, a diverse sound palette can be created. What challenged me most was the task of creating a sense of musical narrative without the conventional ingredients. Two dramatic principles emerged:

- **Gradations of Timbre.** By arranging my sonic ingredients according to certain dialectics – e.g. rough to smooth, steady to chaotic – it was possible to construct both short-term dialogues and long-term progressions.

- **Banded Spectrum.** By characterising each sound layer in a specific, often narrow frequency band, the overall narrative of the piece becomes about journeying through and revealing the complete spectrum. This proved a simple but effective device, with rising frequencies leaning expressively towards an increase in tension and furthering of the narrative.

3.2 Piano Poems

Having gained some new confidence and control over timbre as a medium, it was time to apply these skills to some more familiar material – the risk of being blinded by preconceived sound abstractions being much reduced. *Piano Poems* takes much of its sound material from my Witton Upright piano, recorded at various angles and distances with AKG 414 microphones.

Programme note from the first performance on 14th of February 2014 at the IKON Gallery:

> My Witton upright piano is one my oldest musical companions. Bought by my mother for her studies, its mellow tones ever audible as

> I was growing up, it now lives with me in my composing studio. Somehow, emotions seem to flow easier into sound with a timbre that evokes such fond memories. My goal for this short series of compositions was to explore new timbres and strange combinations of sounds. The gateway for discovery: the familiar tones of the Witton – recorded, transformed and layered with diverse sounds to create musical poems, each with a distinct shape and emotional landscape.

Gradually, poem-by-poem, the piece seeks to rediscover the traditional ingredients of harmony, rhythm and melody through the lens of a timbral composition. I will discuss the creation of two movements in detail: the 2nd and the 4th.

3.2.1 2nd Movement: Maybe

This movement makes heavy use of a banded spectrum in order to distinguish its layers and propel the narrative. At the opening, two layers are present: an extreme low and an extreme high. These are both made from the same piano improvisation, which was then sped up with Ableton Live's transient-tracking timestretch function[6]. The lower layer was shifted down an octave in pitch, whilst the upper layer was shifted up 1 kHz with a frequency shifter, thus mangling its harmonic content.

The result of these transformations is that timbre – frantically clattering high and lows – becomes the most interesting dimension of an originally harmonically conceived sound. To enhance this sensation, the piano is joined

[6] A tool that cuts out the audio between the transients – speeding up the music without modifying the transients themselves.

by other sounds of a similar timbral character: clattering rocks and hissing sand. This technique – where sounds are brought together solely because of their similarities in timbre – was introduced to me by Jonty Harrison in a tutorial earlier in the year, and this is my first composition to make use of it. I shall hereafter refer to it as a *sonic similarity* connection, a vital tool for building sonic relationships, even between sounds of wildly different origins.

Melody

Due to this polarisation of highs and lows, the piece's opening has a pronounced spectral gap in the mid-range. This created an opportunity to craft a long-term progression by gradually filling in this space with an evolving melodic line – a developing variation around a simple motif (Fig. 3).

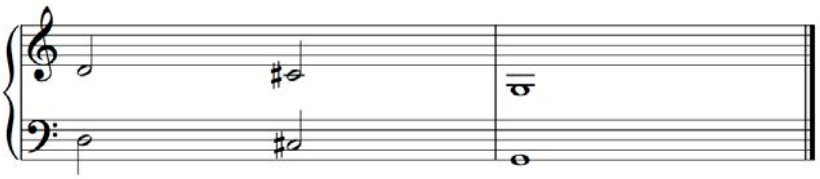

Fig. 3 – Germinating Motif of *Maybe* from *Piano Poems*

Short phrases gradually build up in length, range and intensity. Although this material is very different in nature to the other layers (a preconceived abstraction to be sure), I was able to find many moments of counterpoint between this and the aforementioned clattering. The end of a melodic phrase would provoke a reaction in the high clattering – an increase in intensity/activity – which would in turn filter down to the other layers.

Melodic and timbral material were complementing each other in a way I had not achieved before.

Improvisation

In post-analysis of the piece, by far my favourite sounds are those created by sheer serendipity. A piano improvisation, loosely based upon a mode, would be playfully put through a number of electronic transformations with no end goal in mind. An interesting or characterful result would then become the foundation of a new movement. I employ this technique extensively in the later compositions of this portfolio, but always whilst nudging things towards a specific result. *Piano Poems* is the only composition where the sounds are allowed to grow in a fully organic manner. I shall pick up on this in my Conclusions of Chapter 8.

3.2.2 4th Movement: Mess/Clarity

Inspired by the *Sonatas And Interludes* (1946-1948) of John Cage and *Papalotl* (1987) by Javier Alvarez, this movement engages with the wealth of percussive sounds obtainable from inside the piano. The original samples, improvised with no end result in mind, are rather chaotic in nature – strumming the strings with a plectrum, stopping them to produce harmonics and muted tones, rustling the soft pedal. Listening to them over and over, I began to hear rhythms of an energetic and syncopated quality: dance music. Problematically, no two samples had the same pulse, and so any combinations would destroy this sensation of rhythm. In order to unlock this latent rhythmic potential, I spent time locking the best samples to a grid of

124 BPM. For some – the ones with fewer transients – this was done by hand, whilst others were treated with Ableton's beat-warping tools. I was then able to treat this new crop of material in the manner of electronic drum loops by combining, slicing and 'glitching' them in break-beat fashion.

Melodic Outbursts

There are two moments in the piece where melodic material emerges to dominate the foreground in a conventional melody + bass + rhythm texture. The first of these, at 46 seconds, opens on a B major 2nd inversion chord. Although, most likely, the music up to this point has not been heard tonally, it was the metallic twangs of the previous passage that precipitated this harmonic choice and the emergence of this new kind of material. Like the latent rhythms of the un-quantized percussion, these resonant tones suggested to me a strong centre of C♯ minor, waiting to be capitalised on as a leading harmony to the next passage.

Rediscovering Music

The process of rediscovering rhythm, harmony and melody from the implications of timbral material becomes part of the drama of this movement, in the manner of the newspaper seller of Steve Reich's *City Life* (1995). A by-product of this, however, is that it lends the music a synthetic quality, drawing attention to the hand of the composer and tools of the sequencer warping the sound material into unnatural positions. For this movement, I feel it worked expressively rather well, resulting in a cartoonish character that I was able to embrace. However, a key danger is that – as these sound

modifications are made gradually, one on top of another, a composer may not be aware of just how 'synthetic' the result may be perceived as by a listener. Either this synthetic character must be integral to the work, or the modifications must be made with incredible subtlety.

4.0 DRAMATIC STRUCTURES OF POPULAR MUSIC

An important facet of my Ph.D. research was to take time to reflect on and analyse the stylistic influences in my music. In this chapter, I will outline some elements from the *dramatic structures* of popular music that have captured my imagination. By dramatic structures, I refer to the way that the ingredients of a piece of music – e.g. lyrics, melody, harmony, timbre – relate and come together to form a *unique* dramatic arc over the course of the composition. To illustrate this, I shall discuss some recent evolutions in the formal principles of popular music and their contributions to the expressivity of the music.

> While song forms do not usually have as close a semantic relationship with lyrics as harmony, melody, or sound, anyone involved in the enterprise of interpreting songs should be aware that expressive content such as tension and boredom, calm and impatience, departure and homecoming, order and impudence, chaos, change, surprise, satisfaction, or unease can be both reinforced and undermined by song forms (von Appen and Frei-Hauenschild, 2015, p.2).

In early twentieth century, the **B** section of the dominant **AABA** form[7] was the crux of the drama. By offering an opposing mood to the main theme – carefully chosen to evoke an inverse emotion – it laid the way for an emotionally charged return transition, afterwards casting the main theme in an altogether different light[8]. It is in this transition that the heart of the song is revealed: the reason that explains the whole ritual. One of my favourite examples is the Beatles single *I Want To Hold Your Hand*[9] (1963). The **A** section,

[7] Also referred to as the **Thirty-Two-Bar** form, the 'principle form' of American song in the 1920s-50s (Wilder, 1972 p. 56).
[8] A poetic device that hails back to the Da Capo arias of the sixteenth-eighteenth centuries.
[9] Also discussed in terms of narrative by Negus (2012), but primarily for the narratives that it creates in relation to other songs.

full of eagerness and confidence, is counterbalanced by a **B** section of tender, introverted quality, whose pauses in the lyrics encourage moments of reflection. The return transition – three powerful, progressively rising repeats of 'I can't hide!' – is the most intense point of the song, breaking the composure of the opening to reveal that the singer is more passionately, more madly in love than we had realised, imbuing the **A** section's recapitulation with a new sense of determination.

Moving to the present day, the form that has largely replaced this is the **Verse/Chorus**. This transition took place gradually in the rock music of the 1960s, where by the mid-decade 'contrasting verse-chorus forms become the norm' (Covach, 2006 p. 40). This form draws its life from an underlying dramatic arc, as most often, we do not hear the full chorus until the second minute of the song. Typically, after an attention-grabbing opening that hints at the chorus to come, we are presented with a verse whose partial role is to create a sense of anticipation that grows until the chorus' final arrival. Rod Temperton's *Thriller* (1982) for Michael Jackson, one of the most successful pop songs ever recorded, crafts this shape in an expert and unique manner. Setting aside the Hammer horror introduction, the song proper opens with a tantalising glimpse of the chorus' ecstatic trumpets, before settling in to the steady beat of the verse. With the verse's thinner instrumentation, emphasis on chord IV (as opposed to I) at the beginnings of the phrases, and narrative style of lyrics, a sensation of incompleteness and instability is created – drawing the listener in irresistibly. When the chorus arrives with full trumpets, backing-vocals and beat, this tension is released – to the listener's great satisfaction.

Moving to the twenty-first century, a further development in popular music teleology has come to light: the extended *Bridge and Drop*[10], a dedicated passage for creating anticipation. The **Bridge** section (or **Pre-Chorus**) dates back to the early popularity of the **Verse/Chorus** form, but it was the emergence of electronic dance music in the late 1970s that imbued this section with a new dramatic purpose. With the advent of digital processing and looping techniques, EDM layers drums and synths into textures of high density and consistent loudness. Unfortunately, no matter how intense a musical texture, our ears and brains will always adapt, tire and lose interest. Our mind and body are drawn to novelty, and when a sound is unchanging, we divert our attention elsewhere. EDM producers have found an ingenious way around this. For a substantial portion of a track, this maximum-texture is 'withheld', and the experience becomes about the anticipation of its arrival moment – termed the **Drop** or **Bass Drop**. The anticipation passage, or the **Bridge**, can employ a number of devices in order to:

- Hint at the imminent maximum-texture
- Avoid the key frequencies of the maximum-texture without losing rhythmic momentum
- Increase the tension right up to the point of release
- Keep the listener guessing as to when the **Drop** will occur

To illustrate this device in detail, I shall analyse the first 80 seconds of the electro-house track *Split The Atom* (2010) by Noisia in terms of dramatic effect (Table 1).

[10] The phenomenon does not yet have a formalised terminology.

Time (nearest second)	Number of Bars	Description (sounds entering and leaving)	Dramatic Effect
0:00 – 0:08	1 beat upbeat, 4 bars of 4/4 at 125 BPM	Rhythmic clicks on the beat, blurry clouds of resonant synths and children playing.	Tempo is established, but chaotic textures confuse the rhythmic feel. We are disorientated.
0:08 – 0:16	4	Clouds dissipate. Central synth ostinato fades in, wobbling chaotically between sub and mid range.	We become aware of the groove, but its frequency content is in flux - a further disorientation.
0:16 – 0:24	4	Countermelody 'vibrato synth' enters.	Evokes a sense of mystery (reminiscent of a Theremin).
0:24 – 0:31	4	Rhythmic clicks fade out.	A moment of rhythmic doubt.
0:31 – 0:46	8	Hi-hat loops enter, forming a complex syncopated rhythm with a pronounced gap at the end of the bar. Vibrato synth expands to duo harmony. Central ostinato settles into the sub range.	Doubt is dispelled: the full rhythmic feel is revealed, but is carefully partitioned into the high and low registers. The role of the ostinato as a bass line is made clear. We are frustrated by both the rhythmic and spectral gaps.
0:46 – 1:02	7 bars of 4/4, 1 bar of 3/4	Hi-hats fill out the complete bar. Central ostinato gains overtones in the mid range. Passage ends with an irregular bar, articulated by a reversed reverb rush and kick on the new downbeat.	Things move forward again, and we are rhythmically satisfied with the completed groove. However, the funnelling-in of the texture on an unexpected beat indicates that this was premature.
1:02 – 1:05	2 bars of 4/4	Drums cut back to on-beat clicks. Central ostinato contracts to single dyad (major third) in triplet rhythm. Other synths cut.	The narrow frequency dimensions and repetitive monotony of this passage create a great deal of tension. We know that a release is coming, but not when it will arrive.
1:05 – 1:09	2	'Glissando synth' enters, steadily rising.	A sense of expectation is created: we are waiting for the glissando to reach a high octave G.
1:09 – 1:11	1	Snare fades in to join triple rhythm.	Rhythmic intensity increased.
1:11 – 1:15	2	More overtones added to central ostinato (LP filter opening up), kick drum fades in to join triplet rhythm. Glissando synth approaches high point.	The glissando coming into phase seems to trigger a wholesale opening up of the frequency spectrum – like a monstrous machine powering on. The completion of this process suggests that a release is imminent.

1:15 – 1:17	1	On the 4th beat: **Hiatus** – a pronounced snare heralds a general pause. The momentary gap is filled by the song's tagline, 'Split The Atom'.	The music chokes, seemingly derailing. Expectation is thwarted one last time before the final arrival.
1:17 onwards	4, continues	The **Drop**: full house beat (kick, snare, hi-hats), a mesh of rhythmic synths in middle and bass range.	Release: rhythmic and spectral satisfaction - the maximum-texture.

Table 1 – Analysis of *Split the Atom* (2010) by Noisia, 0-80 seconds

The 'maximum' and 'withholding' textures of *Split the Atom* are strikingly different, not just in terms of amplitude but also, crucially, in their spectral makeup. Figures 4.1 and 4.2 show a comparison of spectral sparseness in the withholding texture (with energy focused at narrow frequency and time coordinates) vs. the fullness of the maximum texture (energy saturating the frequency spectrum).

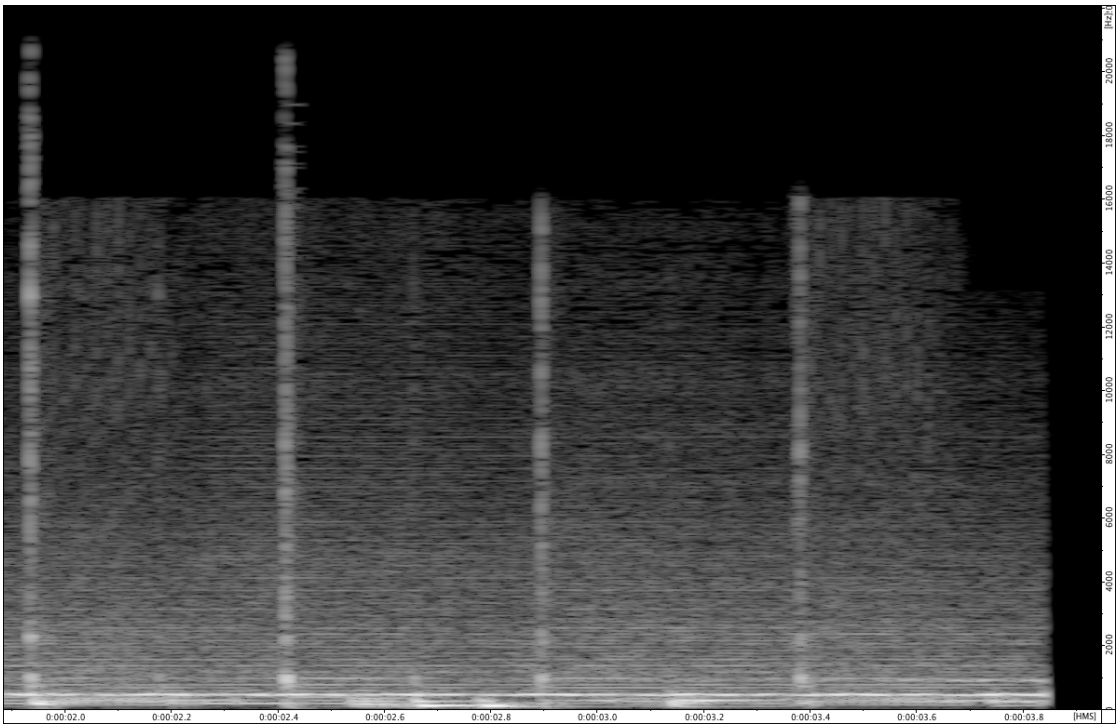

Fig. 4.1 – *Split The Atom* Sonogram**:** Withholding-texture, beginning 0:21

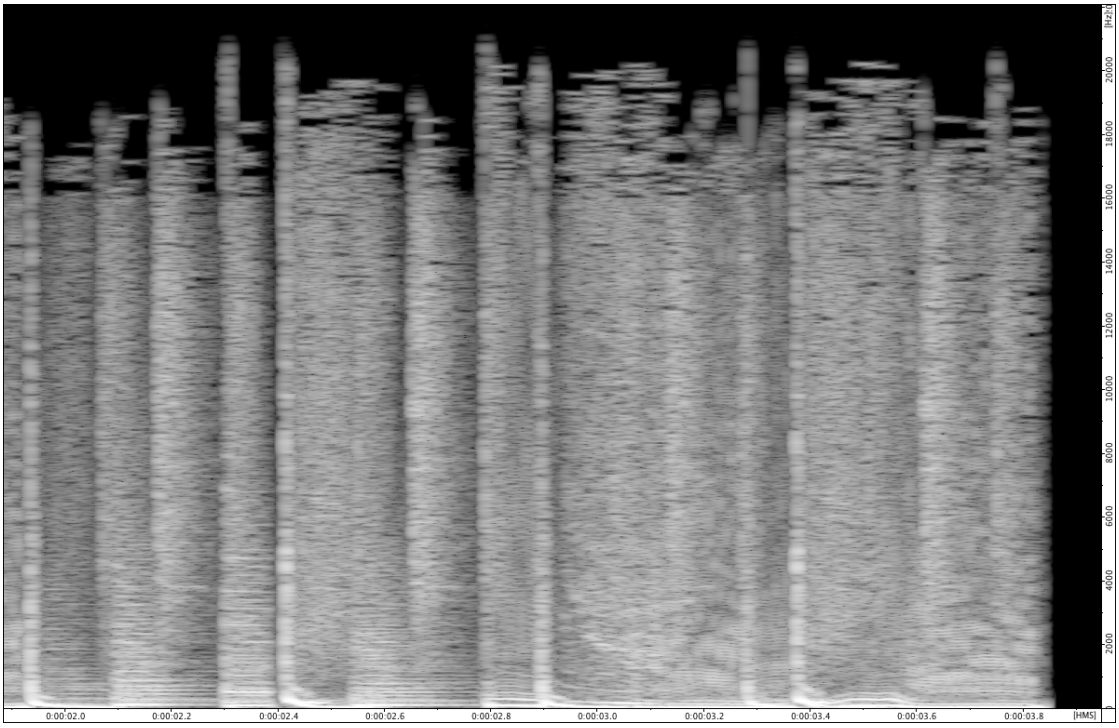

Fig. 4.2 – *Split The Atom* Sonogram**:** Maximum-texture, beginning 1:17

Over the course of the track, the ratio of maximum-texture to withholding-texture is:

Withholding 0:00 – 1:17 = 77 seconds

Maximum 1:17 – 2:33 = 76 seconds

Withholding 2:33 – 3:34 = 61 seconds

Maximum 3:34 – 5:22 = 108 seconds

Withholding (ready for the next track) 5:22 – 5:40 = 18 seconds

Total Withholding = 156

Total Maximum = 184

Ratio = 1 : 1.18 (two decimal places).

For just under 50% of the time we listen and wait, impatiently tracking the details that hint towards the full-bodied release that we expect – and begin to crave.

For me, these are compelling examples of popular music exploiting its sectional conventions in order to create expressive relationships, the sum of which is a dramatic arc that is unique to the song. Discovering these techniques has been a rewarding experience, and has done much to inspire the music of the following chapters.

5.0 SONGS INTO SYMPHONIES

Symphony for four violins and electronics, *Briar Rose* for sextet

Around the middle of my Ph.D. studies, I was struck with a sense of frustration, which ultimately gave birth to an intriguing idea. My compositions were engaging with popular music more and more, but I was becoming increasingly unsatisfied with the strategy of dropping 'chunks' of pop material into a developing variation style composition. Time and again, this would fail to capture the sense of flow and textural fullness that I was trying to engage with. It occurred to me – what if I come at this from the other direction? Would it be possible to compose in the forms of popular music, but expand and amplify the existing dramatic structures in order to create an extended piece of music?

The essential structural device of pop music is a pronounced, stepped transition between energy poles, i.e. verse into chorus. One creates expectations, the other fulfils. The key is what happens next. Usually, we find ourselves looping back to the beginning, but what if:

- The chorus is followed by a new low-energy section, creating new expectations
- The chorus is followed by an even higher-energy section
- A mixture of the two – a new section that is simultaneously 'fuller' in some ways but 'withholding' in others

My inspiration for these ideas comes from a number of progressive contemporary bands including Radiohead, Three Trapped Tigers, and The Mars Volta[11], each having written songs that expand the verse/chorus model[12] with additional sections.

I shall now discuss my first work to implement these ideas: the *Symphony* for four violins and electronics.

5.1 Symphony for four violins and electronics: an experiment in form

The first movement of the *Symphony* employs the verse/chorus paradigm as a way to link extended chains of sections. This was a very conscious compositional process and, in order to illustrate my method, I shall describe the first two of these chains in detail (Table 2).

Bars	Description	Dramatic Intention
1 - 15	CHAIN 1: Rising 1st violin melody, 3+3+2 rhythmic feel established gently in others. Light chimes in electronics, hints of drums. D♭ harmonic centre, square phrases, mid-range frequency focus.	**Verse**. Sets the mood whilst creating expectations for: stronger percussive rhythms to emerge, a broadening of the frequency range.
16-18	Harmonic instability, rising melodic sequences. Irregular phrase length.	**Bridge**. Signals that a change is imminent.
19 - 29	D♭ centre re-established, along with new marcato quaver rhythm and high-reaching melody. Drum machine snare and hi-hat reveal an overriding 4/4 rhythmic feel, but avoid the downbeat.	**Chorus**. Sense of arrival and fullness from comparative rhythmic clarity, wider frequency range.
30 - 32	Harmonic instability, rising melodic sequence. Irregular phrase length.	**Bridge**. Signals that another change is imminent.
33 - 40	3+3+2 rhythm returns heavily in all four violins. Full electronic beat revealed, plus bass line. Unfolding harmonic sequence.	**Chorus II**. Sense of further arrival and fullness from increased rhythmic clarity and filling out of the bass frequencies. Harmonic sequence creates instability, however.

[11] This tradition harks back to the prog rock bands of the 1970s, e.g. Pink Floyd, Jethro Tull.
[12] *Paranoid Android* by Radiohead, "7" by Three Trapped Tigers are particularly good examples.

41 - 47	Opening melody returns, rising melodic and harmonic sequence, full electronic beat continues.	**Verse**. Continued textural fullness, unstable due to progressing harmony.
48 - 52`	Sudden cut back of texture. New 7/4 rhythmic feel. Rhythm fades in on hi-hat, then suddenly revealed in full.	**Bridge**. Cutting back in an unexpected place creates sensation that we are heading to a new destination. Repetition, rising melodies and harmonies reinforce this.
53 - 55	Climax chord, fade.	**Chorus**? We expect a chorus here, but instead the energy is dissipated, ready for the next chain.
56 - 61	CHAIN 2: Three part harmonised melody (minor key), rising pizzicato in 4th violin. Rain sounds in electronics.	**Chorus**, although we do not necessarily know this until the next section. By comparison, there is a sense of fullness from the harmonies and emphasis from the repetitions in the melody.
62 - 67	2nd violin solo, falling pizzicato in 4th violin.	**Verse**. Takes the form of a 'call and response'. Falling lines dissipate energy.
68 - 77	Three part harmonised melody returns, plus full electronic beat and harmonies, rising pizzicato in 4th violin. Melody rises to reach held chord.	**Chorus**. Sense of fullness from a suddenly filled in fortissimo texture – melody, harmony, bass, beat.
78 - 81	New 7/4 rhythmic feel, articulated by drum machines. New three part harmonised melody (major key), shorter phrase length. Ostinato in 3rd violin.	**Chorus II**. Further sense of arrival from major key, emphatic rhythms and repeating phrases.

Table 2 – Chains 1 and 2 of *Symphony* 1st Movement

This is approximately one third of the piece, and we have so far heard two contrasting groups of material. Looking for a way to complete the picture, I drew on a familiar formal principle – the sonata allegro of the eighteenth and nineteenth centuries – as a method for handling a multi-thematic work, a decision which led to the work's title of *Symphony*. My main attraction to this method is its emphasis on large-scale rhyme, i.e. the recapitulation of main themes at around the two-thirds mark as a key dramatic event. The centre of the work then becomes about breaking down the musical ingredients to explore new shapes and combinations, all the time building momentum for the ultimate return.

Each of the other two movements explores a different way to expand the verse/chorus paradigm. As with the first, the third movement looks into the nineteenth century for useful ideas – employing a double theme and variations form. An unstable, rhythmically shifting first group is juxtaposed with a second group in a stable pulse. The variations form was especially fruitful in provoking the overall drama of the movement, as it encouraged transitions between different styles of popular music. The movement can essentially be viewed as a journey of styles. In its course, the piece takes stylistic inspiration from: trip hop, funky house, bhangra and finally Irish folk music, where the themes are superimposed in 6/8 time (bar 680).

By contrast, the second movement takes a different approach to expansion by incorporating a new ingredient altogether: environmental sound, sampled from the London Underground via Zoom H2 field recorder. This is part of the poetry of the movement (dealing with some emotional experiences in my time living in London), but also a chance to explore a structure within a structure. This concept is greatly developed in my final composition *Europa, a tone poem for flute and electronics* and discussion will be saved until Chapter 7.

5.1.1 Mixing the Symphony

I have talked at length about the dramatic structures of popular music, but an equally important dimension, and one that I aim to engage with, is the idea of "the mix" – a consistently full-sounding (at the maximum-texture), spectrally balanced audio product. Perhaps the best way to illustrate is with waveforms. Here is a 30 second segment of a classical style recording (Fig. 5):

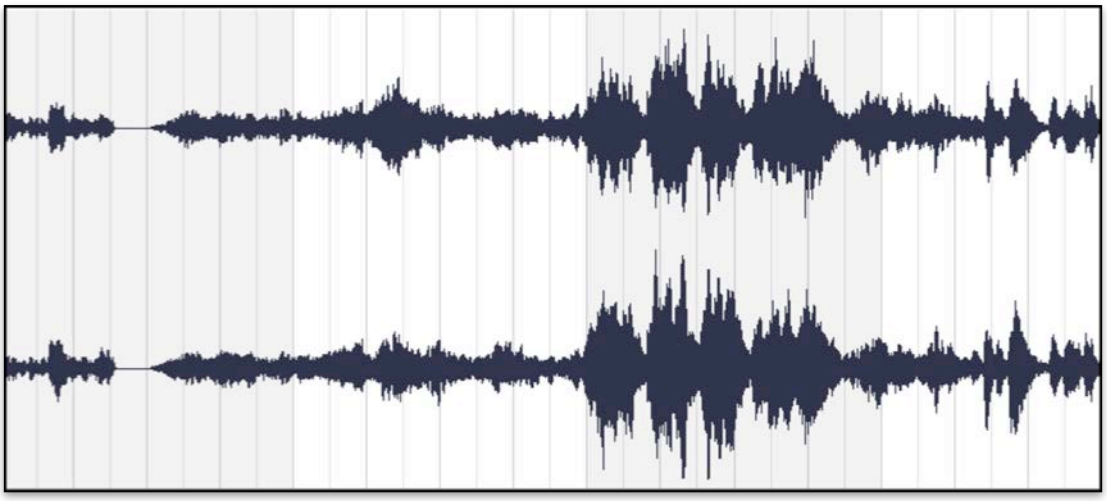

Fig. 5 – Mozart String Quartet No. 15, K. 421: I. Allegro (1783): Waveform 0:00 – 0:30

At the other end of the spectrum, here is the previously referred to *Mookid* at the same amplitude and time resolution (Fig. 6).

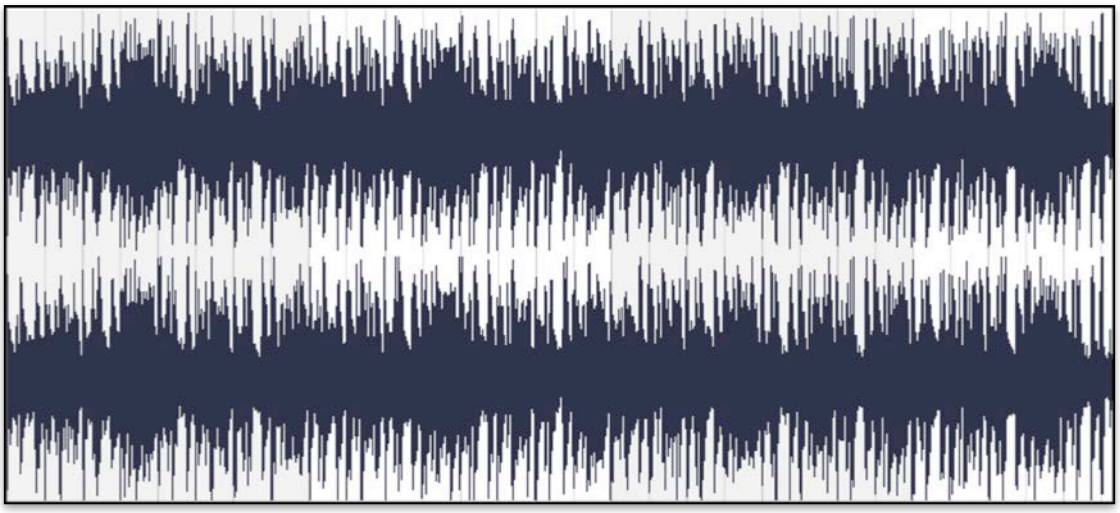

Fig. 6 – *Mookid* (1995) by Aphex Twin: Waveform 0:00 – 0:30

Readily apparent is *Mookid*'s consistent loudness and regularity of percussive peaks in comparison to the constantly fluctuating (or 'breathing', an expressive term preferred by audio engineers) dynamic range of the Mozart. Both of these aesthetics have their appeal. On one hand, a wide dynamic

range brings variety and dramatic depth to the music, but on the other, a compressed sound provides a sense of fullness that can be immersive for a listener in a physical way[13], as well as ensuring that the music can always be heard in a noisy environment. The trend for greater and greater compression and consequent reduction of dynamic range has been referred to popularly as the 'loudness wars', a 'competition' between music producers to create the most consistently loud – and therefore attention-grabbing – product[14]. How is this sound achieved? Partly, it stems from the nature of the musical ingredients (i.e. the instrumentation), as drums machines and synths can be 'square' in nature unless effort is made to make them sound more organic. The final product results from an intensive studio process of applying EQ and compression to every element of the track – bass, harmony, melody, each component of the beat – and adjusting levels to produce the desired balance in accordance with the track's style. Finally, the mix is passed to a mastering engineer, who works to alter its spectral content and dynamic range (again with compression and EQ) to match that of a reference track – a song in the desired style. For example, the Sage Audio mastering studio in Nashville, Tennessee, informs clients that '…a few different reference songs that have a similar sound desired is excellent for giving the mastering engineer an idea of your musical vision' (Sage Audio, 2008).

When mixing and mastering the *Symphony*, a hybrid work with one foot in the concert world, the other in electronica, I did not have access to a suitable reference track. As the *Symphony* is a work for concert performance, I was not

[13] This effect is particularly noticeable with bass frequencies, as they are felt through the body as vibrations.
[14] Reactions against this trend have led to the establishment of a 'Dynamic Range Day' – Shepherd, I. (2011) **Dynamic Range Day** [online]

at liberty to compress the violins by more than a little, as this would result in unwanted feedback with the omnidirectional DPA microphones. Having experienced the hollowness and disparity between instruments and electronics that can occur without sufficient planning (e.g. the *Song* of Chapter 2), I began the mix strategy of the *Symphony* right from the outset by choosing an ensemble that could create thick and focused textures. As a result, the four violins frequently play in close harmony, producing a rich sound in a narrow range, thus leaving room for electronic elements to be placed above and below. The natural dynamic range of the violins (gently compressed, with boosts for solos) is therefore the central pillar of the mix, for both live and recorded versions of the piece. The electronic elements are brought up as far as possible without obscuring the violins, and treated with EQ to leave room for key frequencies in the melodies. The result is a compromise between dynamic range and fullness, illustrated by the waveform below (Fig. 7).

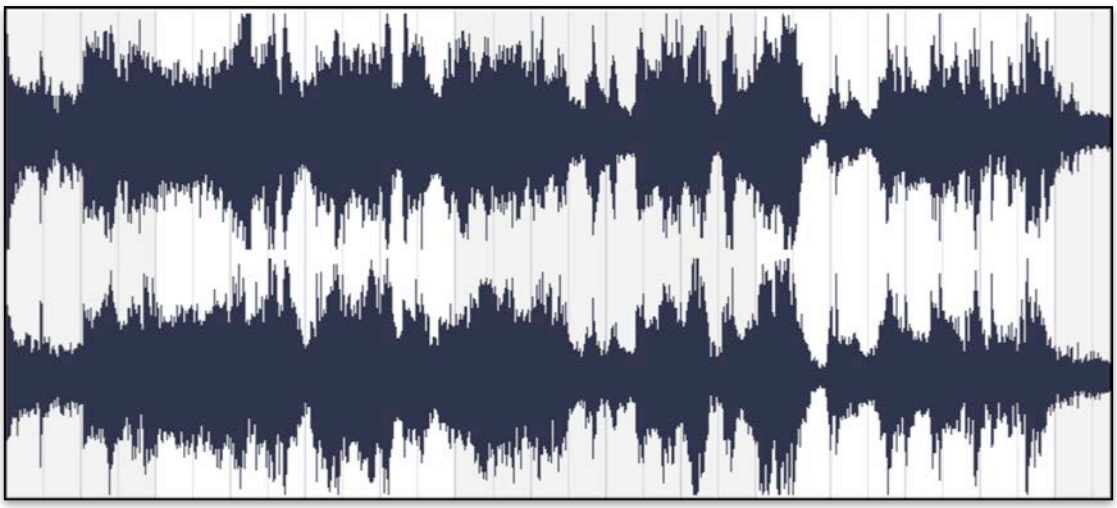

Fig. 7 – *Symphony* First Movement: Waveform, bars 33 - 51

5.1.2 Reflections on the Symphony

The *Symphony* is an important turning point for me in terms of style. Because of this, I had to invent many new techniques in order to create it, many of which leaving clear room for improvement.

- **Coordination In Performance.** The four violins are kept in sync by a click track sent to a conductor. Even so, because of the demanding tempos, constant rhythms and challenging writing (double stops in particular), the parts are very challenging to play with the kind of precision that the work demands. Orchestration textbooks teach what is possible and what is comfortable for an instrument, but a new category of knowledge is needed for judging what is practical within a precise, metronomic tempo.

- **Sound Sources.** The sound material for the electronics is a mixture of my own recorded sample library and several sample packs. As a result, samples vary in quality, and at times the textures lack timbral cohesiveness. Future compositions call for more planning in this regard.

- **Form.** In general, I am pleased with the new formal principles employed in the *Symphony* but, because of the importance of testing them out, I approached them rather single-mindedly. As a result, the work feels a little one-dimensional and lacking in stylistic depth.

- **"The Mix".** By engaging with the commercial concept of the mix, I invite judgement of this piece by the high standard of quality that commercial

recordings conform to. Although my mixing skills were much improved by the undertaking of this project, continual focus is required in order to attain the highest standard.

One final topic raised by the *Symphony* is that of the live vs. studio processing of audio. At the outset of my Ph.D. I was eager to explore live processing techniques, with the sounds of live instruments to voyaging into the electronics as a way of interacting the two worlds. What I hadn't made the distinction between, however, was an *expressive* vs. a *practical* effect. Expressively, the *Symphony* contains moments where the instrumental audio is taken up and transformed by the electronics (although this is more prominent in the works that follow). These moments are simulated; the transformations are performed in the studio. The reason for this is primarily practical, as it is not important to the meaning of the work that the sounds are being transformed spontaneously. For all of these moments, I require a very specific result, and by far the best way to achieve this is in the studio. Instead, live processing comes into its own when *improvisation* is involved – when the spontaneity of the music is an important part of its meaning. This will be discussed in Chapter 7 and in my Conclusions.

5.2 Briar Rose for sextet

Briar Rose was written for the Hermes ensemble workshops of May 2014 and was later performed in concert by the University of Birmingham Contemporary Ensemble on the 10th of March 2015. My goal for the piece was to enrich the formal principles of the *Symphony* by introducing multiple,

simultaneous strands of activity. The work contains three themes: opening with an Appalachian-folk inspired melody for solo viola (Fig. 8)

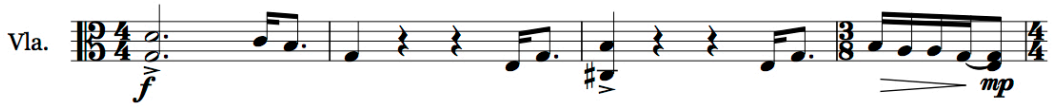

Fig. 8 – *Briar Rose* Melody 1, Viola

In moving forward, as well as employing the verse/chorus paradigm, I wanted to experiment with nesting additional themes inside this framework. In bar 10, the flute begins to unfold a second folk-inspired melody, which does not emerge in full until bar 43 (Fig. 9).

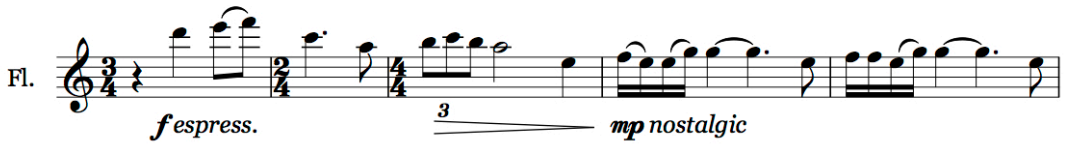

Fig. 9 – *Briar Rose* Melody 2, Flute

In the same way that the first chorus of the *Symphony*'s third movement (bar 513) is in fact an altogether new theme and metrical feel[15], *Briar Rose* reaches its chorus at bar 29 to arrive at a third theme, this time with a rock-inspired feel (Fig. 10).

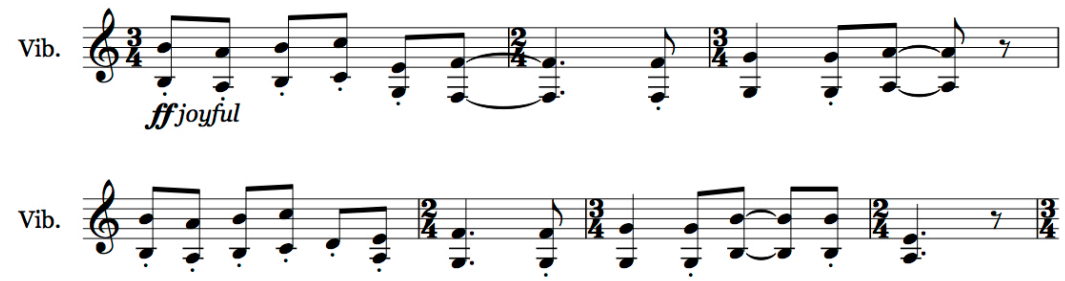

Fig. 10 – *Briar Rose* Melody 3, Vibraphone/Piano

[15] I name it a chorus because of the preceding buildup and its textural/rhythmic fullness compared with the previous section.

With three contrasting themes in play, the main body of the piece works to explore the different textural combinations that can be made from fragmenting and superimposing them. Descriptions of three notable passages:

- **43-65:** Melody 2 is played heterophonically by the majority of the ensemble – transforming a melody into a texture
- **91-94:** Melody 2 on clarinet, Melody 3 on pizz. strings, Melody 1 fragmented on piano and vibraphone
- **143-156:** Melody 3 in original form, Melody 2 on unison winds, Melody 1 fragmented to form constant running semiquavers in strings

5.2.1 Reflections on Briar Rose

By putting down my electronic tools for this project, I was able to focus on developing my ideas for instrumental form and texture. For this reason, *Briar Rose* is also a 'study piece', in that the other musical dimensions (i.e. timbre) are underdeveloped in comparison. Some of these textural ideas find their way into the two substantial works that follow, but others have yet to be taken further. I shall return to this in my conclusions.

6.0 WORLD OF AN INSTRUMENT

Islands, concerto for cello and electronics

Islands was written in close collaboration with cellist Gregor Riddell and was premiered at Birmingham University with BEAST on the 3rd of May 2014. The piece has since been performed at the EMM Festival (Electronic Music Midwest) and the Banff Encounters series. My primary goal with *Islands* was to improve on the concepts of the *Symphony* in the most important areas – in timbre, form and live realisation.

6.1 Sampling in Islands

> The truth is that it is difficult to say where the instrument ends and the rest of the body begins. In this sense, musical instruments are embodied entities (Alperson 2008, p. 40).

The idea of the musical instrument as an extension of the body is an aesthetically attractive one. It creates a connection between even the most elaborately constructed sound generators and the origins of music in the human body. As audience members at a concert, we perceive the instrument as the 'voice' of the performer, akin to their human voice, and that they are speaking to us in a direct, personal way. With electronic music, however, this connection can begin to break down as sound generators become detached from the body and expressive gestures become frozen in computer automation. One effective strategy is to embrace this sense of detachment, allowing the electronic music to exist seemingly in another world as simulated/fantastical environmental sound[16]. In composing *Islands,* I wanted to explore a different solution – how sampling an instrument can lead

[16] Perhaps going further by dimming the lights to obscure the visual source of the sounds, i.e. the loudspeakers.

electronic sound to be perceived as a further extension of the performer, and how a whole electroacoustic sound-world can be presented as an 'embodied entity'[17].

My starting point for this notion was the aforementioned problems in previous pieces, where haphazard sampling choices resulted in a lack of cohesiveness. *Piano Poems* had shown me that it was possible to make full, diverse textures from a primary sound source; it was time to apply this technique to a live instrumental work. Would it be possible, by surrounding a soloist with electronic textures drawn from their instrument, to create the sense that cello and electronics were one cohesive whole – an extension of the performer in mind and body? There are many works by other composers that are constructed in this manner, and all of them take different approaches to this notion of 'ensemble'. Through study, an important point arises: even though the electronics are drawn from an instrument, this does not guarantee that a listener can perceive a connection between the two. Going back to *Papalotl* (1987) by Javier Alvarez, the electronics – rapid rhythms created from processed string plucks and scrapes – bear little sonic relation to the piano part's more conventional jazzy phrases. Because of this, it is difficult to follow the dialogue, and it is often unclear which element is the foreground – they seem to be functioning oblivious to one another. Clearly, to create a sense of relationship, there has to be some sonic crossover between the two elements, with sounds seemingly passing from instrument to electronics and vice versa. Both the instrument and the electronics must have a unique role to play, each contributing something to the texture that the other cannot, but the two must

[17] I revisit and expand on this topic in my Conclusions of Chapter 8.

come together in a clearly established relationship. In *Islands*, this relationship is modelled on that of vocalist (primarily melodic, foreground) and backing band (primarily rhythmic/harmonic, background), and is maintained for the majority of the work. In the manner of a band backing a lead singer, the electronics of *Islands* are designed to grow from and at all times support the solo cello.

To realise this vision, Gregor and I developed a collaborative process, beginning by meeting simply to explore the sound of the cello. He would present new sounds that he had discovered in his practice as an improviser, and I would ask him for variations, modifications and new combinations. These sessions were filmed and taken home for further study. My composition sketches then began to take shape, with the best of these 'found' sounds forming the backbone of the work – perhaps the most prominent being the opening's strummed pizzicato, which was lifted directly from Gregor's improvisation. With these sounds in place, I planned out and 'orchestrated' the work around his solo line, creating sample sheets to list the additional sounds that I would need. An example of one of these can be found in Appendix 2. The sheets are divided into sample cues, falling into the following categories:

- A single notated sound
- Variations on a single notated sound
- A concept for a sound, to be explored and then recorded

- Improvisation around a sound (often an extended technique), with a view to creating a certain kind of electronic texture, e.g. a rhythmic loop or layered texture
- Improvisation around a composed passage in a pre-directed way
- A fully composed passage to be recorded in time with click track

The recording was an active process, with us both working to sculpt and improve the cues with a knowledge of the expressive intention, often finding better alternatives from Gregor's wide repertory of sounds. Unlike in a standard score, I found it was helpful to be flexible, even vague with the notated cues in order to leave room for the most effective sound to be discovered through experimentation. With the samples recorded[18], pruned and organised in the sequencer, a new electronic compositional process began. The first step, and a challenging one, was to hear the recorded sounds for what they were, acoustically speaking, and not be blinded by my many pre-existing intentions for the work – and thus make poor mixing decisions. Not every planned texture worked as intended, some had to be abandoned altogether, and there were many gaps that needed filling with new material. Also important, was to simply play around with the sounds in order to encourage the 'serendipity effect' of electronic music, where chance combinations/manipulations can produce strangely beautiful results. This is most evident in the percussive layers of the work, where I would combine Gregor's improvised rhythms to produce a novel beat. At the end of this process, I was able to create a number of 'extended' cello textures – nesting a

[18] Joined with similarly recorded material from violin and piano.

solo line amongst layers of cello-originating material. I shall describe one such texture in detail, that of bars 10-18.

6.1.2 Sound Layers in Islands

Solo Line - a broad, espressivo solo in the manner of a vocal chorus.

Countermelody - a cello countermelody featuring downwards glissandi. Its timbre was modified with a comb filter to create a sensation of distance, artificiality and separation from the acoustic line.

Bass Line - chugging cello 5ths in semiquavers, quantized to produce an artificially precise and punchy rhythm, treated with EQ to enhance the bass presence.

Percussion - created in layers in the manner of a drum kit. Col legno tapping mimics the role of a hi-hat, quantized and highly compressed to produce a constant, percussive sound. This is locked together with the sound of palms tapping the strings in syncopated rhythms, also quantized and gently compressed. In order to access the bass register, I added a subtractive synth kick drum with the high frequencies removed. This performed its function well without distracting from the cello timbres.

Chords - sampled from cello and piano, their role is to make clear the pop-inspired rhythmic and harmonic framework of the passage.

6.2 Form in Islands

Islands builds on the verse/chorus paradigm of the *Symphony*, beginning by constructing two contrasting chains of intensity-stepped passages (bars 1 - 95, 96 - 141). The chains contain multiple choruses, reworking the returning material to maintain a sense of dramatic progression. However, after a transposed return to the opening in E ♭ major, a new process begins to infect the work. The trigger for this is a chain of sonic similarity connections in the style of *Piano Poems*. Connections are made between: a melodic figure – its transformation into a timbral gesture – the electronic layering of these gestures – the sounds of wind and rain (Fig. 11).

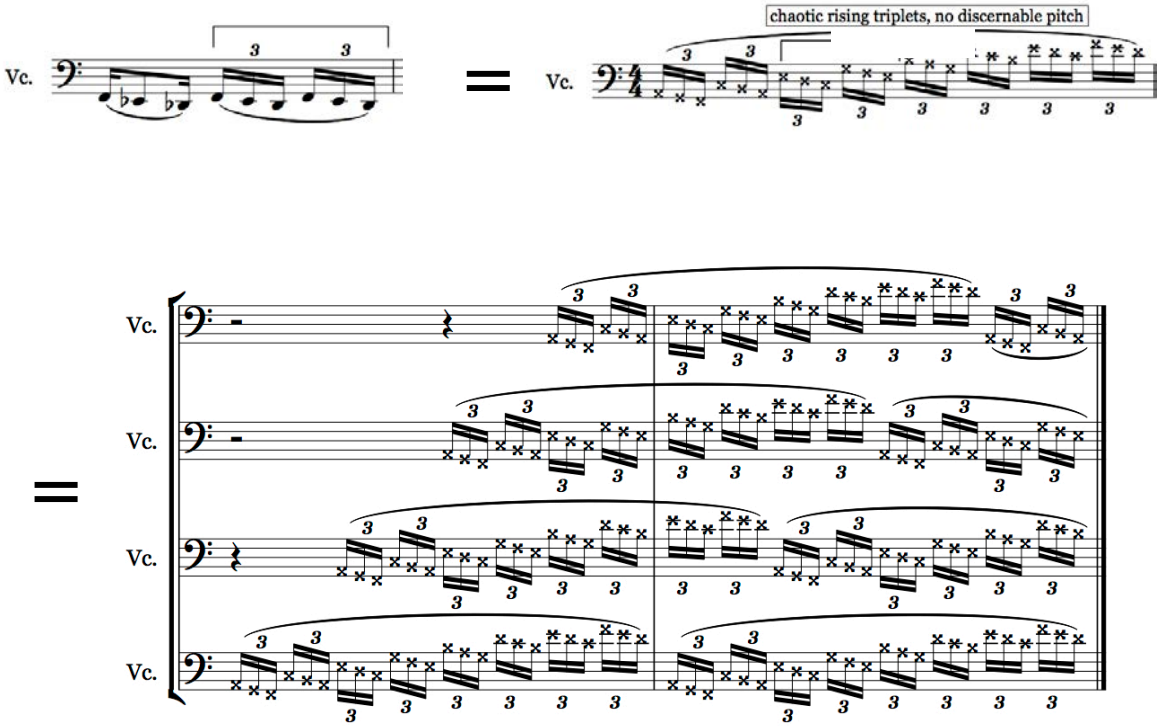

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Fig. 11 – Sonic Similarly Chain of *Islands*

By this logic does the work transform one musical language to another – the song into environmental sound. Out of the ensuing storm (swirling with warped fragments of the themes), a new strand begins to emerge – a song melody in a folk style (beginning bar 175). Its completion is cut off, and after the winding down of the cello/storm, the first thematic group is recapitulated. Instead of proceeding to the second group, however, the music lurches to a painful halt at bar 263. In frustration, the song/environmental transition is restated, and finally the folk melody is voiced in its entirety as the climactic passage of the piece. This was the closest my concert music had ever come to being 'straight' pop music – a clash with the stylistic expectations of some concert audiences – and yet, the process of crafting and preparing its place in the work makes the moment one of my proudest as a composer.

6.3 Performing Islands

> Perhaps it is not even going too far to say that some concert halls can be "played" in the manner of musical instruments (Alperson 2008, p. 44).

The sampling choices of *Islands* are an attempt to extend the musicality of a live instrumentalist outward into an electroacoustic sound world. Premiering the work with BEAST in Birmingham's Elgar Concert Hall offered the chance for this musicality to reach out in a new way – into the three dimensions of the space through BEAST's 96-channel audio system. In fact, the exploitation of spatial relationships in concert music is an old one. The choral music of the Renaissance and Baroque, the string quartets of the Classical, the jazz quartets of the twentieth century – each ensemble is adapted to excel in a specific acoustic, a specific size of space, a specific colour and length of reverb. A loudspeaker orchestra, however, allows space to be approached in an altogether new fashion by creating new 'virtual' spaces within an existing one – employing different distances, locations and designs (and therefore spectral colourings) of speaker to create a dynamic spatial palette for the music to inhabit and exploit expressively. The live realisation of this spatial dimension is referred to as 'live diffusion', where a composer can 'make real the spatial motion and structural relationships implied on the (for the most part) stereo tape' (Mooney et al, 2004 p. 1). To unlock this expressive potential for *Islands,* I created a live diffusion schematic containing several key compromises due to the presence of the acoustic cello.

1. The main component of the electronics is mixed as a stereo audio track to be diffused onto the complete system. This allows for maximum

flexibility and performance opportunity for the work on smaller systems.

2. The elements of the work – fixed media, live cello, processed cello – are individually treated with EQ to compensate for the acoustic of the hall. The fixed electronics are mixed intentionally dry so that they remain crisp in a wet acoustic. Preferably, the cello takes advantage of the natural acoustic, mixed with only minimal artificial reverb.

3. In order to compete and integrate with the power of the system, the cello is amplified with a DPA 4099-C condenser microphone.

4. The cello is positioned behind the main loud speaker pair, allowing for a respectable amount of amplification without causing feedback.

5. To protect the sense that the cello sound is originating from the performer: unlike the diffused electronics, the cello amplification feed is fixed in place on the *main* pair at the front, with the processed feeds on the *wide* pair. In addition, the amplified level is kept below the level of the cello's acoustic sound for all save the loudest, most climactic moments. This level sets the limit for the volume of the electronics.

6. When the cello is playing, the electronics are diffused in a primarily 'front focused' way to avoid a confusing sense of dislocation. Consequently, when the cello is not playing, I make a point to inhabit the sides and rear of the space, giving a break to the front location.

When presenting *Islands* in concert, I greatly enjoyed developing my technique as a live diffusion performer. Working initially by instinct, I began to identify several key activities – some expressive, some practical.

- **Dynamic Range -** crafting a wide dynamic range over the course of the work, from impossibly soft to immensely loud, all the time riding the cello amplification fader to maintain the desired balance.

- **Placing Entries -** making use of the *precedence effect*[19] to give the illusion that a new sound(s) is coming from a new location.

- **Creating a world -** planning the sum of these sound/location pairings to create the sense of an 'imaginary landscape' that surrounds the audience.

- **Spatial Dynamics -** modulating the level of immersion to enhance/create dramatic arcs within the music, e.g. distant → close, front → back, point source → surround. This requires planning and a great familiarity with the console in order to map fader movements to the architecture of the music.

[19] An effect first described by Wallach et al (1949). If a listener is presented with two identical wavefronts within a sufficiently short time period (0-40 ms), they will be heard as a single sound, perceived as originating from the location of the first arriving wavefront.

- **Cutting Down -** sneaking away unwanted channels when the desired expressive affect has been achieved. Otherwise, the volume can creep up to unwieldy levels, leaving no room for further expression.

Returning to my objectives for the piece, is *Islands* successful in its attempts to extend instrumental music into electronics and space in a cohesive manner? Certainly, in terms of my previous compositions, I feel that it is a substantial step forward.

7.0 ENGAGING WITH ENVIROMENTAL SOUND

Europa, a tone poem for flute and electronics

The final piece of this portfolio, *Europa*, was composed in close collaboration with flautist Karin de Fleyt. It was premiered at the Coventry University Lunchtime Concert Series on the 11th of March 2015, receiving a subsequent performance at the iFIMPaC[20] conference at Leeds College of Music. The goal for the piece was to build on the successful techniques of *Islands*, while casting them in a different form – a tone poem about an imagined journey to Jupiter's moon in search of microbial life. In order to tell this story, the work makes great use of environmental sound, which is interwoven with flute-originating audio (and that of few other instruments) by use of sonic similarity connections. As a result, there are three forces that shape the work – song music, developmental music and environmental sound – each making a unique dramatic and expressive contribution. Connections and transitions between the three are explored in depth, with each coming to prominence at important moments in the narrative. To illustrate this, I shall describe the key dramatic intentions of each of the work's three movements, and how these are realised through the choice and working of the material.

7.1 1st Movement: Fighting Gravity

Europa opens with a recitative style passage (similar to *Islands*) whose role is to set the mood and introduce: the main themes of the work, the main sound materials, and several important relationships. The work's two main themes

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are the Europa motif (Fig. 12), loosely modelled on the intonation of the word 'Europa', and the Hope/adventure motif (Fig. 13). These themes return frequently throughout the work, their transformations providing points of perspective on the narrative.

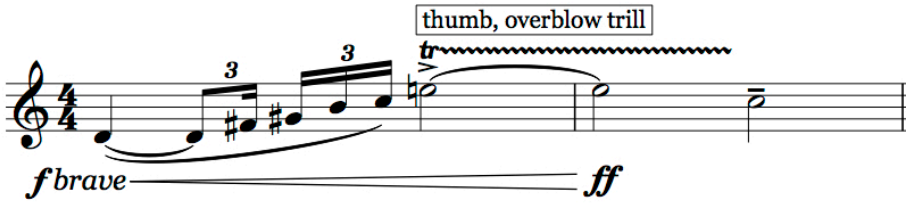


Fig. 12 – Europa motif from *Europa*

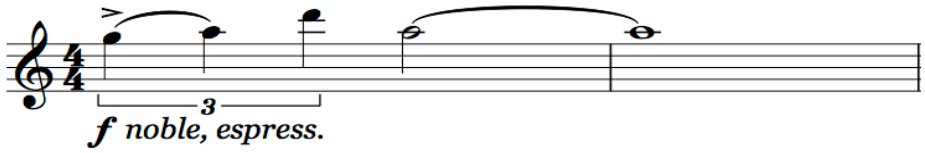


Fig. 13 – Hope/adventure motif from *Europa*

The soloist's melodic gestures are coupled with blasts of rockets and wailing sirens in the electronics. These are made from a roughly 50/50 mixture of sampled flutes (piccolo, flute, alto, bass) and real rockets, with an intentional ambiguity as to which is which. This sets up a relationship where the piece can interpolate freely between the *real* and the *symbolic* – a rich relationship to explore with the flute's powerful ability to mimic other sounds. For each stage of the Europa story, the live and sampled flutes mimic key sounds – blasting rockets, radio transmissions, cracking ice, ocean waves and underwater creatures – in order to knit flute and narrative close together. The opening also introduces a 'hidden' presence within the work: a recorded choir of

sopranos. For the most part, *Europa's* narrative is depictive in nature, focusing on the physical experiences of the imagined journey. The voices, however, carry an underlying emotional message, one of universal joy, with a text drawn from Friedrich Schiller's *Ode to Joy* (1785). This message exists under the surface, finally becoming clear in the work's Coda.

Sphaeren rollt sie in de Raumen, Die des Sehers Rohr nicht kennt.	Spheres it moves far out in Space, Where our telescopes cannot reach.

From Schiller's *Ode to Joy* (1785).

With these forces in play, the fist movement proper evokes the struggle to escape Earth's gravity in a rhythmic allegro of varying moods – some arduous, some joyful. Central to creating this sensation is the use of percussion in dance music patterns, formed by sampling extended flute techniques: key clicks, pizzicato tonguing and tongue rams. These are mixed freely with synthetic percussion whose role is to fill key frequency gaps, completing the rhythmic picture without overpowering the flute timbres. The formal principles of this movement are similar to *Islands*, in that the work presents two contrasting chains of material (bars 31 – 101, bars 102 – 174), a developing central passage in 7/8, and then a recapitulation of the chains. The return of the second chain is interrupted in with a programmatic episode: the struggle for the rocket to separate from its boosters. At this point, environmental sounds of metal grinding, mixed with screeching piccolos, overpower the song material to culminate in the destructive climax in bar 337. Finally, the second chain returns in gentle fashion on piccolo ensemble – we are in orbit.

7.2 2nd Movement: Visions

The second movement begins with an interlude. A granularly-frozen piccolo (seemingly live-sampled but in reality realised in the studio) is joined by distant wind, radio crackles and vocoded combinations of these elements. This texture, a prime moment to explore live diffusion in performance, creates a dialogue with the improvising live piccolo, who mimics 'radio tuning' sounds through flutter tongues and modulating between formants with the embouchure. The passage climaxes with one of the movement's 'visions' – disembodied voices whispering the Schiller text, surrounded with radio crackles and tremolo violin. The movement then progresses with a chain of recitatives and dialogues that revisit the main themes. These contrasting textures are linked together with radio static via a process of destruction and reconstruction. I employ this radio material as a recurrent transitional device throughout the movement, as if our imaginary traveller is switching stations and searching for a hidden signal.

At the centre of the movement is a form within a form, an **ABAB** structure composed of two contrasting passages: one evoking loneliness and isolation (bars 402 – 422, 461 – 497), the other a vision of the Goddess Europa (bars 423 – 460, 498 – 534). Each of these passages calls into play a group of recorded instruments, an 'invisible ensemble'. **A**: a trio of recorders, violin, later a soul band, **B**: a chorus of bass flutes, piano and harps. This topic deserves discussion, as these passages mark an evolution of my compositional thinking in regard to the sampling of instruments. In the works preceding *Europa*, I avoided placing substantial, unmodified material in the foreground of the electronics that could just as well have been produced by a live instrument, in

order to avoid the impression of a 'karaoke' style arrangement. Instead, emphasis is placed on the electronics as a tool for creating sounds that could not have been formed any other way – and not as a cheaper alternative to hiring live musicians. In *Europa*, however, there are moments where sampled instruments do take to the foreground. Would it be better if they were on stage? In fact, these instruments' lack of a physical/visual presence is key to the expression of the 2nd Movement, which is about strange, disembodied transmissions, the emergence of strong emotions and associated song forms, and their dissolution into radio static. The appearance (and disappearance) of these instruments is intended as mysterious, unexpected, hallucinogenic – an impression that would have been difficult[21] to create with them on stage.

7.3 Interlude

The Interlude, depicting a violent crash landing, is the furthest my music has gone in the direction of sound design, akin to the Foley work of film production. I had great fun constructing spaceship-rattling sounds from processed shopping trolleys, impacts from wood on metal. In the context of the work as a whole, this passage is situated very firmly on the *real* end of the *real – symbolic* spectrum, in that the sounds are intended to be heard 'as they are', with no underlying symbolism. As a result, it is expressively very direct, but this raises challenges for interactions with the live flute. The current instructions for the flute's improvised passages are the result of many techniques that were tried out but ultimately failed to match the intensity of the electronics. Initially, I wanted to create the impression that the bass flute

[21] But not impossible – an alternative approach might be to use stage lighting to hide and reveal musicians, although this does not help with the transitions and fade-ins, and the psychological implications would be very different.

was 'causing' the impacts of Figure 21 by introducing them with rushing air sounds and plosive consonants. Unfortunately, although these sounds may be able to effectively symbolise 'crashing' on their own, they appear weak in comparison to the real/simulated sounds – often to unintentionally comic effect. In the end, the modified impression of the passage is of the flute as a frightened passenger, juddering helplessly in response to the rumbles and crashes.

7.3 3rd Movement & Coda: Glaciers And Glorious Geysers, I Saw The Goddess

The third movement begins with an improvisation passage – bass flute whistle tones fed into a looper and multi-tap delay – depicting a desolate, icy landscape. In accordance with my developing strategy for live vs. studio sampling, these effects are performed live, as they are exposed, improvised, and encourage the transformation from acoustic to electronic to be heard as an expressive event. A solitary, fragile whistle grows into an immersive world of sound.

Out of this scene emerges the movement proper, a more or less straight **Verse/Chorus** form, presenting a number of scenes from the Europa narrative. The key progression is from a bleak, frozen verse to a grand, joyful chorus, the latter depicting the geysers of water that are theorised to exist on the moon[22]. These choruses (bars 582 – 608, 660 – 712) have the function of being the climax of the entire work, and thus needed to be at maximum

[22] Tyler (2008) has suggested that Europa is affected by gravitational tides caused by the slight variance in its orbit of Jupiter. At its furthest distance, these could potentially cause eruptive plumes of water similar to geysers on Earth.

volume and rhythmic energy to fulfil this role. Unfortunately, in the process of translating my sketches into the final work, I overestimated the amount of time I had to get from low-energy verse to high-energy chorus. The solution to this was the introduction of the airlock moment at bar 561, a hiatus that precipitates a sudden rise in intensity, thus creating the necessary energy and expectation to get to the high-energy chorus. The choruses themselves are extremely dense, incorporating simultaneously: virtuosic live flute, sampled backing flutes, rushing geysers coupled with arpeggiaic sampled flutes, electronic beat. Mixing these passages was extremely challenging, with unexpected difficulties caused by the low range of the backing flutes not matching the intensity of the other layers. In the end, the desired effect was created by treating them with extensive volume automation, light saturation, a 'slap echo' reverb, and a very specific EQ with a boost at 3.5 kHz to strengthen the upper partials and cut at 11.5 kHz to eliminate unwanted sibilance. The origins of these difficulties are in my sketching process, where electroacoustic textures are formulated in my imagination before being sketched on paper, then recorded and assembled. For a passage as vital as this, in hindsight it would have been wise to test out some of the combinations beforehand – a step that I shall be taking with future compositions.

After the second chorus, the narrative moves forward with a mechanical ice drill (bar 713) and sudden crash through the surface to the ocean beneath – bass flute 'bubble' effects (made by covering the mouthpiece with the mouth and various trills) are interwoven with real water sounds. The Coda then presents an extra-terrestrial zoo in the manner of Stravinsky's *The Flood*

(1962). These imaginary creatures are created from sampled and modified (e.g. transposed in pitch, EQ) flutes and other instruments, with perhaps the most characterful being the 'manatee'[23] created from alto flute singing-and-playing. Out of this, the Schiller text is sung in full by disembodied soprano – the Goddess Europa – reworking the **B** theme of the 2nd Movement. Overwhelmed by these appearances, the solo flute retreats to the background to cautiously restate the themes of the work – re-examining the journey that has led to this point, questioning what these events will mean for the future.

7.4 Reflections on Europa

Europa draws on the success of *Islands* to present a lengthy, multi-movement work that has been rewarding to perform in concert. Through this, my live performance strategies – amplification, coordination, live diffusion – have all been developed and polished further. For amplification, I have incorporated a parallel compressor into my mixing console, which allows for various gradations of sound for the live flute in order to match the different mix-types of the electronic passages – from wide dynamic range (small amplification, no compression), to pop mix (high amplification, medium compression). On the subject of coordination, Karin and I have discovered that, with enough familiarity with the work, only very few click track cues are necessary, which allows for a much more 'organic' performance.

Compared to my previous works, *Europa* is consistently overt in both its depictions of a narrative and engagement with familiar music. I was initially excited to experiment with this arrangement, but throughout the composition

[23] Each of the creatures was named during our recording session to help characterise and develop the improvisations.

process, I found it to be a slightly double-edged sword. On one hand, the work is able to communicate in a direct, visceral way, but on the other, these factors can result in limitations. When working with a literal, time-based narrative, the formal structures of a work can tend to be similarly linear, which eliminates some of the subtlety and potential for multiple strands of activity possible in a more abstracted work. The same limitation occurs when going very close to existing styles – the possibilities for combinations and interpolations are much reduced. This topic will be discussed in my Conclusions.

Europa is due to be performed with BEAST in May 2015 and will be toured in Belgium in the autumn. In this time, these thoughts and strategies will doubtless be developed further, and the resulting knowledge applied to the formation of future works.

8.0 CONCLUSIONS: GOING FORWARD

Looking back to my opening goals, has my search for an 'integrated art music' been successful? I feel that it is too early to tell – that this will likely be a lifelong pursuit. However, I can say with confidence that many positive steps have been taken towards uniting the influences that inspire my composing, particularly when comparing *Islands* with the *Song for Piano Trio and Electronics.* The writing of this commentary has indicated many fruitful topics for exploration in future works. To conclude, I shall describe each of these in turn and how they might be engaged with.

8.1 Portability

Currently, all of my electroacoustic works run from Ableton Live patches, software that not every ensemble owns. My fixed media tracks are mixed with Lexington reverb plugins, and as such any amplified instrumentalists are encouraged to use these same plugins to achieve the best blend. In total, the cost of these programs is in the region of £880 at current date, which is clearly a prohibitive amount. A better solution must be found, but it is difficult to see a single best option at this stage. Rather, I am now adapting my works for multiple formats as they are required – e.g. a Max MSP patch, an Ableton Live set or a flexible format with stand alone audio files plus detailed instructions for performing the required processing. I feel that this is the best solution for our current age of constantly evolving software. In the future I hope that a standard will emerge to allow for a single definitive version of the piece.

8.2 Electroacoustic Relationships

My research into the relationships between instrumentalists and electronics – the notion of electronics being an 'embodied entity' – is far from complete, and must be developed through future compositions. It is now apparent that there are two sides to the equation: the performer's perspective and the audience's perspective. Each shifts the focus to different aspects of the performance, but it is clear that they must be treated as a whole in order to create a compelling relationship.

From the point of view of the performer, the electronics must be a force of *empowerment* as opposed to *subjugation*. To achieve this, the electroacoustic relationship must draw a parallel with that between two human musicians. In practice, this means that responsibilities are evenly distributed amongst the ensemble and almost all inter-ensemble communication is done by ear. To address the dimension of rhythm – the one that raises the most challenges in my work – it must always be clear who is leading and who is following, and any following must be easily achievable by ear. In future works, I will make a distinction between *Acoustic Time* and *Electronic Time* passages. In *Acoustic Time* passages, the live performers have free control over the tempo and the electronics are primarily reactive – either live generated or split into many tracks that can be triggered at the right moment. In *Electronic Time*, the music is fixed to a quantized electronic grid, with instrumentalists receiving rhythmic cues aurally from a fixed electronic track. One remaining area of difficulty, however, is situations where performers need to be cued non-aurally. To this date I have primarily used click tracks for this purpose, with results of mixed satisfaction. It is clear that these moments must be kept to a

minimum, but when they are absolutely necessary a number of cueing systems must be available to suit the preference of the performer – e.g. visual metronome, conductor, click track, haptic pulse generator (a worn device which taps a pulse).

From the point of view of the audience, these electroacoustic relationships are perceived both aurally and visually. By writing music with fixed media elements, there are thus elements of the music that are *invisible* to the audience – they have no direct visual origin. Any connections must therefore be made indirectly via a number of means. I have written about instrumental sampling as a means of 'extending' an instrument poetically; played-back samples of an instrument may still be perceived as 'originating' from it when the timbral relationship is evident. An additional dimension that I aim to explore in future works is more fundamental, relating to the musical dialogue itself: the *cause and effect* principle. If events in the electronics seem to be precipitating events in the instruments and vice versa, a strong relationship will be formed independent of the timbral content.

Clearly, each of these dimensions must carefully considered when planning an electroacoustic work, and there are likely more to be discovered.

8.3 Improvisation as a Sampling Method

In some ways, the textures of *Piano Poems* are the most intricate of this portfolio. They are the focus of the work, created through highly processed piano improvisations, without any strict formal goals. In future works, before

settling on a formal scheme, I intend to incorporate additional stages of free (or lightly structured) improvisation as a way to inspire novel textures. Ultimately, I feel that only the most critical thematic materials should be set in stone early in the process.

8.4 Mixing for Recordings

Over three years, I have worked hard to develop my mixing skills, primarily for creating electronic tracks for performance with live instruments. However, this is only one possible outlet for electronic music – the main other being mixing for music released as recordings. The difference here is primarily one of dynamic range, as one assumes that commercially released recordings will sometimes be listened to in a less than ideal environment, and therefore a sacrifice in dynamic range is necessary. Especially in my works that incorporate live diffusion, I have laboured to keep as wide a dynamic range as possible, and this presents some challenges when reinterpreting the work for production as a recording. In future works to be released as recordings, it will be necessary to 'recompose' the electronic elements with a reduced dynamic range in mind.

8.5 Form

In regard to form, I have always felt that a delicate balance is required between solid structures and the freedom for a composer to explore their material 'playfully'. This balance is difficult to achieve, and is something that I am constantly adjusting from piece to piece. As many of these works are primarily concerned with exploring clear formal structures, I feel that they

lean at times too much towards stricture – in particular during the *Symphony, Briar Rose*, and some moments of *Europa*. For me, a critical factor is a sense of confidence and familiarity with the formal techniques being employed in order to not lean too heavily on them. When experimenting with new structures, rigidity is often the initial outcome, but with time, nuance can emerge.

8.6 Ensembles

The majority of the works of this portfolio are scored for small ensemble plus electronics. This has allowed me to focus on creating an aesthetic where virtuosic performers are placed at the centre of visual attention. However, prior to this Ph.D., I was primarily focused on acoustic music for larger ensembles, and I am excited to bring these two strands of working together in a future composition, building on the textural techniques of *Briar Rose*.

8.7 Scoring and Notation

The scores for my electroacoustic works indicate the electronic elements through use of simple click-track cues. I have kept this intentionally minimal visually so as not to be misleading by communicating only part of a complex picture. Instead, performers are encouraged to gain their own personal understanding of the work by listening to recordings of previous performances (always available with the score), digesting the details of the electronics free from reductive or leading notation. This strategy has been effective for the works of this portfolio; I have not found that it limits the potential for individual interpretation. By keeping my electronic cues visually

minimal, I have been able to observe how performers learn the piece and construct their own understanding of the complete picture. So far, it has been different every time; some prioritise rhythm, others harmony or timbre, and I would hesitate to limit their perception unnecessarily with 'leading' notation. However, with a piece that has a complex network of triggered cues and live processing (as my future plans demand), a skeleton score of key pitches and rhythms will clearly be necessary to create a roadmap of the work to facilitate performance. Still, with electronic music's focus on the creation of unique timbres, there will be no substitute for a detailed study of the electronic elements by performers.

Composing and performing these works, being part of the department at Birmingham University, working with BEAST, my supervisor – Scott Wilson, my instrumental collaborators, and writing this commentary have all been incredibly rewarding experiences. They have left me simultaneously equipped and inspired to continue my contribution to the field of composition in the coming years.

David Ibbett, 2015

Appendix 1

Buffercomposer

Max for Live Patch by David Ibbett
Installation and Instructions

A device for the manipulation and playback of live-buffered audio.

Installation

1. Place files in msp-externals
2. Place **DI Buffer Composer** and **DI Buffers** in an Ableton recognised folder

Guide to Setup in Ableton

1. Place *DI Buffers* (the buffering device) on a send track, set this track to 'sends only'
2. Place *DI Buffer Composer* (the playback device) on a MIDI track
3. Select which of the three available buffers to use under the **Buffnum** menu on each device. This allows for up to three separate channels of manipulation using multiple devices. Default - set both to 1.
4. Send the audio to be buffered to the send track
5. Press **Rec** on *DI Buffers*
6. Manipulations are then performed on the MIDI track by sending MIDI notes

DI Buffers Controls

- **Rec** – records audio into a rolling 30 second buffer. Turning record off allows for the buffer to be frozen, along with all timing data.
- **Buffnum –** sets buffer number
- **Sig min/max** – controls range of transient detection
- **Attack sens.** - minimum size of transient to be detected
- **Reattack** – minimum distance between transients
- **Output transients** – (optional functionality) allows transients to output as a midi note using lh_midiout, can set **Channel**, **Velocity, Notelength**
- **Trans nudge** – adjusts transient latency
- **Maxtrans –** how many transients to store
- **Insert_trans** – new transients become #1 in the list
- **Rotate_trans** – new transients become the next number in list, looping back with maxtrans is reached
- **Clear** – clears the buffer

DI Buffer Composer Controls

- **Buffnum** – set buffer number (match with **DI Buffers**)
- **Forwards/reverse** – playback direction

- **Pitchsemi** – pitch shift in discreet semitones
- **Pitchshift** – pitch shift in cents
- **Loop off/on**
- **bbu –** (bars, beats, units) sets length of loop e.g. 8n x 1 = 1 quaver. This is added to **looplength in ms** below
- **Nudge /8th –** nudges playback position up to one quaver either side
- **Nudge *8th** – nudges playback position up to 20 quavers either side
- **LoopXfade** – crossfade time for loop
- **LoopAfter** – begin looping after a set time
- **Set Pan –** sets pan position for next note. Notes currently playing will not be affected
- **Vel<127 8ths –** allows MIDI velocity to control playback position
- **ADSR** – shapes notes
- **Vel/Amp** – amount that velocity modulates volume
- **Vel/Decay** – velocity modulates decay time
- **Legato –** smooths transitions between notes
- **Curve** – enables a logarithmic velocity curve
- **Play_time**, the default mode. Incoming MIDI notes will cause playback.

List of MIDI commands

- C0 – begin playing from the most recent transient
- C#0 – A#0 – play transients 1-10
- C1-A2 - play from the previous downbeat, each semitone upwards moves forwards one quaver. Notes exceeding the length of the bar will be locked to the final quaver of the bar (useful for improvisation)
- A#2-B2 – play from position of previous command (duplicates allow for multiple voices)
- C3-D4 – play from the current downbeat, each semitone upwards moves forwards one quaver. Notes exceeding the length of the bar will be locked to the final quaver of the bar
- C7- E7 – play from now (duplicates allow for voice overlapping)
- B6 – C5 – play from now minus one quaver for each semitone (B6=one quaver ago, A6=three quavers ago).

Switching to **Play_pitch** will cause incoming MIDI notes to control transposition of the audio (i.e. playback speed) rather than the time position. **Play_pitch timeset** must be used to control which of the above time commands will be used.

§

Buffercomposer Acknowledgements

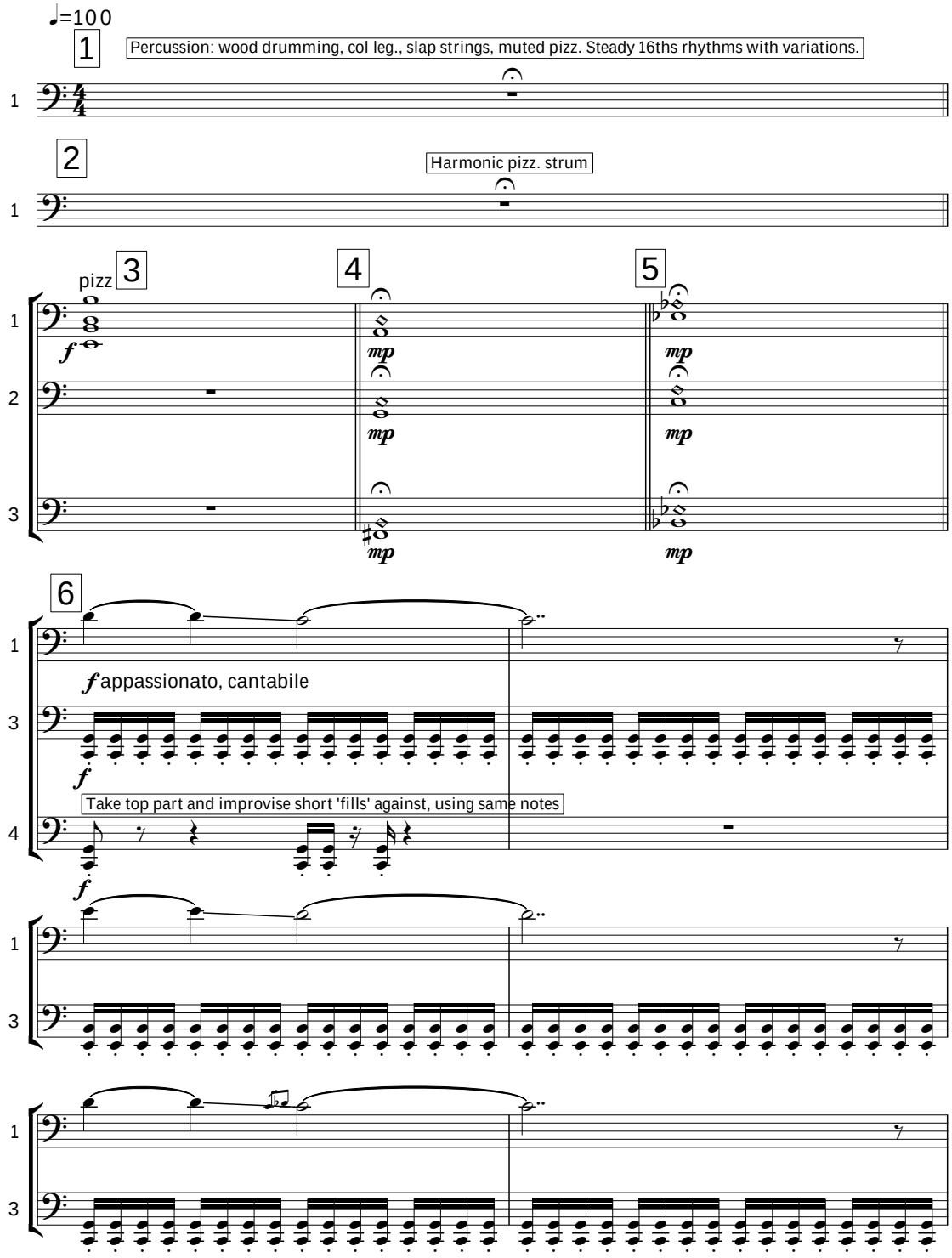
Buffercomposer makes use of several max and msp externals by other authors.

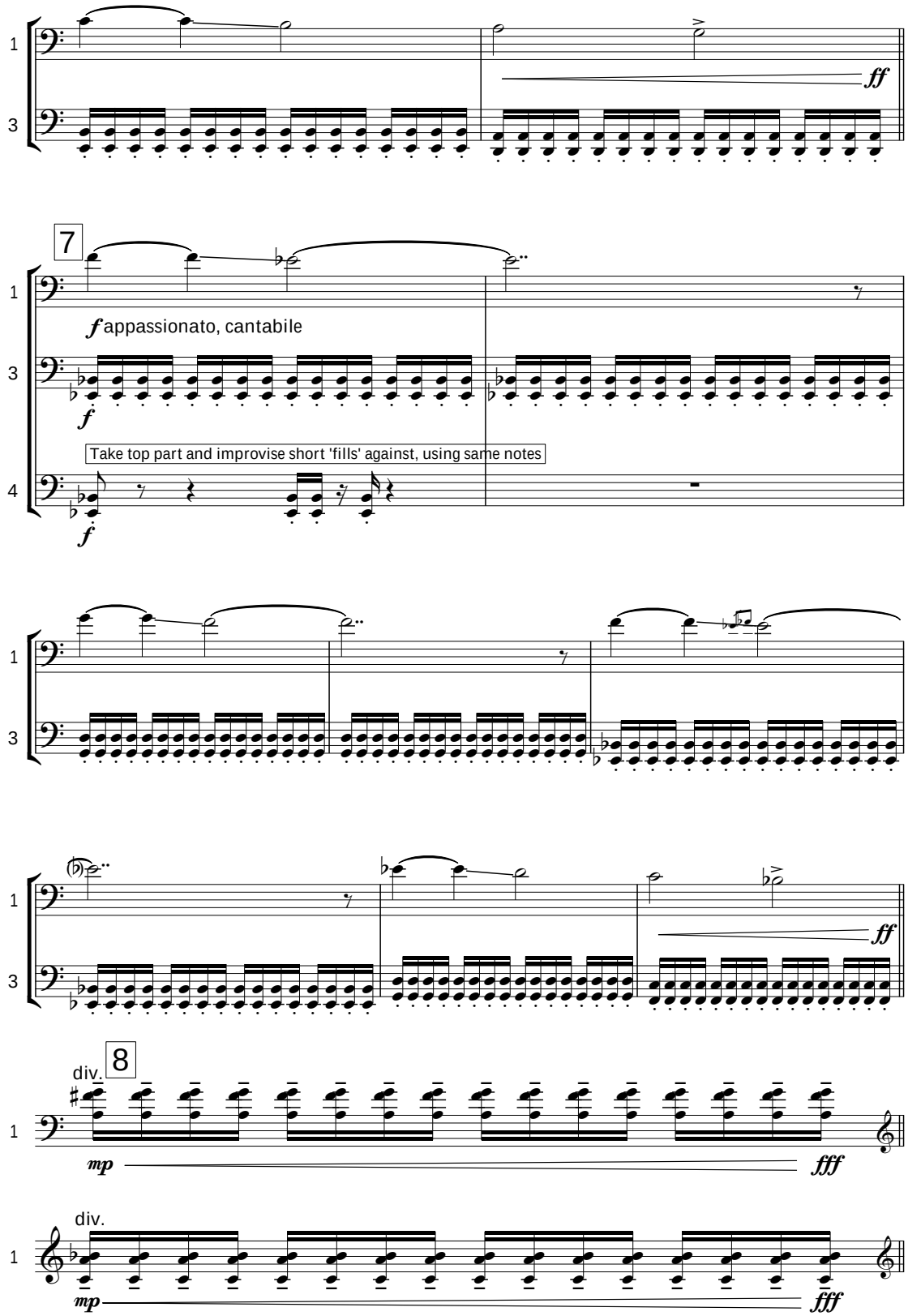
analyzer~ a freeware msp external for performing fft analysis of audio, part of the library 'Tristan Externals' produced by the Center for New Music & Audio Technologies, University of California at Berkely.
http://cnmat.berkeley.edu/downloads

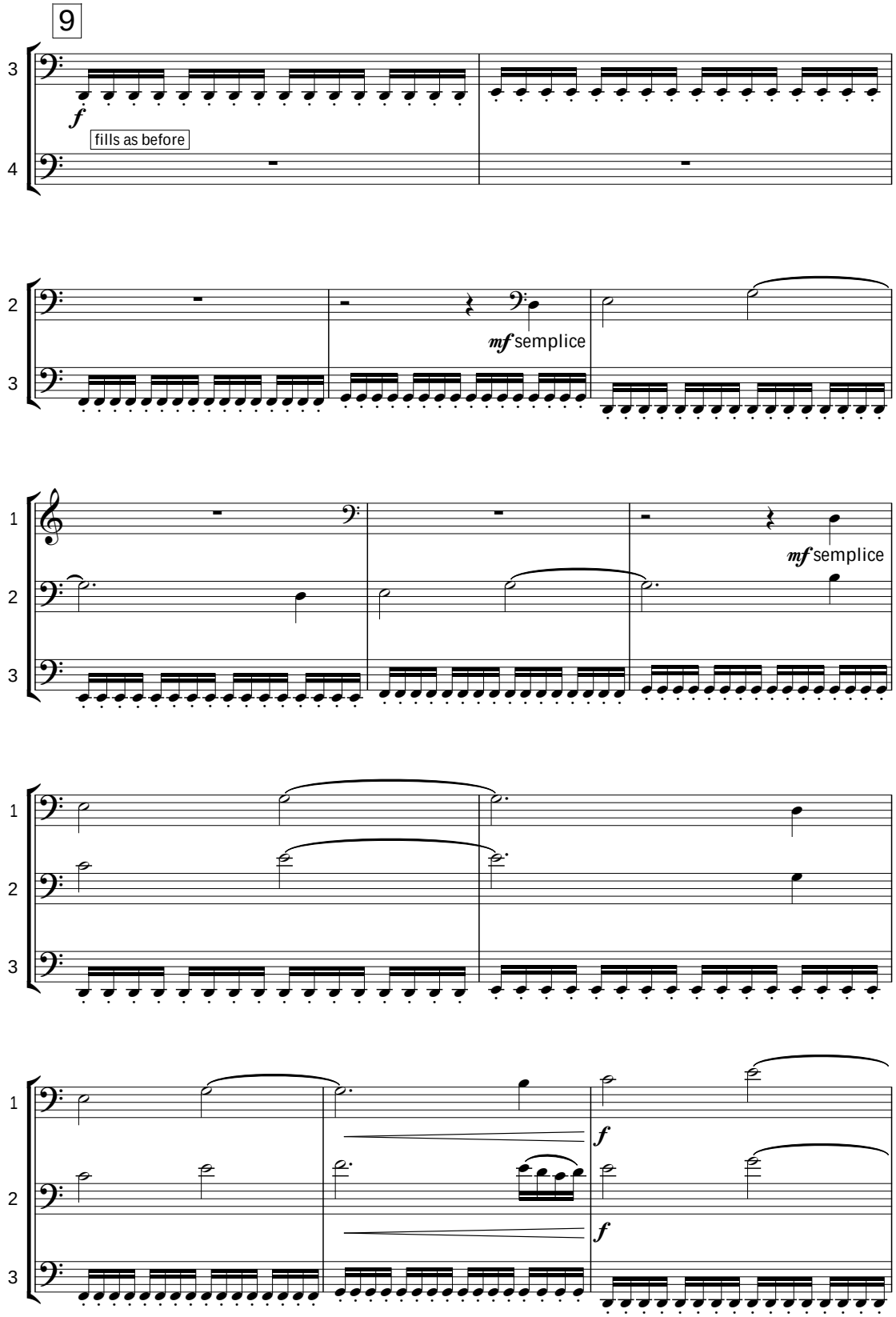
lh_midiin, lh_midiout two freeware externals for routing midi between Max for Live patches within Ableton. Produced by Leigh Hunt, available at
http://web.mac.com/leighhunt/iWeb/Site/downloads.html

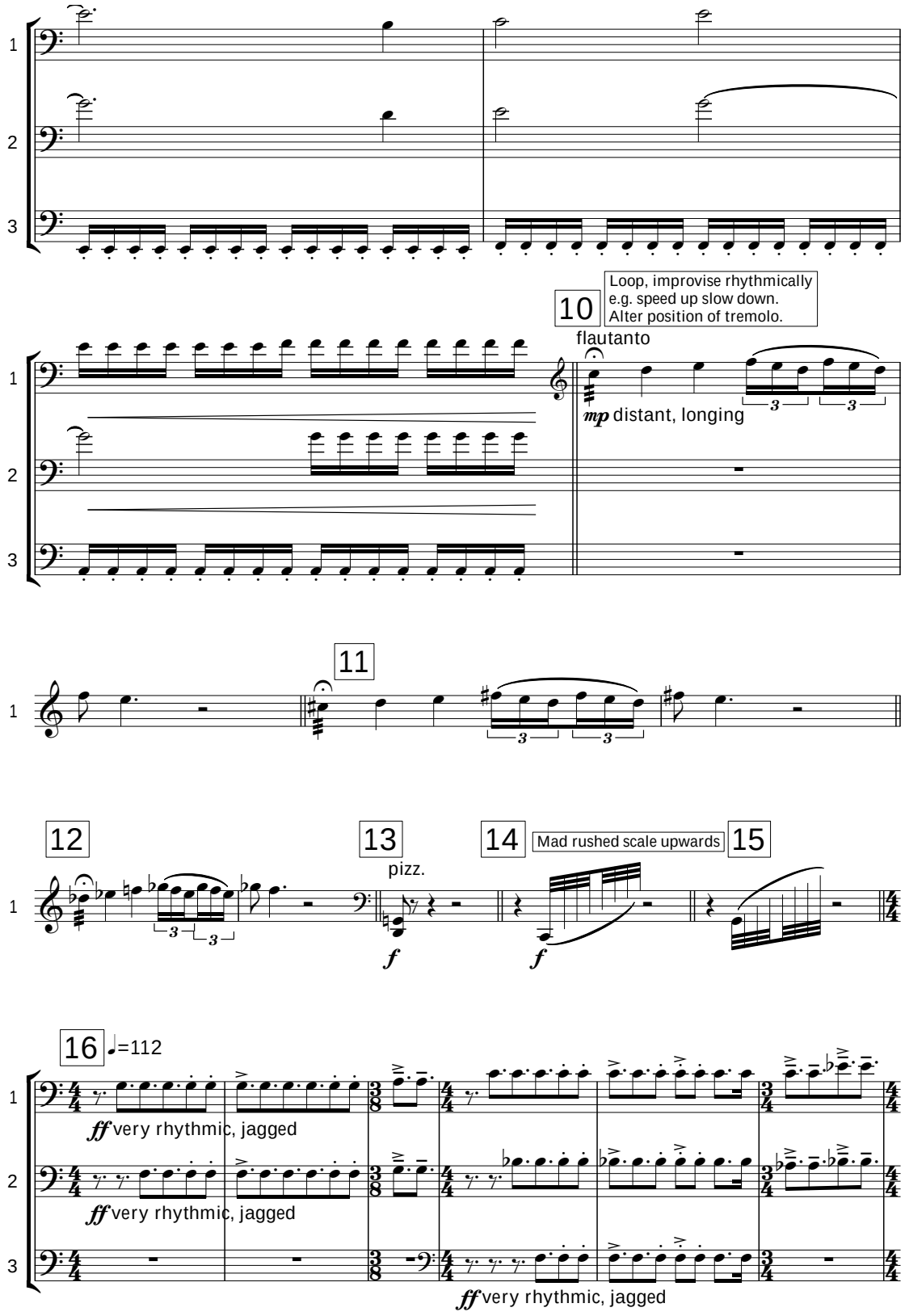
Appendix 2

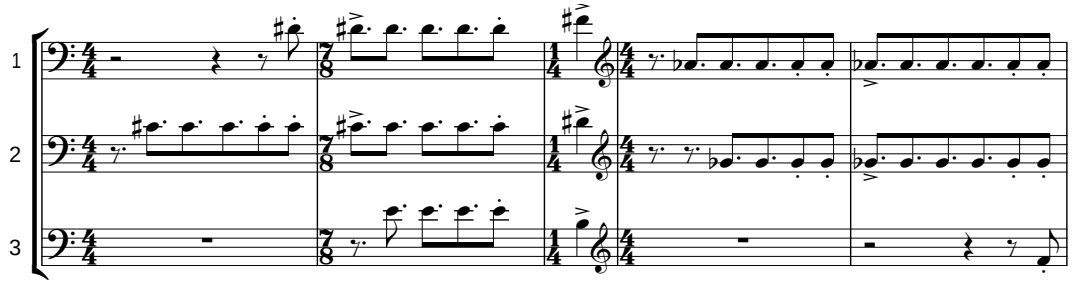
Islands, cello sample sheet

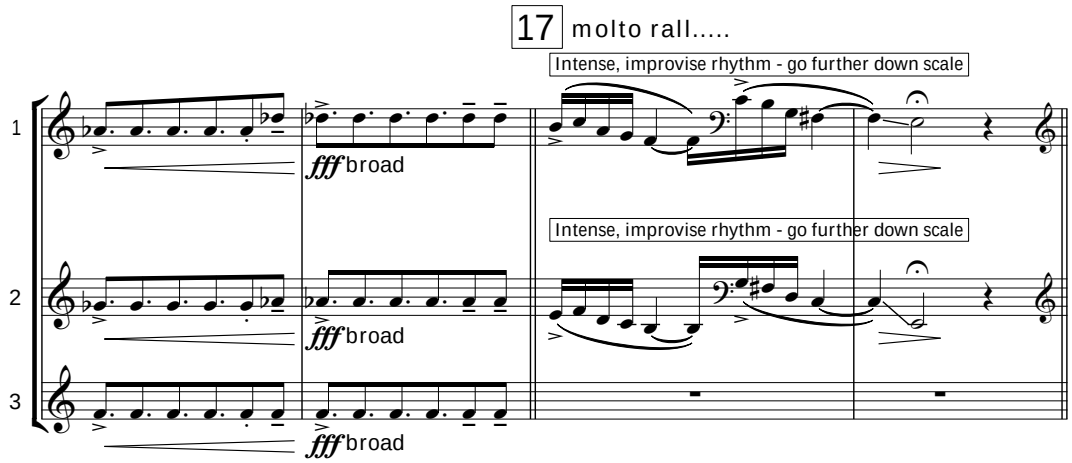


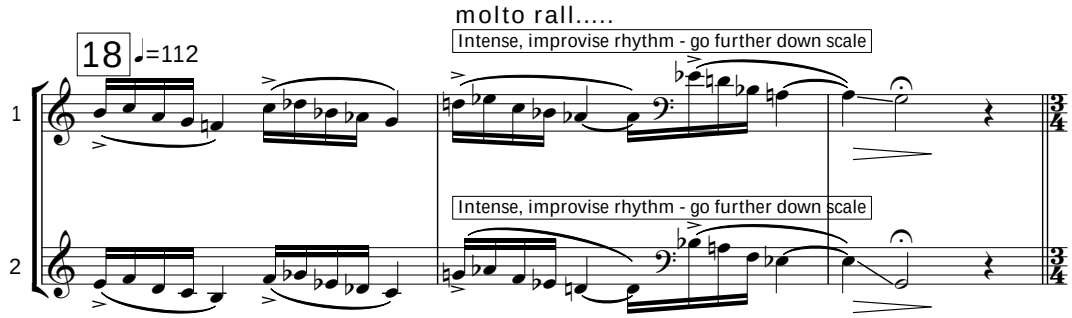

1
3
ff
7
1
f appassionato, cantabile
3
f
Take top part and improvise short 'fills' against, using same notes
4
f
1
3
1
3
ff
div.
8
1
mp
fff
div.
1
mp
fff


9
3
f
fills as before
4
2
3
mf semplice
1
2
3
mf semplice
1
2
3
1
2
3
f
f

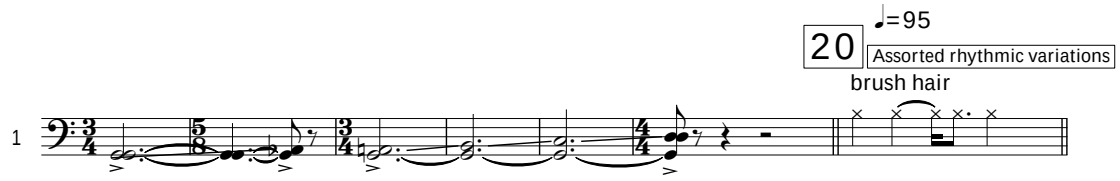

1
2
3
10
Loop, improvise rhythmically
e.g. speed up slow down.
Alter position of tremolo.
flautanto
mp distant, longing
11
12
13
pizz.
f
14
Mad rushed scale upwards
f
15
16
♩=112
ff very rhythmic, jagged
ff very rhythmic, jagged
ff very rhythmic, jagged

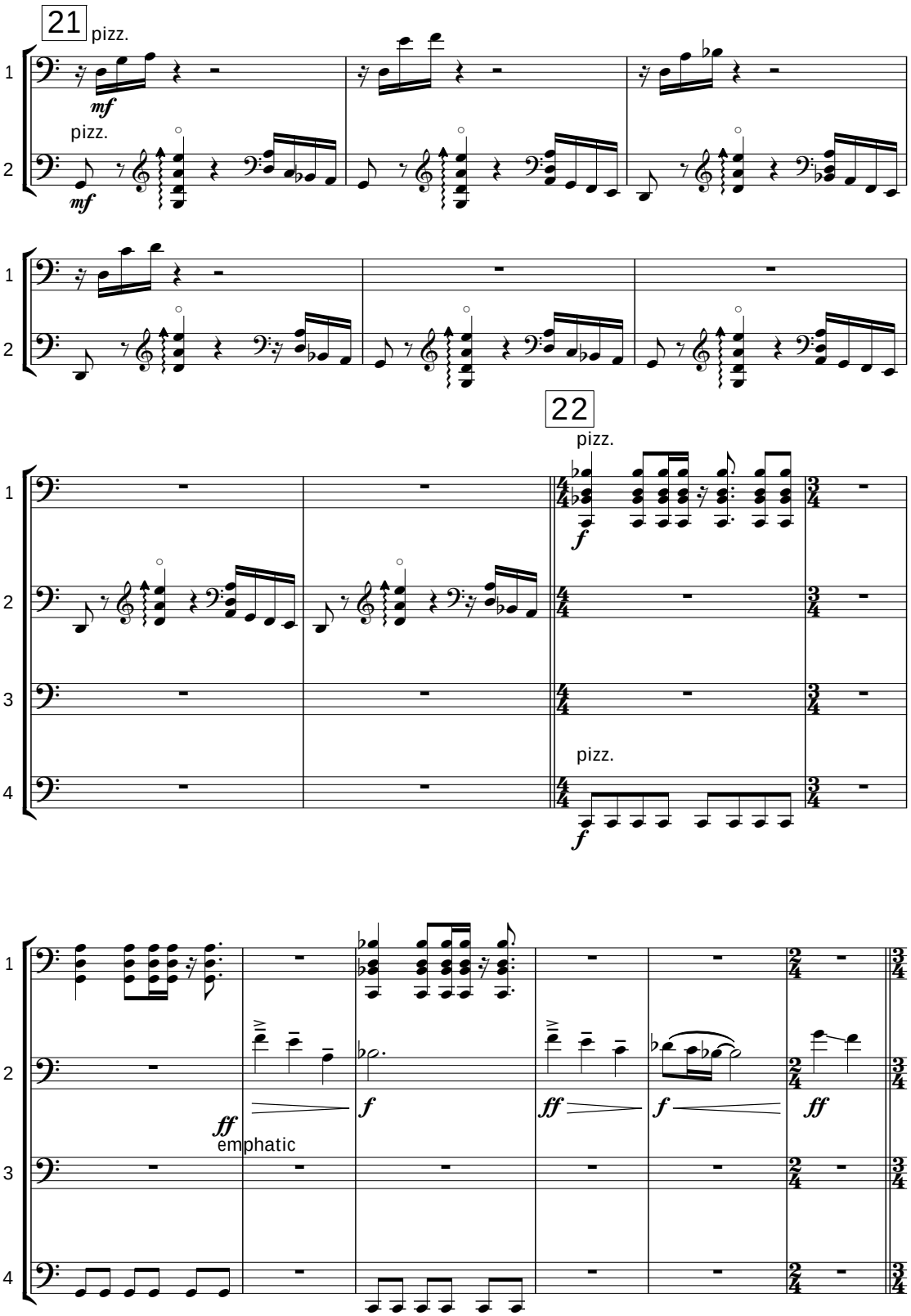


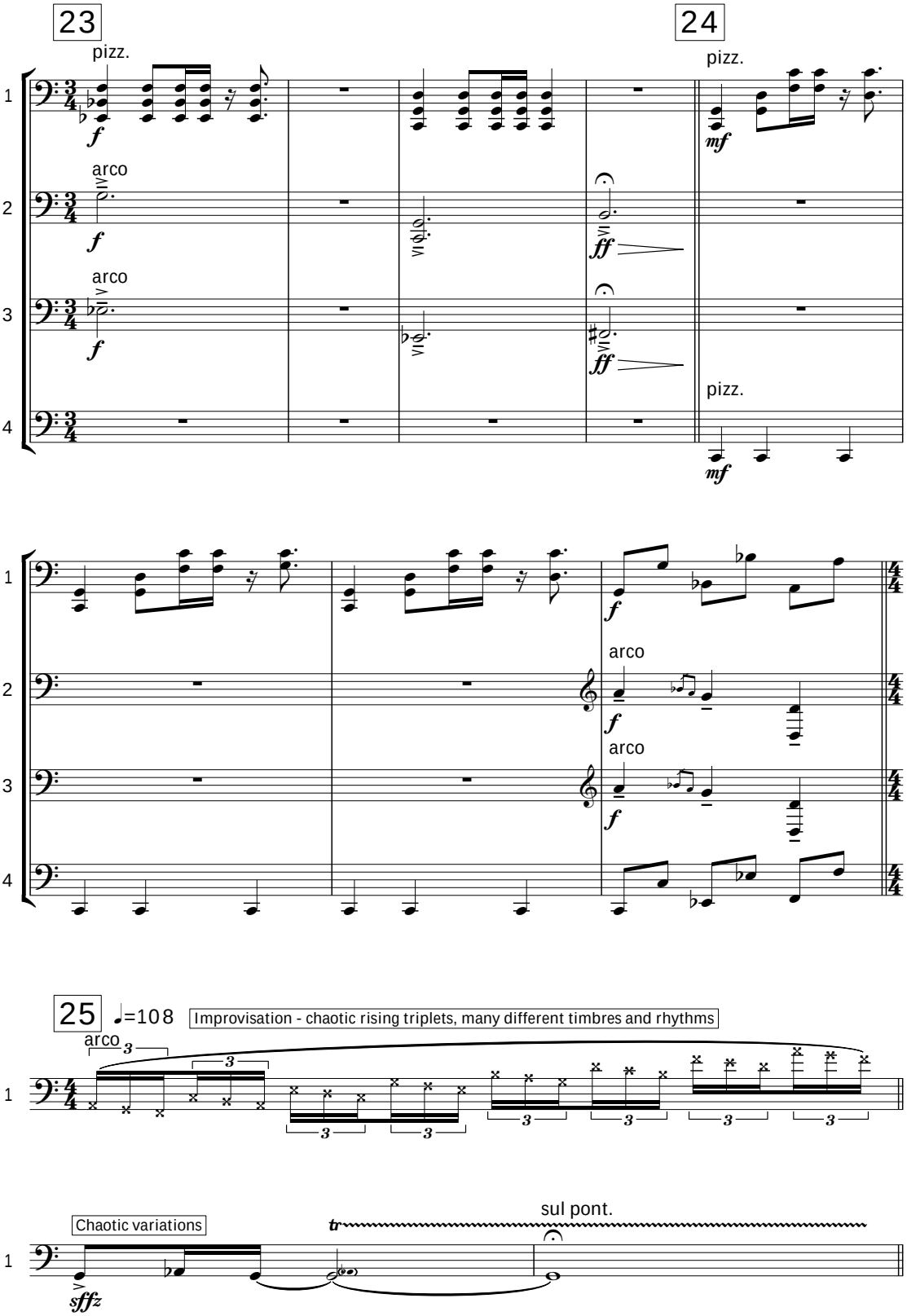

17
molto rall.....
Intense, improvise rhythm - go further down scale
fff broad
Intense, improvise rhythm - go further down scale
fff broad
fff broad

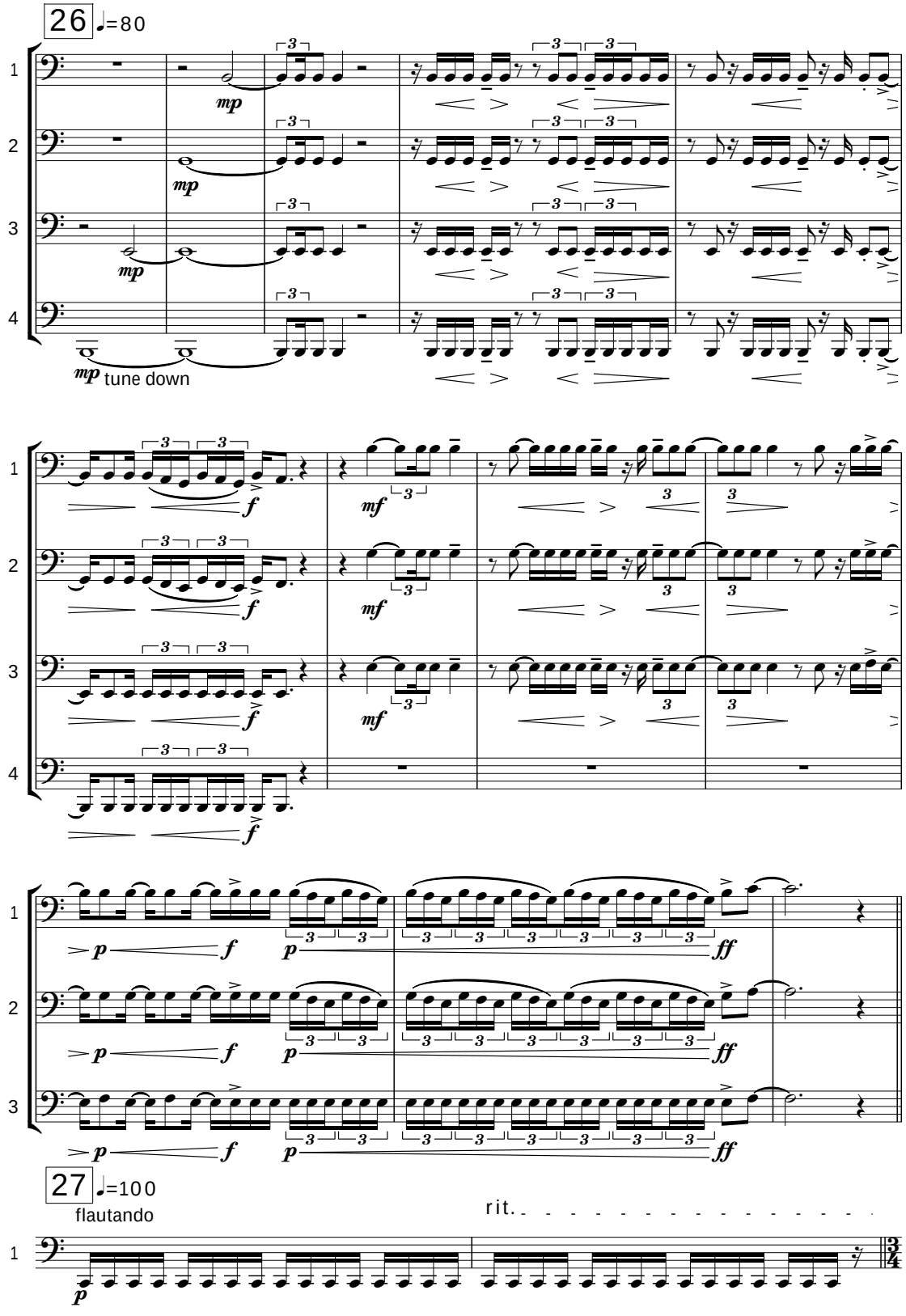

molto rall.....
18
=112
Intense, improvise rhythm - go further down scale
Intense, improvise rhythm - go further down scale

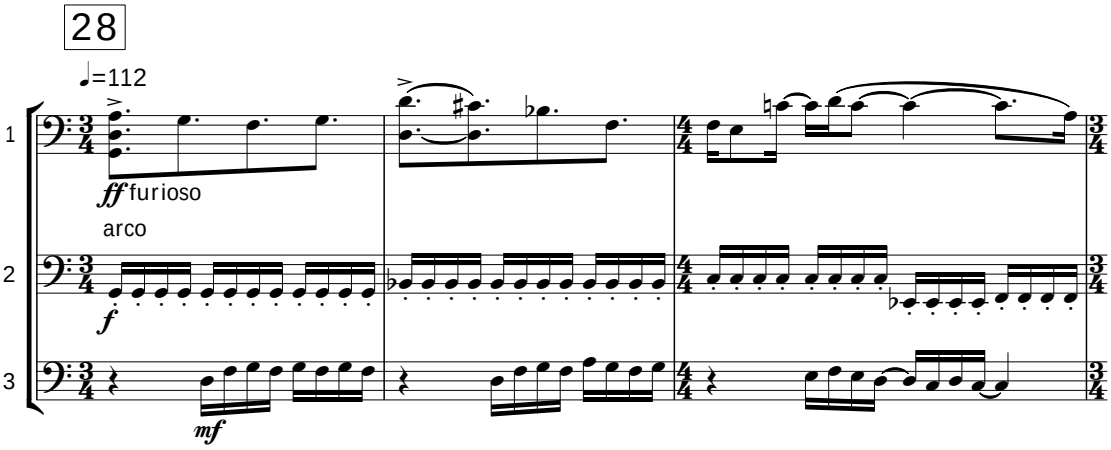

19
Variations with tremolo.
fff

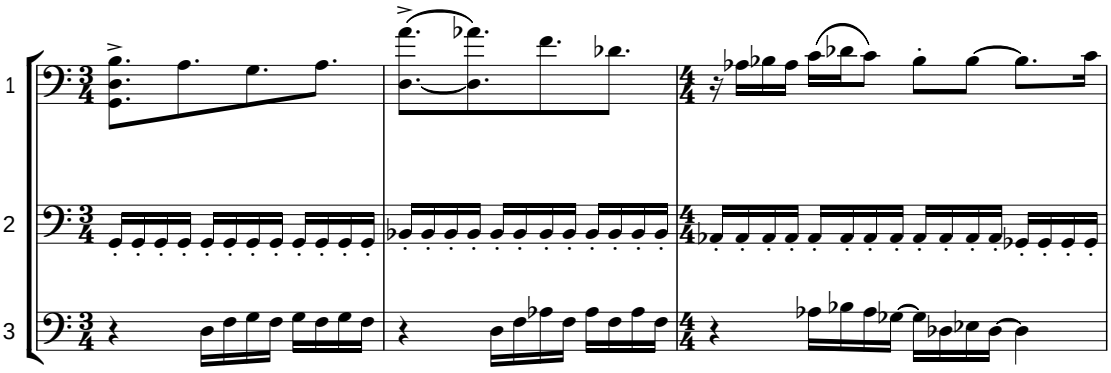

=95
20
Assorted rhythmic variations
brush hair

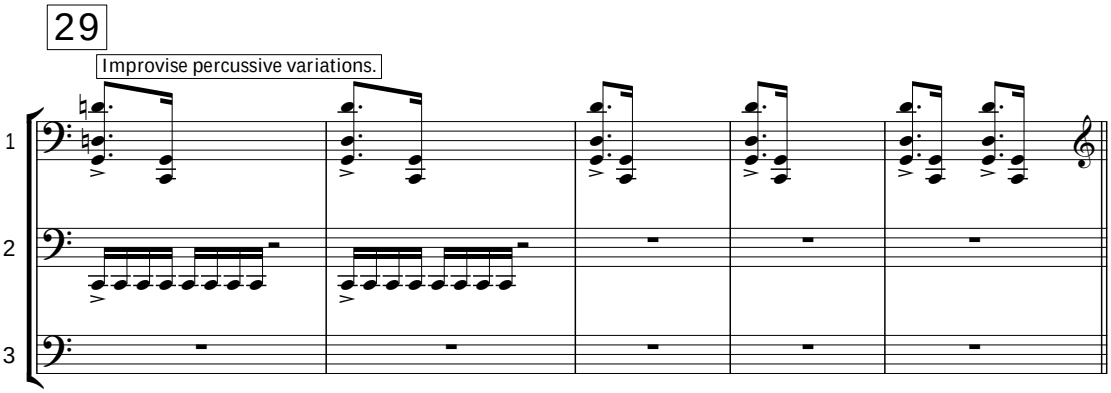

21
pizz.
mf
pizz.
mf
22
pizz.
f
pizz.
f
ff
emphatic
f
ff
f
ff

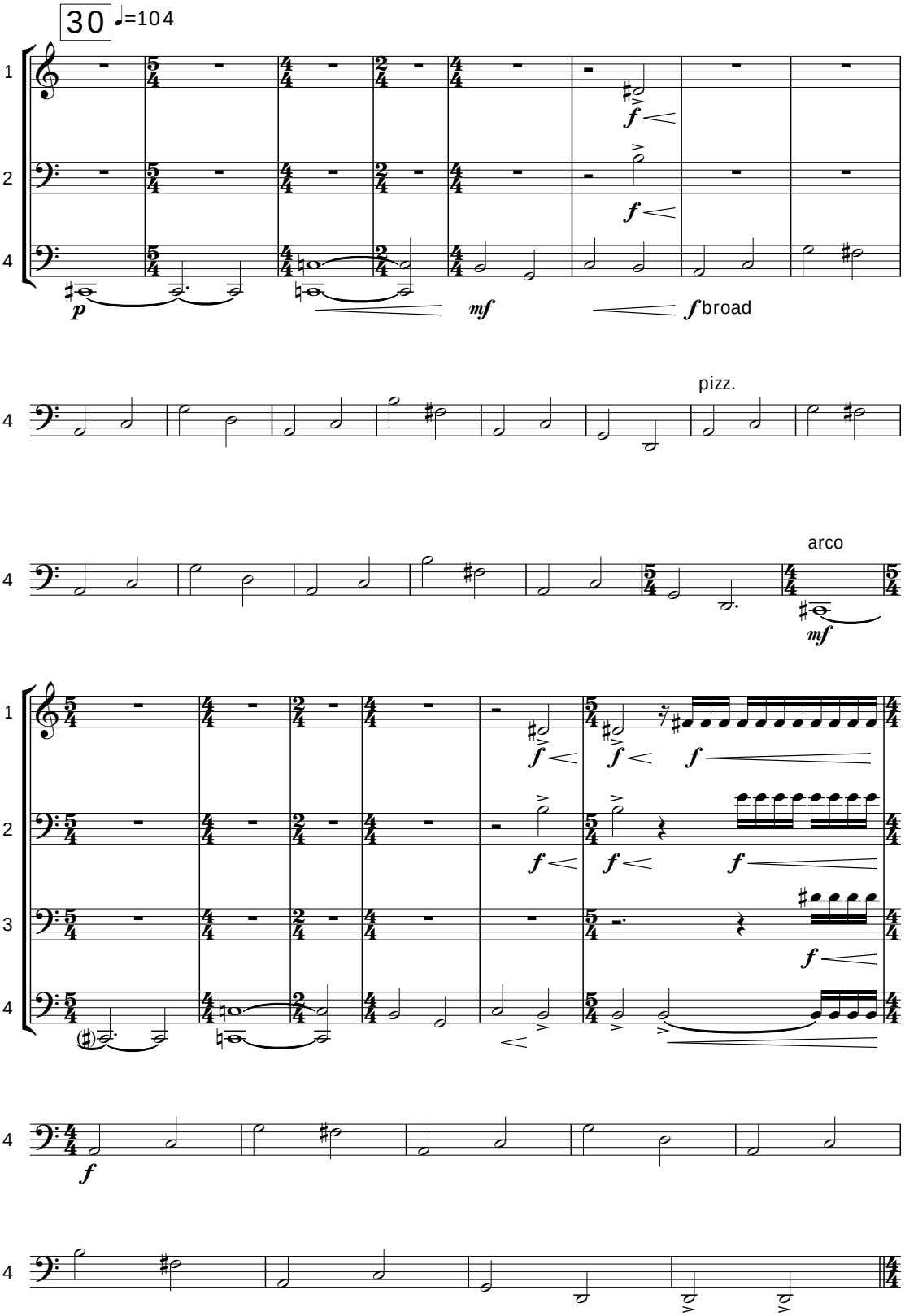

23
24
pizz.
arco
arco
pizz.
pizz.
arco
arco
25
♩=108
Improvisation - chaotic rising triplets, many different timbres and rhythms
arco
Chaotic variations
sul pont.

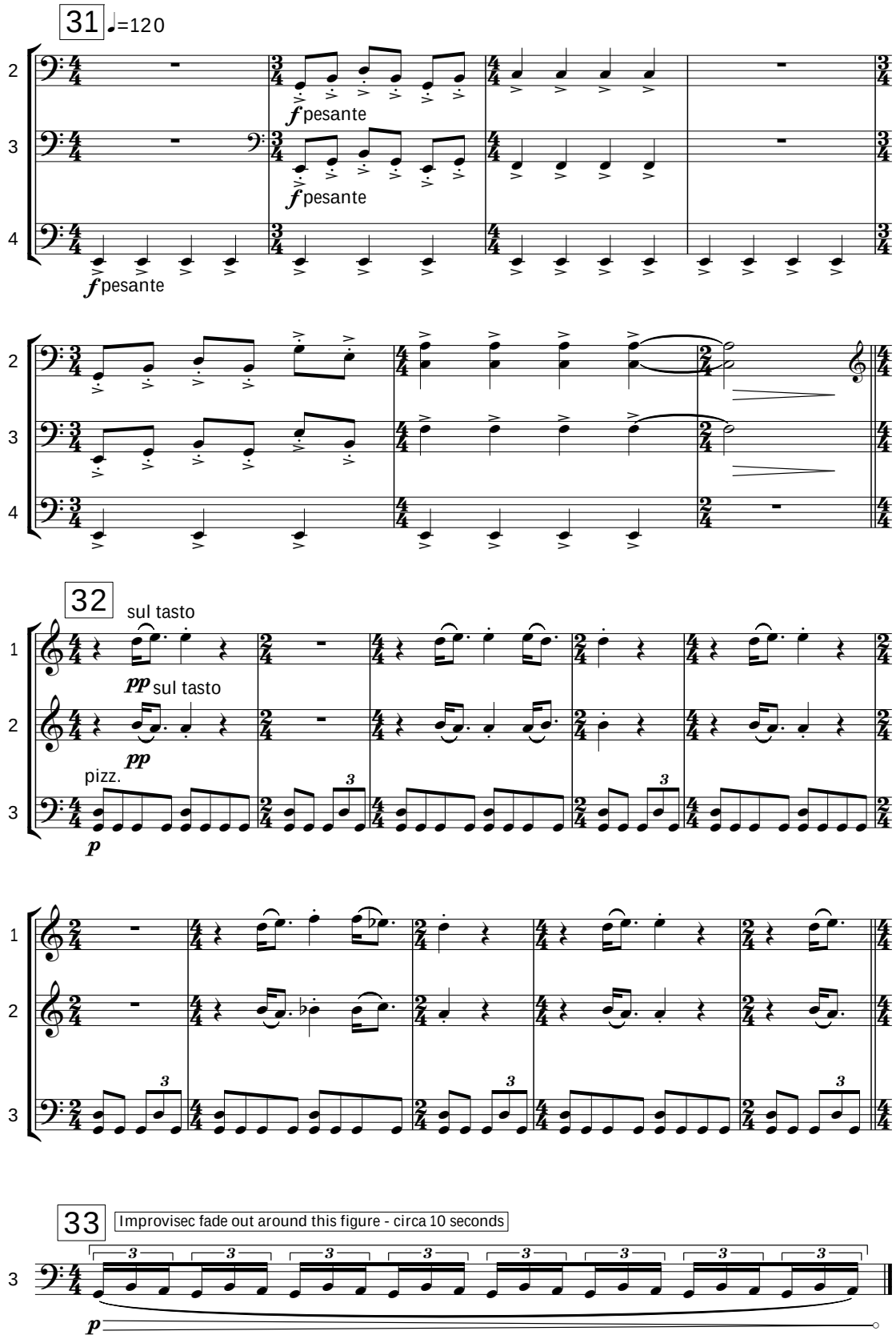

26
♩=80
mp
tune down
f
mf
p
ff
27
♩=100
flautando
rit.


28
♩=112
1
2
3
ff furioso
arco
f
mf


1
2
3


29
Improvise percussive variations.
1
2
3


30
♩=104
1
2
4
p
mf
f broad
pizz.
arco
mf
f
3


31
♩=120
2
3
4
f pesante
f pesante
f pesante
32
sul tasto
1
pp sul tasto
2
pp
pizz.
3
p
33
Improvisec fade out around this figure - circa 10 seconds
3
p

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