Folio of Compositions with Critical Commentary

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Abstract

This Doctor of Philosophy submission comprises a folio of original compositions, including some audio and visual recordings, with an accompanying critical commentary. As a composer my background is in both scored composition and digital audio production. The principal aims of the program were to explore the possibility of an integrated compositional practice in the midst of divergent media, and to identify and examine various implications of this. Music I scored for live performance is contrasted with, and related to, musical recordings I created at a Digital Audio Workstation. While detailing the development of Electromechanics, an album of electronica, I have exposed and examined idiosyncrasies of digital production. These idiosyncrasies affect an evaluation harmony and melody, which in turn marks a change in the way my scored works are composed, beginning with the work Vagabond Suite. The commentary develops new terms to describe a space of technological attributes that encompasses all media a composer engages with. The commentary describes how this attribute space may be purposefully involved in a composer's technique. A composer may operate within this space or exploit it by subverting technological conventions and limitations. This is encompassed by glitch, a recent variety of audio production, and I demonstrate a connection between glitch and scored music. These ideas result in a new concept which I title ‘manifold composition’, which essentially means a realised piece of music along with its unrealised potential. A composer may wilfully create manifold compositions, and my late-folio works, especially Chalumeau Orbits, exemplify this.
Declaration by author

This thesis is composed of my original work, and contains no material previously published or written by another person except where due reference has been made in the text. I have clearly stated the contribution by others to jointly-authored works that I have included in my thesis.

I have clearly stated the contribution of others to my thesis as a whole, including statistical assistance, survey design, data analysis, significant technical procedures, professional editorial advice, and any other original research work used or reported in my thesis. The content of my thesis is the result of work I have carried out since the commencement of my research higher degree candidature and does not include a substantial part of work that has been submitted to qualify for the award of any other degree or diploma in any university or other tertiary institution. I have clearly stated which parts of my thesis, if any, have been submitted to qualify for another award.

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Publications during candidature

No publications.

Publications included in this thesis

No publications included.

Contributions by others to the thesis

No contributions by others.

Statement of parts of the thesis submitted to qualify for the award of another degree

None.
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Introduction:

This research project comprises a folio of music completed over three years including two modes of composition: score-based, and the creation of music at a Digital Audio Workstation (henceforth referred to as a DAW). The folio demonstrates a gradual integration of a method of composition that involves both of these modes.

Accompanying the folio is this commentary. It articulates what is implicit in the compositions, as well as highlighting and developing a number of key concepts which relate strongly to the folio. I develop a new notion about the possibility of a ‘manifold composition,’ drawing from the key concepts established here. In the contemporary musical world, where different music media is readily available, a concept of manifold composition enables the composer to create musical works that may exist at once within and beyond the confines of a single medium, all the while maintaining a stable approach. I have found this may be achieved through an exploration of each medium’s deep-seated limitations, restrictions and idiosyncrasies.

The folio is comprised of three varieties of composition: music composed with a score for live performance; music produced at a DAW and realised as a recorded work; or some combination of the former two. As such, the folio explores two divisions. One is between concert works and recorded music; the other is between art music and electronica. The divided categories may be grouped in different ways: for example, art music might be either concert works or recorded music, and recorded music might be both art music and electronica. This dissertation relates my experiences of creating explorative music and also appraises the music retrospectively in order to highlight the concepts which give rise to the notion of a manifold composition.
CHAPTER 1:
Musical Context, Outline, Rationale and Methodology

The compositions of this folio explore the divisions between musical categories, however the compositions’ purpose is not always to heal them. Kylie Gann describes a “gap” (184) between varieties of music, especially serious and vernacular or art music and popular music. Different varieties of music within this folio exhibit something akin to this. But deliberately dealing with such as these is something I have considered less important than focusing on completing music. Musical style will unavoidably develop in its own way. Pluralism of the 21st Century appears to involve a narrowing gap between contemporary art music and other varieties of music in any case (Davidson “How to Collaborate” 1-2). When a contemporary composer works across different styles of music and different mediums he or she must find ways to work stably and remain artistically satisfied in spite of stylistic diversity. That occurrence is what I am calling an ‘integrated compositional method.’ A stylistic unification may eventually result, but it is not assured, and perhaps not required.

1.1 Background and Influences

As a composer I have always worked with dual media. During my time in high school in the 1990s my first compositions were hand-written and influenced by Western art music tradition, particularly compositions of J.S. Bach, Rimsky Korsakov, and Stravinsky (considered the greatest composer by my young mind) and, later, Phillip Glass and Arvo Pärt. Of the latter two, I instinctively understood the fundamental difference between their music and varieties of modernist music.

At the same time I was keenly aware of pop and rock. Kyle Gann states that for Americans, “growing up in an environment pervaded with rock music has become an almost universal
experience” (354). I have little doubt that this was as true for fledgling Australian composers in the 1990s as it was for Americans. Rather than simply being surrounded by rock and pop I was captivated by it. I revelled in genre-defying sounds of Björk, Massive Attack (“Unfinished Sympathy” for example), the distorted electronics of Nine Inch Nails, the graininess of Portishead and the intelligent sampling and lyrics of De La Soul. I also gradually became aware of and startled by new varieties of electronic music from the UK labels Warp Records and Ninja Tune, including that of Aphex Twin, Autechre, Squarepusher and Amon Tobin.

Over time, I have become more conscious of artists who have frequently crossed genres or used disparate media in their own practice. John Cage, Karlheinz Stockhausen, Miles Davis, Frank Zappa, Steve Reich, the Kronos Quartet and my supervisor, Robert Davidson, are examples.

At different times I have composed music which is, variously, more like modernist, minimalist, pop or electronic music. This could be because, in an environment pervaded by many kinds of music, a contemporary composer is more often obliged to cross between styles, or it could simply be because I remain fascinated by these kinds of music. In any case it has meant a persisting involvement with two different modes of composition: working primarily with a score to be prepared by instrumentalists for live performance, and creating music at a computer.

Even when we imagine that working with several mediums might have particular advantages for an artist, we should not assume this will not have its difficulties. Working with dual mediums has resulted in two difficulties for me. The first is achieving stability of methods.
Precisely because I have engaged with more than one medium, I had not settled quickly into a particular workflow as readily as composers who operate more exclusively. The second is that using different media has meant that my compositions vary considerably in their style. On the one hand, I had largely accepted that this outcome was part of my identity as an artist. On the other hand, as an artist who desires to reach career milestones, I still felt some dissatisfaction when the stylistic variances of my music perhaps indicated different pieces are composed for irreconcilable ambitions. Despite that I would continue to work with different media, and without any assurance of achieving a singular style, I hoped to discover an integrated approach to composition.

This was the situation with my music at the commencement of the program. I have found that, by developing the concept of a manifold composition, stability of methods and artistic satisfaction can be achieved even when working across media. In this way an integrated compositional method may be reached.

1.2 Commentary Overview

1.2.1 Chapter outline

Concepts which are crucial to this document’s conclusions are identified within its different sections. These concepts will be introduced in an order which provides a direction toward an eventual discourse about manifold composition and the final works of the folio. Chapter 2 details limitations inherent in digital production, which is essential to various subsequent sections. An appraisal of folio works begins at Chapter 3, at which point concepts from Chapter 2 assists an examination of works created at a DAW. These works are from the EP called *Electromechanics*. The appraisal is especially concerned with how those works deal with and exploit the limitations of the DAW medium.
While completing the folio, I encountered various problems in achieving an integrated approach. In Chapter 4, traditional methods of composing are challenged for several reasons. Systems of pitch relationships, in particular, are considered.

The concept of glitch is identified in Chapter 5, and how it has been employed successively within the folio is detailed. A case is made for using the term (at least in the context of this program) to describe the intentional subversion of conventions in composition in general, and thereby applying a concept of glitch to a scored composition and even more broadly.

Some of the folio works are experiments in crossing between media: the problems associated with undertaking such projects naively are discussed in Chapter 6. This leads to identifying compositional techniques which are media-spanning, enabling a conclusion about manifold composition. Chapters 7 and 8 detail this conclusion and explore the folio’s final compositions.

1.2.2 Terminology

I employ the terms DAW-based composition and score-based composition as a practical means of delineating compositions in the folio. I acknowledge that these terms themselves raise some questions about assumed distinctions between such categories. For the moment it suffices to recognise that the terms are intended only as part of a practical guide to appraising the folio. Many of the issues which these terms engender will be tacitly dealt with as this commentary progresses.
A DAW is a relatively recent, well-described concept within the music industry\(^1\), notable in particular for its unprecedented multifaceted capabilities (Huber and Runstein 252). I use the term as a generalisation for music principally created as a recording at a computer using present-day digital technology. In other words, the DAW is central, but I do not use the term to exclude peripheral devices or processes, especially to do with recording from external inputs. It is also noteworthy that a DAW is at present known to be constituted by commercially-available, off-the-shelf equipment and software. What I refer to as a DAW is not mainly comprised of equipment or digital processes designed personally, from the ground up, by the user of the equipment, even though this equipment may sometimes be boutique. Rather, both in terms of industry standards and the definition I use here, a DAW is a collection of extant, reasonably well-developed (usually commercially-developed) devices and processes which are made use of by a composer to create musical recordings.

Score-based composition, in this document, refers to composition which primarily utilises a score of the Western staff notation (which I will henceforth refer to as a \textit{traditional score}). It may or may not be completed at a computer. David Cope sanctions the production of a score at a computer and yet, insofar as creating a traditional score is concerned, he prioritises reading and notating as the main objective (4-6). It is in this sense that I am distinguishing score-based composition from DAW musical creation: the production of a traditional score is the principle achievement of at least the initial phase of the composition. DAWs certainly may possess score-like systems of their own such that it is not necessary to utilise a traditional score when creating music at a DAW (Davidson "Notating Music"). However the main implication of my score-based concept is, that in its case, the initial achievement of the composer is always abstracted from – i.e., a “metaphor” for (Brown

\(^1\) for a concise description see Kefauver. Also described in Laptop Music Power, The Comprehensive Guide by John Von Seggern.
Computers In Music 12) – the ultimate realisation of the work, yet often considered the principal achievement of a composer. These definitions are merely preliminary and offered for practical purposes; I acknowledge that finer concerns may render them erodible or beg further consideration.

Electronic music, electroacoustic music, electronica, EDM (electronic dance music), and IDM (intelligent dance music), are referred to variously throughout this document. Each has a different meaning and I suggest definitions supplied by Joanna Demers (163) are sufficient for the purposes of this document. Very briefly, electronic music is the broadest category here and encompasses any music predisposed to electronic production; electroacoustic and electronica are often understood to be, respectively, institutional and commercial electronic music (6); EDM is dance-focused electronica; IDM is varieties of electronica which are said to offer greater complexity or depth so that it is as enjoyable for listening to as well as dancing.

The terms I make use of to describe DAW concepts, processes or techniques correspond to those of the Avid Pro Tools system. These may be located within the Pro Tools Reference Guide. However I will endeavour to restrict usage to those whose general meaning is reasonably self-evident or commonly known; in any other case I will provide citations for the relevant section in the manual.

Specific terms describing core concepts will be introduced which require definition and elucidation: loudness, referentiality versus actuality, texture, spectromorphology, hyper-detail and glitch. Once this is accomplished, when any several are mentioned they may be referred to collectively by the phrase ‘core concepts.’
1.3 Rationale

More than ever before, distinctions between traditional composition and music created with the aid of electronic and digital processes are questioned, blurred or redefined. It is because of this that it is increasingly important for a composer to hone an awareness of the interrelationship of these media.

1.3.1 The distinction of electroacoustic music

The music of artists such as Bjork (*Volta; Homogenic*) Radiohead (*Amnesiac*) and, later, Sufjan Stevens (*The Age of Adz*), as well as many others, merges electronic music production and composition associated, to some extent, with the Western Art Music tradition. In a word, they use traditional acoustic instruments and purposefully composed scores amongst their electronic production. However, this music remains quite distinct from the exploration of electronic music within the Western Art Music tradition, perhaps because of an “historical trajectory” (Taylor 11) with which composers of the latter variety have often aligned themselves.

To appreciate the genesis of this distinction we may consider electro-acoustic music in its heyday. Simon Emmerson’s earlier writing (*The Language of Electroacoustic Music*) gives the impression of a perceived cutting edge, glimpsing what must have appeared as potentially limitless possibilities offered by the new, still comparatively rare electronic music technology of the time, up until about the 1980s. Before then, electronic and computer music had been predominantly “the domain of experimental or avant-garde musicians” (Ramshaw 2). The notion that one day the normalisation of such technology would offer a platform for a much larger and broader base of musicians and composers seems unnoticed in the wake of excitement about individual technical achievements of the time. We may...
contrast Gann’s statement that a history of electronic music is a history of its technological advances (253), with Holmes’ observations about contemporary composers (273-257) and how they are “absorbing [rather than] battling with” (275) the use of technology. It is now clear that the numerous amenities of commercialised music technology for musicians and composers entering their careers are within easier reach than ever before.

1.3.2 The digital revolution

This process has been greatly aided by the large-scale adoption of digital music technology, often referred to as the digital revolution, and escalating since about the 1980s.1 Amongst other things, an important ramification of this was the increased facility for a single individual to take over and complete tasks that had previously required the expertise of several people operating various, physically separated devices (Ramshaw 3). “[T]oday, virtually anyone with a personal computer can afford to produce professional-quality electronic music from inside the home for less than a few hundred dollars,” remarks Joanna Demers (9). Additionally, in the midst of this, music educators have been increasingly prompted to take commercial technology seriously as they are presented with a “cross-fertilisations of artistic genres and styles,” (Bresler 15) or what George Odam refers to with a degree of humour as “The Age of Aquarius” (234).

The division between composers inside of the Western Art Music tradition (including those who produce electronic music) and present-day artists, who frequently employ electronic sounds, proffers little explicit justification. Though in many respects it seems to be something currently subject to erosion it is still recognisable: “there remains a certain antagonism between ‘art music’ and ‘experimental/club electroacoustics’” (Living Electronic

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1 Roads 13; Hannan 93; R.F. Moore 341; Gann 270-271; Holmes 273.
Music 81). If this is still observable, there must be many complex contributory reasons, several of which Emmerson candidly explores (Living Electronic Music chp.3).

Various authors\(^1\) describe a general concern that commercial technological devices and practices would impart various restrictions on the creativity of its proponents. Primarily, they cite necessary restrictions on media when commercial success is prioritized. Other factors are mentioned, such as when the frequency of upgrades which is “clearly antithetical to the stability traditionally associated with artistic practice” (Truax "Electroacoustic Future" 25).

1.3.3 Tool use breakdown

Such opinions face substantial challenges and, in my view, fall short of a 21\(^{st}\) century post-digital understanding as described by Cascone (12).\(^2\) Many seem founded on questionable assumptions. A frequency of upgrades is not avoided by using exclusively non-commercial systems (Holmes 4th ed. 313). “Popular music…has remained about the same in form and content as it was before the commercialization of music technology,” writes Richard Moore (344);\(^3\) I cannot decide what exactly Moore means by claiming this.\(^4\) It would be superficial and aimless to call Pop ‘samey’ when a similar claim can be made about some music of any tradition. Holmes points out that this is no remark on exciting and original electronic music currently being made (2nd ed. 274). The claim that “skewing the development of the technology towards more conventional aesthetic preoccupations” is a “disadvantage,” (Wishart 577-78) could be picked apart in several ways. In relation to this document, however, it is more important to describe one particular challenge to these views:

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1. Mercer 166; Wishart 578; R.F.Moore 344; Truax “Electroacoustic Music” 25
2. Chapter 5 of this document examines the most substantial reasons for this in depth.
3. Fortunately, Moore’s conditions for “artistically expressive technology”(350) seem to be broadly applicable, in spite of some of his restrictive statements about commercial music technology.
4. Especially in light of what is written elsewhere about Rock and Pop’s relationships with technology. For example, see Holmes (4th ed.), p. 442-467.
commercial processes can be learned, embraced and then subverted, or even broken. Far from being a disadvantage, for some contemporary artists embracing conventional aesthetic preoccupations will be a necessary aspect of their development.

There is something undeniably exciting, appealing and admirable about bottom-up inventiveness, like the work of David Tudor in the 1970s (Holmes 4th ed. 299, 313). But this doesn't disqualify entirely different orientations. More to the point, approaching from a low level is now more a choice, and less a necessity (see Chapter 5). A “top-down” approach (R. F. Moore 351) is freely available to present-day artists. Michael Hamman questions presumptions of technological determinism when he points out that “tool use” practices – computer practices in this case – can be broken down via artistic practice. Indeed, he claims, this is desirable in artistic practice, and that in art these breakdowns are frequently “intentionally engineered” (101) by artists. More succinctly Ramshaw writes, “any tool can be used to do something. Whether that something has artistic merit depends on the artist, composer or producer” (10). Cascone writes, “in this new music, the tools themselves have become the instruments, and the resulting sound is borne of their use in ways unintended by their designers” (16).

Additionally, some of the concerns about technological obstacles – particularly digital technology – have become redundant (Holmes 273), or at least should be considered in a new context, in light of the continued development of digital technology through to the present day. The frequency of upgrades\(^1\) is the result of rapidly developing technology, no doubt pushed by market forces. Yet we may presently observe that this has more often resulted in more powerful generalised systems for contemporary musicians, rather than ‘dumbing down’. Take for example the limitations of real-time granular synthesis in

\(^1\) Of concern to authors like Truax (“Electroacoustic Music” 25) and Risset (609).
commercial MIDI controlled devices of the time ("Electroacoustic Music" 394); these have now been largely surpassed thanks to contemporary music software (Holmes 4th ed. 335-337). And in spite of Trevor Wishart’s concerns (578), generalised tools have become more readily available to consumers as computing power has increased.¹ ²

The way commercial devices and processes can be subsumed to serve a composer’s overall technique – to be at once utilised and subverted – will be described in Chapters Five and Eight. But at any rate, commercial or mainstream technology in music – DAWs in particular – can now be considered ubiquitous, and consequently, increasingly difficult for a creator of music to ignore or avoid. This at least seems to be conceded by Truax ("Letter"). Huber and Runstein state, “In short, we’re living in the midst of a techno-artistic revolution that puts more power, artistic control, and knowledge directly into the hands of creative individuals from all walks of life in the music business”(1).

1.3.4 The ubiquity of recorded media

Texts on popular musicology have sought to draw attention to the way that a recording, when it is the primary text (Wicke 147) significantly impacts on or fundamentally defines the final product (Warner). Alf Björnberg discusses how the development of music technology systems effects the mediaization of music, such that by 1980, “there [was] an increasing acceptance of mediaized music, ‘loudspeaker music’, as a genre distinct from, but equal or

¹ NI Reaktor (Native Instruments) is a good example of this kind of application.
² Moreover, an anti-commercial concern seems not to account for artists whose creative output expressly involves the use of mainstream commercial technology for its unique sonic characteristics, and who famously employ the equipment in roles unanticipated by the developer. An example of this is the music group 808 State and their fondness for particular makes of synthesisers and now outdated electronic equipment; indeed naming themselves after the commercially successful and still highly-sought Roland TR-808 drum machine (Arnold and King). This in itself represents a coming of age – such associations only make sense because they are employed nostalgically, something not possible unless the commercial device has been part of a practice which greatly expands on its originally anticipated scope.
maybe superior to, live music” (129). Clarke emphasises a recording’s radically acousmatic nature, repeatability (and interruptibility), spatial and object-like character, editablity, and reach (to a broad audience) as its defining characteristics, and concludes that “recordings have profoundly affected the way we listen” (67) and indeed that they are still transforming the way that we do. In 2000, Nigel Sabin commented that securing a recording is more difficult than securing a performance (7). Because of the availability of new audio technology, and even because the way that our regard for the media is changing, at the time of writing Sabin’s claim is no longer as certain.

Given the ubiquity and influence of the recorded medium it may be inferred that, irrespective of a composer’s stylistic direction, choice of genre, or even intended means of performance, if the composition is to eventually be recorded (or otherwise utilise music technology in some part of its production) an understanding of how that technology affects or defines the final product will be instructive during the compositional process. This technology is increasingly constituted by a DAW.

Consequently, useful to most present-day composers is an understanding of the relationship between live music composed with a score and recorded music produced at a DAW. It is anticipated that this study will be able to contribute to this understanding.

1.4 Methodology:

1.4.1 Practice-based research

My program falls within the paradigm of practice-based research and adheres to a model where the creation of the music is itself the research activity. “Research…needs to be
treated, not monolithically, but as an activity which can appear in a variety of guises across the spectrum of practice and research” (Dean and Smith 3). The primary task of this commentary is to explicate any of my findings which, though implicit in the music, are elucidated here to most efficiently meet the aims of the program.

I acknowledge the “friction” identified by Reiner and Fox (5), between composition as a creative activity and composition as a form of research. However I do not insist on a distinction between new knowledge latent in the compositions themselves and new knowledge explicated by this commentary in relation to the folio. It is my hope that I am essentially making explicit what is inherent in the folio’s works. Submitting a folio without a commentary would be problematic mainly (and significantly) because, although analysis of the folio might reveal any number of interesting subjects, only some of these would form a narrative which aligns with my research topic. In other words, I choose not to make the distinction offered by Candy (3) between practice-based and practice-led research, for an argument could be made to classify this work as either. Instead, I suggest that this commentary’s principal role is to explicate the key areas of interest concerning my program; ones which form a pathway toward its most significant results.

1.4.2 Exclusions

As a consequence, where some things about the compositions are too removed from that pathway I must be scant when discussing them. Here I rely on a theme outlined by Reiner and Fox (5), where my compositions are both research items and creative works, and this imposes a limited scope. Most notably, traditional harmonic analysis is only employed as required; details of hardware and software usage or technique-centric issues are forgone where they don’t directly relate to the topic. These are already (and no doubt will continue to
be) well-documented in technically-oriented texts\(^1\). Although some of my folio works are represented by video productions, and although video production as a part of a composer’s activities is an intriguing topic, a complete discourse on it is beyond the scope of this commentary.

Reiner and Fox suggest qualifications for a folio of compositions as research. I agree with these and follow them with one accession: even if a composition taken individually from this folio cannot be regarded by itself as an item of research under Reiner’s and Fox’s terms, when observed as part of a selection of compositions it may be. That is to say, progress might need to be observed over a succession of works for any one of those works to qualify as research. This is important because, although I have developed my music on the basis of a single research question, the nature of that question means that there is still much stylistic diversity amongst many of the folio’s works. Furthermore, I have included music composed early in the program to illustrate a point even if this means the folio’s works vary in quality. The observation of a stylistic progression – from disparate and enterprising at the beginning towards a more observable cohesion across the differing mediums – can itself be regarded as an element in the outcomes of this research. Permitting stylistic non-confinement at the commencement of the folio was necessary to allow an in-depth exploration of music typical of one or another medium and I believe this has been crucial to the program.

1.4.3 Retrospective analysis and appraisal of folio works.

By its nature a folio of music represents an organic, somewhat indeterminate process. An unavoidable result of this is that it resists a prospective format optimised for specific answers to a research question. This is part of Reiner’s and Fox’s friction. However, sufficient foresight will provide flexibility to permit the growth of a music folio around a central topic,

\(^1\)Huber and Runstein; Rumsey and McCormick; Kefauver; Russ; Dodge and Jerse
with the view of placing increasing importance on a retrospective analysis or appraisal of completed work as the program progresses.

This is in line with Graeme Sullivan’s distinction for practice based research, where instead of “moving from the ‘known to unknown,’” the program is an instance of “the possibility of new knowledge that may be generated by moving from ( . . . ) the ‘unknown’ to the ‘known’ whereby imaginative leaps are made into what we don’t know as this can lead to critical insights that can change what we do know”(48). This allows “serendipity and intuition [with] direct attention to unanticipated possibilities”(48). As such, instances of retrospective analysis are central to statements made about the folio.

This approach best provides a reasonably reliable method of observation without interfering with the creation of the music itself. “Composers and analysts need to establish observation methods that provide reliable data without crippling or distorting the creative compositional process” (Donin 5).

Consequently, the conclusions here will be something other than an immutable proof of what has never before been established, yet will provide new insights about the subject matter with the hope that these might be gateways for further investigation.

1.5 Choosing Electronic Music

Initially the DAW-produced works broadly included music comprised of acoustic or electric instruments physically performed during recording sessions. Eventually the focus was narrowed primarily to electronic music. There is, of course, some overlap of these varieties, and that is indeed observable in some folio items (for example, Asteroids).
My interest in electronic music increased throughout the formation of the folio but the choice to focus on its production was made for particular reasons. The first was practicality: all of the techniques crucial to the direction of the folio did not preclude electronic music, yet completing projects in a timely way was critical, and intensive composition and production of electronic works was not bottlenecked by arrangements with other performers. Secondly, and more importantly, electronic music of the variety explored in the folio is inclined to be experimental in nature and this was of benefit to the program; this point will be returned to later. Electronic music proved an immersive occupation, and in time it became evident that only a thoroughly immersive practice would motivate the most vital insights. As such, restrictions and limitations of DAW production – to be discussed next – were only gradually revealed.
Chapter 2: Restrictions, Limitations and Idiosyncrasies of the DAW Medium

As for myself, I experience a sort of terror when, at the moment of setting to work and finding myself before the infinitude of possibilities that present themselves, I have the feeling that everything is permissible to me.... Will I then have to lose myself in this abyss of freedom? (Stravinsky 66)

In this chapter I single out a few aspects of the DAW medium which direct, restrict or limit a composer’s choices and merit close examination. Though they are certainly not all that might be said about DAW production, they serve as examples of how a composer is affected by the inherent limits of a medium. Also, they are of particular relevance to my folio works, and consequently what is illustrated later in this document.

Digital production systems have a way of appearing to offer limitless possibilities. Various writers have remarked on its unprecedented versatility (Demers 9; Ramshaw 3) and invoke the term “digital revolution” (Roads 13; Hannan 93). Because of this it is not always clear where digital systems impose limits until a user immerses himself or herself in the medium. A commercial device for music production will always have reasonably clear limitations which influences the music created with it. However, there are restrictions, limitations and idiosyncrasies which are due to the medium itself, rather than a particular device or process. These most essential characteristics of a medium affect my composition, and these and their consequences will be detailed below.
There is much that might be mentioned about a medium’s characteristics, but I highlight particular items due to their effect on my musical process. The way I created the works in this folio reveals, incrementally, some of the ways that the DAW medium limits and restricts my music, and by extension other music. Through an exploration of the medium’s restrictions and limitations an understanding of musical qualities is advanced. These are qualities that are not typically highlighted in a traditional practice of composition.

2.1. Limited Dynamic Range in a Recorded Medium and the Perception of Loudness

In much concert music and audio production it is important for the music to occasionally (or frequently) sound loud for expressive purposes. However, because part of the folio consists of audio recordings, identification of requirements for dynamic range which are unique to the recorded media has meant a heightened concern for loudness and its implications.

2.1.1 Dynamic ranges

The potential dynamic range for live music is only limited by the ambient noise, capacity of the instruments and a concern for the comfort and safety of an audience. The human auditory system is responsive to a very large range of sound intensities, which ranges to 120 decibels above the faintest sound we can detect (B.C.J. Moore 127; Plack 115). Live music may make use of a fair portion of this wide dynamic range: what may be discerned above ambient sound and what lies below a safe (or at least tolerable) threshold.

Contemporary recording media has a dynamic range less than the capacity of a normal listener. For instance digital audio at sixteen bit resolution (that is, CD and standard format
MP3 quality) has a range of ninety six decibels.\(^1\) More significantly, conventional practices in audio production mean that an additional reduction in dynamic range is typical and expected. Bob Katz states that dynamic range in popular music is typically only six to ten decibels, and that ranges beyond fifteen decibels are rare (109).

The reasons for this are complex, but may be divided principally into two categories: Firstly, the reduction of dynamic range in a recording benefits its playback in noisy environments, for example a home or car (Katz 111). Secondly, there has been a tendency for artists and producers to premaster their albums with increasingly high average amplitudes due to the assumed competitive benefit of a louder recording. Here, the reduction of dynamic range means amplitude peaks are lessened and average intensity may be increased. This practice is called the “loudness war” (Vickers).

Earl Vickers, Bob Katz\(^2\) and others\(^3\) discuss the history, far-reaching and potentially damaging implications of the loudness war. An artist is always at liberty to make use of the dynamic range physically available in the recording medium, but there has been a clear trend toward less dynamic recordings in commercial music.

2.1.2 Loudness versus intensity

The ‘competitiveness’ of an item of music is not a topic covered here. Nonetheless, being involved with media which requires an artist’s deliberation dynamic range obliges a consideration of loudness and its implications in audio production.

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\(^1\) Fries and Fries 147; Dodge and Jerse 67  
\(^2\) (110-11; 87-88; 273)  
\(^3\) Viney; Jackson; Reierson
Physical intensity and loudness are not identical; the latter is only measurable via responses of human observers.¹ When mixing music, this distinction becomes very noticeable. It is possible to measure the average intensity of two different mixes and establish that, although they are roughly the same, one will still sound distinctly louder than the other (Katz 166).

Another way of considering this is the “indifference to absolute loudness”(Lerch 73) in a traditional score, or how a recording’s intensity may be increased via the playback system’s volume control, “without losing the piano or forte character of the performance”(73). Dynamics are indicated with expressions rather than quantities. This is related to Zagorski-Thomas’ remark, “[we] would not alter the perception of a shout as having an aggressive meaning by simply making it quieter” (2). So, achieving loudness in an audio recording is decidedly a more complex task than simply increasing the intensity.

2.1.3 Achieving loudness in DAW production

There is no absolute method for predicting or ensuring the loudness of a section of recorded music (Howard and Angus 85). What constitutes a reasonably accurate model of the perception of loudness indicates loudness as affected by frequency. However, a question for audio producers remains: will nothing other than frequency selection and intensity account for Katz’s “drastically different loudness”? ²

I suggest that aiming for specific spectral areas is often not sufficient to ensure the loudness of a section of music. While creating my recordings, care and attention to other factors frequently appears to have an effect, each playing a role in the perceived loudness of a

¹ Lerch 71; Howard and Angus 82; Mathews 71
² For loudness of sine waves versus complex musical sounds, see Mathews (71-78) and for various other factors affecting a perception of loudness, see Chowning (273-275).
section of recorded music. These include the avoidance of masking, arrangement of sounds in time and the clarity of sound sources and their spectral relationship. In a piece of recorded music, where dynamic range is restricted, where the composer requires a loud passage, and when loudness depends on more than simply raising the average intensity of the sound, crafting the mix in a variety of other ways becomes essential. The folio demonstrates a gradual development of techniques with respect to this, and these will be detailed later.

2.2 Restrictions of Loudspeakers, Playback Systems, Listening Environments and a Consideration of Referentiality vs. Actuality

2.2.1 Loudspeakers

With their singular cardboard diaphragm, two dimensional axes of movement, and practical or economical restrictions on how many may be employed in most situations, loudspeakers have clear limits, which composers have often remarked on.

Smalley is concerned with the timbre of a loudspeaker, which he refers to as an “indigenous timbre” ("Defining Timbre") of electroacoustic music and Emmerson refers to these systemic limits as “the grain of the medium" (Living Electronic Music 84). The physical reality of the speaker itself – for example, the spectral weighting loudspeakers commonly impart – must be considered carefully when preparing a musical recording, more-so than might be first assumed. Moreover, a moment’s reflection points to considerable differences between acoustic sound and a reproduction of that sound via standard recording procedures (Pierce 292).
2.2.2 Playback environments for commercial producers

Additionally, I suggest that the reality of a playback system as part of a playback environment presents a more pressing concern for the commercial producer than what is generally true for the creators of electroacoustic music. For the latter, it would seem that in most situations it is assumed that their playback system should provide as much fidelity as possible. This is supported by Emmerson (*Living Electronic Music* 31). This is not to say electroacoustic composers would not expect such things as spectral weighting in a loudspeaker. Emmerson, for example, makes a distinction between “ideal” and “realist” approaches to loudspeaker representation (*Living Electronic Music* 148), but even for a realistic understanding of speaker grain and environmental considerations, a composer may still customarily demand the highest attainable fidelity with the objective of presenting the “intention of the composer” to “greatest possible effect” (*Living Electronic Music* 148).

Yet commercial music producers will from the outset assume their music will be subject to a broad variety of playback fidelities and environments. Of those environments which can be anticipated as likely the potential range of their fidelity is extensive. Earbuds, car stereos, supermarket PA systems, along with home hi fi systems - all are expected to perform as suitable and satisfactory conduits of the producers' intentions (Katz 75; 77-79; 127). The profundity of how the environment where the listening takes place affects the experience is remarked upon by Emmerson (*Living Electronic Music* 82); the more this is realised by a producer, the more it will affect their production style. For example, as noted in section 2.1, producers of music intended for a wide variety of environments will commonly opt for a reduction of the recording's dynamic range, often substantially. In Emmerson's terms, this generally means a commercial producer will be radically “realist” in their approach.
2.2.3 Bound and unbound sounds

The different degrees of source bonding of which Smalley classifies are relevant here ("Defining Timbre" 37-39). Bound and unbound sound may be thought of as opposite ends of a scale. At either end of the scale, a medium’s grain which includes loudspeaker bias, playback artifacts, noise floor, and so on, are musical concerns. However, it is only on the end of the scale where a sound remains unbound to a source, that grain (for example, the nature of the loudspeaker) is most closely involved with the sound being produced. That is to say, where a sound is entirely unbound, there is nothing that can aid a distinction between the “intention of the composer” (Emmerson Living Electronic Music 148) which includes the sound of the speaker, and the composer’s intent as without it.

On the other end of the scale, for strongly source bonded material – say a recording of a string quartet – all four source-cause levels (Smalley "Defining Timbre" 38) aid the listener in putting aside a concern for extraneous matter, including indigenous timbres. A listener will spontaneously “discriminate the incidental from the functional” ("Defining Timbre" 41). In this case any amount of incidental material due to the playback system’s processing and production technology is readily set aside by a listener, guided by, in the case of a string quartet, an “extrinsic matrix” ("Defining Timbre" 37) which is well-endowed in its “extended” and “dispersed” source-cause levels.

In other words, even though a listener hears the sum total of sounds produced by the playback system and the environment, including those that are unintended by the composer – especially present when listening and playback systems are not ideal – he or she merely enjoys the music of a string quartet. The listener may well disregard the resultant timbre of a reduced bit-rate recording played by an inexpensive system of questionable fidelity, in a noisy environment, as the case may be. However, for unbound
sounds – electronically synthesised sounds, for example – the listener is less able to
distinguish the sound intended by the composer from any other timbres.

2.2.4 Referentiality versus actuality

A consideration of bound and unbound sounds can help us to recognise the following
distinction. Two poles can be thought of as residing at either end of a continuum, and a
piece of recorded music – or its constituents – may exist anywhere between them. At one
pole, strongly source bonded sound only requires the playback system to be of satisfactory
fidelity for successfully permitting a listener to make that reference; for example, to allow the
listener to identify and enjoy the sound of a string quartet. So long as this is true (and
assuming an adequate performance) the intention of the composer is conveyed. At the
other pole, non-source bonded sounds must accommodate the medium’s grain, but
additionally may intentionally make use of the extent of the playback system’s character.

For convenience I will refer to the first pole as referentiality, and the second as actuality. For
referentiality, the playback system merely presents the composer’s intention; whereas for
actuality, the intention of the composer must accommodate the playback system. Musical
recordings can exist anywhere along this continuum.¹

These terms are approaching synonymy with Emmerson’s “idealist” and “realist” (Living
Electronic Music 148) respectively. Yet there is a distinction, when on the one hand a
playback system which preserves the character of a string quartet may still be far from ‘ideal’
even if it succeeds, and on the other hand moving towards actuality can in fact provide

¹ Zagorski-Thomas launches a discussion which has similarities to what I have outlined here. As he
points out, there is no true referentiality in recording (5). The term I use here is abstract: Referentiality
is only ever an ideal, and not even that unless it is sought.
unique opportunities for a composer/producer, as Emmerson and Zagorski-Thomas clearly recognise.¹

Janne Vanhanen states:

Recording technology is essentially referential machinery, and yet makes non-referential, acousmatic sounds possible in the first place. In a way, referentiality is a fundamental structure of digital music, (. . .) but utilizes such technology that it can simultaneously subvert this referential structure, transmitting sounds to listeners without the gesturing of a performer or representational awareness of a supposed sound source. (49)

As a commercial composer must be radically realistic about playback fidelity, he or she will frequently opt to extend towards actuality as a utility. Acutely aware that a breadth of potential playback systems will present fairly predictable limits, the composer will seek to create music whose strengths are manifest in spite of those limits.

For example, if it is anticipated that listeners will often encounter the music using systems which attenuate bass frequencies (headphones for example), the producer may choose to augment a voice which includes primarily sub-bass content by accentuating its harmonic content, for example by creating upper partials by applying a distortion process (Dodge and Jerse 115). By adding higher harmonic content, the sound is objectified higher in the spectrum and this may enhance its audibility on systems which are attenuated in their bass range.

¹ Emmerson Living Electronic Music 84; Zagorski-Thomas 5
During the completion of the folio I gradually gained the understanding that actuality can be utilised by a composer. Once these limitations were recognised, it became a matter of choice as to when to employ compositional methods which worked amongst them. This eventually meant that actuality, in the sense described above, was recognised as an opportunity for artistic expression.

Of course, these concepts – referentiality and actuality – are abstract. A more detailed analysis would probably relate a situation which is too complex to be described one-dimensionally. Nonetheless, the concepts are introduced here so that the folio’s direction may be considered, as abbreviations for complex ideas, and that they may be built upon later.

### 2.3 Working Inside Limitations in Digital Audio production

I gradually came to terms with the general restrictions and idiosyncrasies of the medium as outlined in sections 2.1 and 2.2 throughout the production of electronic music for the folio. This is exhibited by the way the recorded music in the folio has developed; it will be discussed from Chapter 3 onwards, furnished with examples.

In particular, I found that the limitations, such as have been discussed above, prompted a number of reoccurring strategies. A consideration of loudness in audio recording fostered strategies for avoiding auditory masking, requiring numerous techniques. Understanding the contrast of referentiality and actuality encouraged a tendency to create composite sound objects. That is, by seeking to preserve the definition of a sound object independent of playback conditions, I discovered techniques to create and sufficiently expose what I call hyper-detail in sound objects. These items require an appraisal.
2.4 Auditory Psychological Considerations for Audio Recording: Masking and Object Characterisation.

2.4.1 Masking and audio production:

The masking of one voice by another in an audio record will often be of concern because the dynamic range is restricted.\(^1\) Although the amplitudes of both voices are summed and, as such, physically occupy an amount of the available dynamic range, it does not follow that both voices will be clearly discerned by a listener. This is because of auditory masking. So a practice of avoidance of masking of one voice by another became an important aspect of the DAW-produced music within the folio.

There are a variety of ways in which masking may occur (B.C.J. Moore chp.3; Moylan 33). In particular, a consideration of simultaneous masking (Howard and Angus 230-36) in relation to audio production, and how this is dealt with in the folio, is detailed in Chapter 3.

2.4.2 Sound object characterisation

A producer frequently encounters complex sounds – meaning sounds comprised of many partials of different frequency, amplitude and phase, perhaps as well as some noise content, all variable in time (Plack 22-25). Additionally, those complex sounds which are characterised as singular sound objects may be manufactured by a mixture of other sounds. In this case, the producer chooses to create a singular sound object by combining various sounds which are originally separate and often derived from different sources. I refer to these manufactured sounds as ‘composite sound objects.’

\(^1\) See section 2.1
When we listen we are hearing a mixture of all the sounds in our environment, even though we can separate and group different sounds as required. Plack (193) and Moore (chp.8) explain what is known about this. *Perceptual grouping* (274) is required to separate different sources. Though we may hear sounds from a number of different sources, their collective frequency components must be separated into groups, each group matching its source. *Simultaneous grouping* and *sequential grouping* are aspects of this, where in a single moment all simultaneous frequencies emanating from a single source must be grouped together (simultaneous grouping), and where over time changing frequencies produced by a single source are connected (sequential grouping) (275).

These observations of auditory psychology support my experience in audio production. Here, an intuitive awareness of these things is gained via experience, allowing a producer to craft a mix such that some sounds are intentionally singular objects, where others are separated. Techniques I have developed as a result are akin to the examples provided by Charles Dodge and Thomas Jerse (59), where composite sound objects may be created in a targeted manner. This means that undertaking the task of constructing a sound, especially by manipulating timbre, envelope and apparent source, will be intended to serve a specific musical purpose. This is demonstrated in Chapter 3.
CHAPTER 3:
Folio Works Exemplifying a Compositional Relation to the Restrictions and
Limitations of a Recorded Medium.

Taking concepts explored in Chapter 2, I turn now to an examination of the music of the folio. This chapter deals particularly with an EP of music titled *Electromechanics* – music created exclusively at the DAW – in order to demonstrate the importance of those concepts from Chapter 2 in the creation of this music.

3.1 Spectral Construction Methods of Singular Sound Objects

In the piece *The Retrofit* (the second track of the EP), during the “chorus” section (approximately 1’27”), there are four distinct components to the kick drum sound, which is intended to be heard as a composite sound object. For present purposes I have named these ‘transient,’ ‘emphasis,’ ‘body,’ and ‘sub’. They are distinctive in more than one respect. Firstly, they were synthesised independently, so that in the DAW arrangement they remain separate regions; in fact each occupies its own track. This is illustrated in figure 1. Secondly, I intended each component to take on a particular task by inhabiting different areas of the spectrum; this had to be accomplished while avoiding masking.
Figure 1. The arrangement view, demonstrating the different components of the kick drum as waveform regions in the arrangement.

A kickdrum’s effectiveness is often enhanced because of its frequent broad-spectrum content, though a mid-low spectral area will often dominate. When a drummer plays an acoustic drum kit, the action of the beater on the drum-head not only creates a bass sound, but also a snap, with additional sound due to other elements of the drum kit resonating with the kick strike. Being able to control several artificial components, each of which represent potential physical characteristics of an acoustic phenomenon, is a facility of digital production.

In this music, each component possesses a specific role in expressing an aspect of the composite sound. They begin as separate timbres where each one is clearly recognisable as distinct from the other when heard independently. I have included audio recordings of...
each of these sounds. Although these are distinctive sounds, my intention was for their combination to result in a composite timbre, or a singular sound object.

The transient component serves to delineate each strike. Like various electronica producers, I have found that the perception of a short bass strike is greatly emphasised by inducing a quick, sharp snap sound to mark the beginning of the event. This is necessarily high in the spectrum, in this case its energy is strongest around about 7kHz – 10kHz (see figure 2.1). This means that emphasis is gained with little expenditure of energy, as these snapping sounds demand less energy than the lower portions of a kick drum’s sound, according to the Fletcher Munson Curve (Mathews 71-72).

The emphasis component is intended to provide the composite sound with interest over time. It has a more complex waveform, and in this case created with granular synthesis (Russ 257). It is loosely analogous to the extraneous sounds which are triggered in sympathy by a physical strike, for example, the rattling and resonance of other drum kit parts when its kick drum is struck.

The body is the main part of the sound, and would constitute the remainder, except for the addition of a high-pass filter which in its case removes the very lowest part of this sound. So this is not the fundamental component, but the important spectral content immediately above the fundamental, which is slightly more energy-efficient than that lowest component. It delivers a punchy quality to the composite sound, and the term is often used to describe frequencies between 400Hz to 1.5kHz (Snoman 346). In this particular case it is observable that this emphasised low frequency area quickly descends as it sounds (see figure 2.3).

1 Examples are in a directory called “mixing examples,” amongst the other audio-visual items in the folio. Each example’s name corresponds to the descriptions in this document. There are two instances each (identical to the images in this document).
The *sub* is only separated for practical reasons, as it could be synthesised along with the creation of the *body* component. It is handy to be able to control how much sub bass is present in the overall kickdrum strike, as sub bass sound is relatively energy inefficient, in terms of the amount of energy it requires in order to be heard at a given level.

Masking is primarily avoided by ensuring that each component mainly occupies its own spectral region. This involves an extensive process of aurally assessing multiple combinations of different sounds, and different quotients of equalisation ranges on the lower two components. An awareness of each component’s *timing*, apart from modelling a physical occurrence, serves to prevent what is called forward masking (B. C. J. Moore 108-09). For example, here the *transient* is noticeably very short (see figure 2.1), while the *sub* begins later than every other event (compare figure 2.4 with the other images).
Figure 2.1 Spectral representation of the *transient* component of the kickdrum sound. Figures 2.1-2.5 are spectral representations of sounds. Time is indicated on the horizontal axis, in seconds. The vertical axis (right hand side) is frequency in Hz. The audio samples are in stereo; both channels are represented here; the left channel is the higher part of the image and the right is the lower. In each audio sample, two strikes are sounded; both strikes in each sample are represented here, the second following the first by about 1.1 seconds – note the horizontal axis reading. These images have been produced so that the amplitude of the sound at a given time corresponds to the darkness of the image (this is scale is also consistent across these images). Thus in figure 2.4, most of the sound’s energy resides below 100 Hz, meaning it is a low bass tone. The frequency here is represented by a logarithmic scale so that higher and lower frequencies equally discernible.

Figure 2.2 Spectral representation of the *emphasis* component of the kickdrum sound
Figure 2.3 Spectral representation of the *body* component of the kickdrum sound

Figure 2.4 spectral representation of the *sub* component of the kickdrum sound
In this case the combination of sounds results in an image where each component may still be distinguished. Examining the final image of a composite sound, while comparing it to the others, it may be observed that all four components inhabit their own spectral region, and as such remain discernible both aurally and, as it happens, in the composite image. In this way, a broad-spectrum sound can be created by piecing together several constituents, even on a short time scale; in this case most of the energy transpires in about 200 milliseconds. Where dynamic range is limited, sound energy is prized, and in this example the composite sound object has been constructed in a way which does not waste too much energy on masking. This has been achieved by a consideration of the components’ spectral areas of density and where they occur in time in relation to each other.

3.2 Temporal Arrangement in the Construction of Singlular Sound Objects

In *The Retrofit*, I have used a similar production technique to produce the snare drum sounds. In this case, the sound is less broadly spread across the spectrum. Rather than

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**Figure 2.5** spectral representation of the *combined* kickdrum sound
primarily being a matter of spectral relationships, avoidance of masking was achieved via temporal placement in combination with a spectral awareness. For the snare drum (in this section), two components have different, complimentary roles: The ‘body’ here provides what may be described as “punch.” What I refer here to as the ‘emphasis’ provides interest to the sound over a duration exceeding the initial punch. Again, using granular methods for its creation, it exhibits a complex waveform, which occasionally pre-empts the snare strike as well as following it. Once more, this is intended to loosely represent the way in which a loud sound will cause other objects in its immediate environment to sound in sympathy; this potentially cues the listener to a striking gesture. Here, the effect is able to be exaggerated as the component responsible for it may be intensified at will using its fader. These waveforms are pictured below. These sounds are available to be heard independently and in combination.¹

![Figure 3. Snare componentry](image)

¹ Examples are in a directory called “mixing examples,” amongst the other audio-visual items in the folio. Each example's name corresponds to the descriptions in this document
The preceding discussion provides examples of creating composite sound objects, which is a technique very common in the later work of the folio. Combining sounds at a micro level (i.e., measured in milliseconds) to form composite timbres has depended upon a strong awareness of spectro-temporal relations between components, and the significance of these combinations for source-cause bonding.

3.3 The Separation of a Sound and its Source

Notable amongst the applications of this technique is that the methods of component creation are not limited to synthesis, but include recorded found sounds and signal processing. Most revealing was that, in choosing sounds to record, they may be selected exclusively for their timbral qualities and spectral habitat, and with a disregard for the real causes of the sounds. Thus, in *Elves versus Mecha*, to create a kick drum and snare sound, in addition to some basic synthesised content, the following acoustic sounds were recorded:

- Felt beater strikes on the detached metal tray of a wheelbarrow, producing complex low-mid frequency content with rich partials and noise.
- Pouring nails into a steel saucepan, producing a granulated, continuous, evolving sound somewhat discernibly comprised of micro-plosives, with no readily distinguishable pitch content but rich in its temporal complexity and noise.
- A side-stick strike to a snare drum rim, creating an abrupt transient strong above about five kHz.
- Crumpling of plastic bags containing dried onion, resulting in a complex crackling timbre, spectrally rich above about one kHz.
- Vigorously tossing a handful of nails into a wide metal pan, producing a sharp sound with a fast attack and fairly rapid, though noticeable, decay, with strong gestural associations.
Indeed, the completed EP *Electromechanics* exemplifies techniques throughout similar to those discussed above.

### 3.4 Volume Ducking in Mitigation of Masking and Spectral Automation

Ducking is the process of temporarily reducing the volume of one sound so that another sound which occurs simultaneously may be more effectively exposed (Snoman 108). I will demonstrate the use of this technique in the composition, *Sniper Training*.

In *Sniper Training*, at about 4'49," a heavy-sounding synthesised bass melody begins. This sound was created with two synthesisers; one digital analogue-modelling (the most dominant sound) and one true analogue. The digital synthesiser begins with two oscillator models: an abrasive wavetable-generated sound and a less intense square wave model, pitched an octave below the first oscillator serving a sub-bass function. The signal generated by the first oscillator is then subject to two filters in series; several parameters of both filters are linked to a single variable universal control. The first parameter on the first filter is cutoff frequency, the second and third are varieties of a resonance model. The second filter is a comb filter, where the pitch of the selection of frequencies is linked to the same universal control mentioned above. The sub-bass sound is set to bypass all the filters, and mixed back with the original sound at the final stage. When the universal control is moved, all the above-mentioned parameters move in conjunction with it. This enables the

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1. It is often used when two bass sounds occur at the same time, especially a kickdrum sound and a bassline tone. As the former is customarily briefer than the latter, momentarily reducing the volume of the bassline serves to unmask the kickdrum sound, without sacrificing the eventual perception of the bassline, which may be returned to its regular volume even as the kickdrum sound fades. In electronica, this task is often achieved using a sidechaining (Snoman 97), (Soundzone.Info) compression method. It is easily noticeable in popular Trance music, for example, Armin Van Buuren’s Beautiful Life, featuring Cindy Alma (Van Buuren), as well as commercial dance-pop and RNB, for example, Dynamite by Taio Cruz (Cruz). However, I have employed volume automation as my preferred method.

2. Please note that texts such as Sound Synthesis and Sampling by Martin Russ, and Electronic and Experimental Music by Thom Holmes, provide explanations to many terms used here, such as “analogue-modeling,” “oscillator,” “wavetable,” “cutoff” and “resonance.”
digital synthesiser to be variable between a rich, dense sound and a simple bass sound, as well as vary perceived pitches, via the setting of spectral range, the cutoff, resonance feedback and comb filtering. Figure 4 is a simplified illustration of the signal path:

Figure 4. Signal path

The analogue synthesiser supplements the digital, combining with it, adding a low sound which is slightly overdriven, adding harmonics and depth to the overall effect. Though a dense, complex sound, the overall result is intended to be perceived as a single instrument, even if the casual listener cannot identify that instrument.

Figure 5 shows the universal control, mentioned above, being varied by automation data. It also shows the waveform from the analogue synthesiser. It can be seen that the most spectrally dense sound (when the cutoff is open, the resonance feedback is full, the resonance increased, and so on) will occur on the first beat of the bar. In other words, the sound occupies the fullest spectral range and is also most intense at that occasion. I have provided a spectral representation of this sound below. All of this is reasonably evident
aurally. I have also provided an audio example of this sound isolated from the rest of the mix.¹

![Figure 5. Universal automation](image)

If this rich sound had been left unaltered on beat one, the sound of the kick drum would have been significantly masked. At that juncture, the most labour-saving resolution would simply be to increase the volume of the kick drum by moving its track fader up and adjusting the

¹ The example is in a directory called “mixing examples,” amongst the other audio-visual items in the folio. It is called “conclusive synth line.wav”.

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balance of sounds. However, recalling the earlier discussion about dynamic range in this medium, increasing the bass-heavy, energy-demanding\(^1\) kick drum sound to a threshold where it is satisfactorily discernible often means that it must become the most intense part of the recording. Headroom is always regulated in an effort to avoid wasting dynamic range. Making one sound more intense, when occurring at the most intense section of the production, has a seesaw-like effect, and all other material is made somewhat less intense. A solution is offered by ducking, whereby the kick drum sound may be heard clearly, and the other material need not be made much less intense overall. The following image shows the volume automation employed to drastically reduce the volume of the bass sound while the kick drum sound occurs. Note that in this case the volume automation feature is used to generate silences in the digital synthesiser part (for example, beat 2 in figure 6). This happens to correspond with the occurrence of the snare sound.

\[\text{Figure 6. Volume ducking (corresponding to universal automation)}\]

\(^1\) See sources on Fletcher Munson curves.
I have included a spectral representation of the synthesised bass melody below, which reveals at a glance the way both amplitude and spectral width are lessened greatly at the start of beat one, even though the sound is intended to be perceived as beginning on beat one. As the spectral width varies over time, it has the effect of generating harmonic motion. Like many instances where spectrum is given priority ahead of harmony and melody, there is a coincidental result: the spontaneous generation of harmonic or melodic interest. As Smalley says:

[T]imbre is an extension of harmony, or vice versa. The composer uses spectral analysis as a basis for conceptualising the relationship between pitch and sound qualities, and attempts to negotiate a fluent border crossing between the two (. . . .) Once tonality and intervallic pitch are no longer regarded as the predominant carriers of musical messages, pitch and timbre can cohabit in a spectromorphological music where the ear has opportunities for shifting in and out of pitch values. ("Defining Timbre" 36;40)

In this case, the intensity of harmonic overtones varying in time, causing something resembling a hetrophonic texture in the synthesised part,\(^1\) is indeed visible in the spectral image (see figure 7). In each entry, harmonic content is ramped up in time, held between about 1000-2000 kHz, and then ramped away, causing visible “n” shapes in the spectral image which relate directly to the similarly shaped DAW automation visible in figure 5.

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\(^1\) Livia Teodorescu-Ciocanea refers specifically to this type of hetrophonic movement as “a superimposition of various hypostases of the same melody” (90).
It is clear that if the synthesised bass melody and the kick drum sound did not occur simultaneously, there would be no incentive to employ the ducking technique for the purpose described above. As such I was progressively motivated to arrange content carefully in time, with an increasingly acute awareness of when and how voices overlapped. Textural arrangement of sounds provides another method to avoid masking, and intentionally enhanced distinctiveness of sound objects.

In the piece *Post Apocalyptic Fortress Architecture* at about 2’40” there is a similar system of synthesis routing and synthesiser combinations as described in the case of *Sniper*.
Training. In this case I chose to arrange the texture in such a way that only those sounds considered sound objects are discerned at one time, essentially creating a monophonic texture. The choice for this to occur here is founded on the fact that these sounds all have significant spectromorphological complexity. The drums are again a layering of sounds from found objects; the first synthesiser sound is designed so that its higher partials may move up and down the frequency scale in time to create a quasi-melody, which remains embedded within a single sound object. The final synthesiser at 2’46” (that is, beat four) also seems to move in pitch, although in this case this movement is caused by a self-oscillating resonance (Russ 87) which glides over the fundamental; its perceived pitch depending on location of the cutoff frequency.

This creates an unusual situation where the interest of the musical texture is not satisfactorily revealed by a traditional textural description: the texture here is monophonic\(^1\) despite the complex sounds, because each sound here is a singular sound object.

This overtly simplistic texture lasts only for only a short while yet it provides a good example of an emerging concern for texture in spectrally rich areas of the music over the course of the folio. Even from 2’48” onwards, more than one sound object can be distinguished at a time. For example, the snare strikes at the same time as the synthesiser note sounds at about 2’48”. Although simultaneous sound objects were introduced for musical reasons, I maintained an awareness that a limited dynamic range and unusually complex sounds would mean masking would be difficult to avoid. The discussion on ducking (above) establishes a solution to this situation, and a ducking technique is indeed used here to specifically avoid this problem. However, simultaneous sounds whose lengths extend together over significant time cannot rely on ducking to delineate them because that technique depends on the rapid

\(^1\) Sections of music like this could perhaps also be described as antiphonal, or heterophonal; for the latter see Teodorescu-Ciocanea’s description (90).
cessation of one sound. Instead, understanding the relationship of their spectromorphology is crucial. It is not enough for the central areas of their spectral energy to be separated even though that is important in keeping sounds delineated. Rather, the whole habitat of their spectrums over time must be something the composer is aware of, as even the partials of one sound interfering with another’s can result in masking of one by the other or a lack of clarity of both.

3.6 Distinctiveness of sound objects: Hyper-detail

These examples show an awareness of masking as a concern when working with limited dynamic range, and the role of composite sound objects. Moreover, the pursuit to create music for an abundance of playback environments, and an awareness of the musical impact of unmasking sound objects encouraged aesthetic choices. These have become crucial to the creation of music for the folio, above and beyond the limitations of the media from which they are stimulated.

The examples in this chapter show that I have fostered an awareness that a composer may willfully move along a continuum between the referential and the actual. A sound object may be devised which is referential in part, yet possesses qualities which are ‘larger than life.’ In particular, exaggeration of a sound object’s distinctiveness, via the employment of composite techniques and its exposure by avoiding masking via spectral and textural arrangement, means it can no longer be considered strictly referential. For brevity’s sake, I have named the intentionally exaggerated or enhanced distinctiveness of a sound object, its ‘hyper-detail’. The ideas detailed in Chapters 2 and 3 will be returned to later.
CHAPTER 4:  
Reevaluating Pitch Relationships for Conceiving Melody and Harmony

The music from early in the folio shows a gap between the media. At first, it appears to be a stylistic difference. Some items seem intended as ‘art music’ whilst others resemble ‘electronica’ or ‘IDM.’ I believe these appearances are of secondary interest. They are consequences of a more fundamental distinction: on one hand, my focus on pitch relations and, on the other, a growing emphasis upon timbre and texture. While composing music for the folio, I would learn about a deep relationship between these things. This results in a development of my style, including both media, and I will remark on this in later chapters.

Works I completed earlier in the program (and not necessarily included in the folio) are mainly score-based generally preference harmonic and melodic complexity, or pitch relations. The pieces experiment with non-diatonic scales and harmonic colour provided by dissonance; there are a few attempts at creating harmonies and melodies based on formal systems of pitch relations, like pitch set theory (Cope 77-88). These works are traditional in the sense that the main compositional activity is ordering pitches to create harmonies and melodies. On the other hand, Flicker was produced with a DAW and, even as an early folio work, demonstrates a deepening interest in timbres.

But pitch orientation seemed unrelated to my interest in working with dual media, and I never took up using an identifiable system of harmony regularly or systematically. Many works completed early in the program, especially those created exclusively in the scored medium, have not been included in the folio, removed as they are from the narrative of my experimentation.

1 Actually, this resulted in certain problems: there was a mismatch between the trumpet part (which was mainly conceived as a string of pitches) and the more concrete electronic part. This will be discussed in section 6.1.
4.1 Various Harmonic Techniques in the Earlier Compositions of the Folio

In the absence of any strongly or consciously formulated harmonic systems, I found utility in using a loose combination of modal harmony and contemporary harmonic techniques which are not yet exclusively associated with a particular musical style. For example, *Piano Duet* uses clusters, as in bars 13-16, modally-derived harmony, split members, as in bar 18 between the G♯ in the treble and A♮ natural in the bass, and common tone chord progressions, as in bar 73. Though I felt free to compose however I pleased, I was still unsatisfied with my overall method of harmonic planning. Briefly recalling the modernist music I was so impressed by in my youth, I imagined that harmony and melody might only be called ‘sophisticated’ when there is demonstrable complexity in the relationships of their pitches; and a particular system must be employed if that complexity is to be demonstrated. Therefore, near the beginning of my program, one of my concerns was that I was composing less sophisticated music. But even at that time, I intuitively knew that evaluating music purely in such terms was questionable, and I had to postpone a purposeful revaluation of my harmonic techniques because at that time I was becoming more interested in the complexities of sound itself.
4.2 Retrogressive Harmonic Relationships – Moving Toward a New Concept

Like the earlier works of my program, *Vagabond Suite* typifies a vacillating or probationary harmonic practice. Composed roughly half way through my program, it does not intensely embody the most important concepts mentioned in this document. Yet, it signifies where my awareness of those concepts began to grow, and I would later consciously compose with those principals in mind. I employed a piecemeal variety of techniques, especially deriving harmony from modes and synthetic scales.
This led, intentionally or not, to its somewhat anachronistic sound. Cope suggests that “[e]ven the traditional ecclesiastical modes, which predate tonality, offer opportunities for composers to create new melodic, harmonic (functional), and hierarchical (formal) possibilities” (26).

Despite my concerns, the main objective of this composition was never to break new ground melodically or harmonically. Instead, my intention was to explore a non-customary delivery: an audio-visual production as the primary performance vehicle, rather than a live concert. By focusing on this relatively new conception for performance and its associated technology, instead of focusing on traditional compositional affairs, I had new insights. I will return to this point in section 4.3. For the moment, I will outline the way I composed harmonies in in Vagabond Suite. The way I derived harmony from melody has a connection to my changing view of harmony in composition.

A selection of modes or scalar patterns underpins most of Vagabond Suite’s harmonies. In this way dissonance, and even non-tonal entities, are permitted without making dissonance central. It also permits a free trading between tonality and modality, and this provides a means for periodically involving tonal features. This is useful for occasionally including functional harmony.

An illustration of this is the degree inflection (Owen 205) which alters the mode of the scales which comprise the first twelve bars of the first movement. Here, an ambiguity is set up between different scale patterns which originate at a tonal centre. In bars 2 and 3 an aeolian scale rooted on D is almost completed, with the omission of F\#\textsuperscript{♭}. In bar 6 a changed modal member occurs which alters the scale in such a way that until bar 10 the D major scale is
suggested. In bar 8 an F♯ appears presenting an ambiguity, denying the implied F♮ of the earlier aeolian mode (see Figure 9). In bars 11 and 12 a synthetic scale is used which involves both F♮ and F♯, heightening the instability by making this split member explicit.

Figure 9. Vagabond Suite example 1

This scalically oriented passage supports a large portion of the ensuing harmony. For example, in bar 15 (see Figure 10) there is a series of chords based upon the original aeolian mode (i.e., B♭ and C♯) while bar 18, though using identical rhythm and similar
vertical arrangement of notes, disrupts a direct repetition of bar 15 by using harmonies implied by the D major melody; particularly the introduction of C# and the naturalisation of B.

Figure 10. Vagabond Suite example 2

The derivation of harmony from melody is a useful tool for linking harmonic content between movements. The principal melody of the second movement is derived from the first movement. The initial melody from Movement One is approximately inverted, slowed in tempo, and its rhythm is altered. Again this creates a mode from which harmonies can be drawn. Movement Three again modifies the initial melody of the first movement to create new thematic material; once again the offshoot is that harmonies may be derived which are unified via their melodic origin.

Producing harmony from a melodic implication is more fully exemplified in this work than any previous works in the folio, and persists as a technique used in later works. This has an important connection to my central thesis. Namely, when I derived harmony from melody it was part of my new appreciation of texture and timbre. I began to revaluate what constitutes interest or complexity in a monophonic or homophonic texture. By extension, I started questioning my loosely held assumptions about complex music (mentioned in section 4.1).
A monophonic texture may be called ‘simple’ if it is only considered as a string of pitches, yet I was learning that it may be imagined differently. For example, though a composite voice might be monophonic overall, it may be composed of different constituent voices, and this composition might be harmonically complex: This demonstrates a relationship between harmony and timbre.

Retrospectively, this can be seen as the beginnings of an attempt (conscious or not) to work towards a new method of harmonic planning. When it was unclear how my compositional practice might advance harmonically, the folio’s music demonstrates trimmed harmonic content, where harmonies simply expatiate melodic material.

This accounts for a retrogressive sound that some of the music in the folio possesses, well exemplified by *The Vagabond Suite*. The urge to recede, trim back or disencumber musical material could be seen as a step in the direction of minimalism. Yet, for the most part, I do not compose with the intention of creating minimalist music. Instead, this disencumberment of harmony is a sign of something deeper: a re-imagining of harmonic preparation, where harmony is more than abstracted, systematised pitch relationships. The repercussions of this are evident in the late folio music and will be discussed in Chapters 7 and 8.

### 4.3 Recording a Musical Performance Provides Insights for Composition

In the case of *The Vagabond Suite*, I produced the audio and visual media. This was enlightening: It eventually became clear that a concern for the techniques and technology of recording may impact the entire process of composing.
In this case, the preparation and rehearsal of the score followed the traditional pattern. However, when an audio-visual recording was prioritised ahead of a standard concert performance, I learned that composition should anticipate this outcome, and furthermore, that the process of composition may be considered to include post-production of the recorded material.

At the time I anticipated that by choosing a non-traditional mode of performance, insights might be gained by working across media. But how this would transpire was uncertain. In retrospect it can be observed that some compositional opportunities – particularly to do with anticipating a recorded medium – were not exploited. This observation is detailed below, and it affected my subsequent compositions.

Working with DAW production was drawing my focus to ‘core concepts’ (see section 1.2.2). By composing Vagabond Suite in a more traditional manner using a score and then recording and mixing it, I gained an understanding that these core concepts might have been brought to bear on a score-based composition. Mixing pointed to various missed opportunities for a better recording, yet crucially, these would have been best addressed during the creation of the score. In a word, limitations, restrictions and idiosyncrasies of the recorded media might have been taken into account during the abstracted phase of composing: the creation of the score.

This is exemplified where the more intense sections of the music involve overlapping of voices to the extent that, in the recording, masking of one or another voice is inevitable. Although there are sections of the music which are comparatively clear and defined, in this piece they are usually the quieter moments. However, at bar 99 in Movement One (about 1'58" in the recording), and at bar 185 in Movement Three (about 5'40" in the recording), I
had much difficulty – during the mixing process – in ensuring each part was satisfactorily
distinctive. It is hard to say in which ways the score would differ if I had better anticipated
the mixing process. It is sufficient to point out that a more complete consideration of the
recorded mode of delivery would probably have affected the way this music was written in
the first place. Even, plausibly, to the extent that my concerns about harmony, mentioned in
sections 4.1 and 4.2, would have been abated, if this new focus had been established.
Indeed, this appears to occur in the folio’s later works, and will be discussed throughout
Chapter 8.
CHAPTER 5:

Convention, Tool use breakdown and expanding the concept of glitch

5.1 Usage Conventions

Working with contemporary, commercial-grade computer technology often means executing processes whose complexities are largely hidden from the view of the user. Thanks to graphic user interfaces (GUIs) a user can extensively manipulate these processes and maintain efficiency. Similarly, successive generations of programming language have enabled programmers to work at increasing levels of complexity, progressing to “what needs to be done” from “how it should be done.” (O'Regan 123). These things enable a contemporary composer to operate from both “top down” and “bottom up” (R. F. Moore 351) orientations, so that he or she may be more engaged with a musical objective than a technological concern, or vice versa.¹ Not only is it commonplace for commercial music software to rely on GUIs, there is now software which allows a user to operate at more than one level; for example the difference between Core and Primary levels in Reaktor (Sasso 11), and the various features of MAX (Cycling 74).

High level processes are designed to be used a certain way, and so users normally encounter restrictions in the way the system operates. “The particular characteristics of a computer music system reflect the designer’s view of how music is constructed or utilised,” states Andrew Brown (Computers in Music 19). Indeed, Chapter 7 of this document describes how a composer may wilfully prioritise limitations of an instrument, environment or process within the act of composing. However, the very recognition of such boundaries – especially what falls within an item’s design – provides the opportunity for an artist to

¹ At other times it may be more useful to consider a composer’s orientation to computers more multidimensionally. For example, Andrew Brown involves the metaphors of “medium,” “tool,” and “instrument” for computers as music-making devices (Computers in Music 6).
consciously undermine them. This empowers creativity which, while encompassing a vivid awareness of technological limits¹, is able, somehow, to break them.

5.2 Glitch

In audio production, intentional breakdown of conventional processes has become a musical practice in its own right. Styles which rely principally on these breakdowns have been gathered under the term *glitch*. Glitch has developed since artists in the 1980s began incorporating sonic artefacts relating to erroneous digital processes as musical source material (Prior 305). Cascone puts forth a basic summation:

> While technological failure is often controlled and suppressed – its effects buried beneath the threshold of human perception – most audio tools can zoom in on the errors, allowing composers to make them the focus of their work. Indeed, “failure” has become a prominent aesthetic in many of the arts in the late 20th Century, reminding us that our control of technology is an illusion, and revealing digital tools to be only as perfect, precise and efficient as the humans who build them. (Cascone 13)

Glitch exposes the relationship between the artist and their tool palette. Here artists foster a duality in their production concept. Firstly, the tools are in their own right a focal point – whereby an artist must understand the tools’ conventions in order to partake in the breakdown of convention. Secondly, at the same, time they are transparent, in the sense that their processes are immaterial and the aim, in many instances, is to achieve a result the tool was never promised to deliver.

¹ It is likely this entails an awareness of “metaphor” (Brown *Computers in Music* 20-22).
In this way an artist moves from treating a tool as a separate external object, to involving it as an aspect of their artistic expression. I believe this often occurs when artists are “involved” (Brown *Music Composition* 40) with technology. Andrew Brown considers human relationship with technology especially via a phenomenological perspective:

This is a shift from traditional objectification of the world, which exists independently of human interpretation or manipulation awaiting observation and discovery, to a view that people are located in the world as an active part of it and that understanding and meaning emerge from interaction with the world. (. . . .) An involved person has an ontological rather than intellectual connection with their world, not unlike the sportsperson who is involved in their game by being “in the zone.” (*Music Composition* 40)

In this light, composing is not an abstracted activity but rather an interrelationship of the composer and his or her environment. This description may be applied to a composer’s focus upon technology in the broadest sense, be it traditional acoustic instruments, development of novel processes, an interest in the physics of sound via technological aid, or making use of recent commercial digital technology.

5.2.1 Glitch and experimentation

Both aspects of this duality – convention and glitch – are in their own ways reliant on contemporary, commercial products and processes. This places glitch at an interesting juncture, somewhere between experimental and conventional music. Here, I challenge an assumption that extant tools are for “commercial compositional practices” (*Music*
Composition 71) and tools developed by the composer are the domain of those “following less established paths.” \(^1\)

Glitch exists between electroacoustic music and other varieties of electronic music. Vanhanen writes “laptop music situated itself at a crossing-point between the traditions of twentieth-century academic electro-acoustic music and bedroom producers” (45). Demers not only recognises that intentional breakdowns in tool usage and its consequent noises, repetitions, states and distortions (106) place electronica at this juncture, but also describes its uniqueness:

(W)hen these sounds of failure occur alongside sounds conforming to traditional ideas of beauty, something different is at play: not the critical deconstruction of boundaries that have marginalised noise from musical language for so long but rather the desire to return to conventional aesthetic language mixed with the knowledge that such a return is impossible. (Demers 107)

Nick Prior argues the inherent experimental quality of glitch, and here he models his view on the arguments of Bourdieu: “In short, while still part of an ever fragmenting music industry, glitch is closer to what Bourdieu calls a ‘research sector’” (309). At the same time, glitch is at odds with methodical operation: “Sometimes, not knowing the theoretical operation of a tool can result in more interesting results by ‘thinking outside the box’” (Cascone 16).

\(^1\) Still, Brown does seem to acknowledge this point, when he remarks about the partnership between composer and computer (Music Composition 57) and states that a composer using a computer “is not intent on stabilising material but seeks to perturb it to surprise the audience.”
5.3 Glitch in the music of the folio

In the way that glitch is at once potentially conventional and experimental, low-level and high level, ordered and random, carefully planned and anit-theoretical, it is an inevitable result of my own involvement with contemporary media. It beckons artists who seek to play with sound and technology, especially ‘non-musical,’ or even ‘counter-musical,’ sound (as it may be considered at first). Nonetheless, this takes place while embracing and understanding conventions of music and its technology, and even with a refined awareness of how an audience will respond to disconcerting sounds. Later in this chapter I will illustrate how encountering glitch in electronic media has encouraged me to broadly revaluate my conception of scored music.

Prior’s term “Sound hacking” (306) could be redeployed as ‘audience hacking’ to describe games played with an audience to defeat their expectations, especially by subtly or conspicuously undermining technological processes and conventions. “Aesthetic of failure” (Cascone 12) might be extended to include when an artist, especially when involved with the conventional, momentarily glitches an audience’s expectations. Not only the prominence of error, noise and distortion, but also an involvement with audience conventions, are modalities I gravitated towards. At first, I only consciously employed glitch in music created with a DAW.

*The Retrofit*, for example, frequently involves the extension of production processes past their regular limits, which results in a sound which in turn undermines a listener’s expectations. Pro Tools offers a feature called Elastic Audio (Avid Technology 877) that employs an algorithm to stretch digital audio in time, without altering its pitch. Stretching audio past a recommended threshold possibly results in “incorrectly” (898) processed sound. The more out of range the process is pushed, the greater the distortion. In fact, the
algorithm’s stretching eventually exposes individual sound grains, which inadvertently provides a method of sound manipulation akin to granular synthesis (Russ 208). Thus composition becomes focused upon timbre and simultaneously temporality, and the composer notices that timbre and time are explicitly linked; as the pitch is stretched, the timbre changes, as does the tempo of the music, in a way which undermines its metrical structure. The results of this are audible at about 2'55" in The Retrofit, and even more prominently with regard to metrical breakdown from 3'47".

In Electromechanical, especially from 5'40" onwards, there is evidence of audio clip splicing which exceeds conventional use. The DAW provides what was originally envisioned as an advantage to actual splicing of tape, but it is extended beyond utility to become a crucial part of the composition’s sound.

Exploring glitch in these DAW works would ultimately affect the way I think about score-based music, and the relationship between the composer and the technology associated with that medium.

5.4 Expanding the Concept of Glitch

The artist’s involvement with their tools – being ‘in the zone,’ meaning that they possess “an ontological rather than intellectual connection with their world” (Brown Music Composition 40) requires a deep, intuitive awareness of the medium’s multifaceted limitations and idiosyncrasies. This is a juncture where the mediums of this program meet: inasmuch as the above is true, glitch is as readily applicable to scored music as audio production. Therefore, though it has previously been associated with audio production, I suggest that a concept of glitch can be readily applied to any music where a sound, technique or process may be used conventionally and at the same time radically subverted, specifically as a result
of the composer’s involvement with the medium and consequent ontological awareness of its conventions and limitations.

There are countless experimental techniques for acoustic performance pioneered by twentieth century composers and in most cases predate my own music by decades. Glitch resembles many of these. Of the many available examples, John Cage’s music is prominent. It often invokes an established practice or device only to irreversibly reconfigure it: A prepared piano; or just humorously pushing a radio onto the floor during a live performance (Mount), literally breaking its pattern of use. Yet, the application of glitch particularly requires a recognition of and involvement with a medium’s conventions. High-level processes and their associated conventions (discussed above), are not simply made use of, but embraced. And at the same time they are transfigured (or transmogrified). This provides glitch a unique place amongst experimental music, as remarked on by Vanhanen and Prior (see section 5.2.1).

The extension of the concept of glitch to scored composition for acoustic instruments has enabled me to approach score-based composition in a new way, by providing a new outlook on experimentation in general: where media may be both involving and transparent, and where convention may be at once embraced and subverted. In the folio, this is manifested as a redeployment of extended techniques for acoustic instruments, with its own flavour. This has an important relation to conclusions detailed later.

An avant-garde technique by strict definition is new, novel, or at the forefront. Extended techniques, as they are deemed ‘successful’ and incorporated into a standardised method of playing can no longer be, per se, strictly labelled ‘new’. Before discovering glitch, I had avoided various extended techniques out of a fear of association with avant-garde historicity.
I have little doubt that this and similar attitudes contributed to stylistic turbulence or even vacuity near the beginning of my program. Conscious *disencumberment*, ¹ though perhaps ‘refreshing the palate,’ left a recurring question about the stylistic direction of my composition. I believe that a lack of stylistic direction is exemplified in folio works such as *Vagabond Suite*. Yet, along with the development of glitch techniques in my DAW production, I began to imagine ways in which a scored composition may be ‘glitched.’ It meant that I could involve experimental processes and simultaneously embrace conventions, even within a single work, as glitch shows that these things are not exclusive. As I remark elsewhere in this document, exploring the technology and limitations of both DAW and score-based mediums proves to be a way of unifying my practice. Here, it is remarkable that when my composing in either medium was experimental, it began to progress under single paradigm. This too becomes a part of the unification of my practice.

I only consciously observed this late in the program, and many of the folio’s works can only be seen to progress incrementally in this direction. However, it is evident that in the most recent folio works this is part of a growing stylistic stability, *in spite of* diverging media.

¹ see earlier discussion about harmonic techniques (section 4.1 and 4.2).
CHAPTER 6:

Cross-Media Experimentation: Identifying a Compositional Nexus

I now introduce the term ‘compositional nexus’ to describe musical material which qualifies the identity of a piece. If a composition is arranged for a new medium and preserves its basic identity, then both versions of the composition share a compositional nexus. In this chapter, an examination of experimental works from the folio shows that a compositional nexus is not always easily identifiable or consisting of well-established musical properties.

It is too restrictive to assume that a compositional nexus, so described, always consists solely of melody, harmony and metrical rhythm. For decades, a statement like that has been increasingly unsurprising. And yet, relying mainly on melody, harmony and rhythm is the traditional way of completing an arrangement or transcription.¹ Some investigation is warranted.

My cross-media experimentation was open ended: I had some expectation that melody would be an insufficient means to always bond all music between two very distinct mediums, yet I had no well-formed theory for what might be consistently used as a compositional nexus, if those things did not serve.

There were unanticipated problems that arose with haphazard mixing of media. Unless these difficulties are given due attention they tend to mitigate progression towards an

¹ Books which instruct on arrangement and transcription reflect this. Samuel Adler addresses a wide variety of suppositions for transcription which extend beyond mere melody and harmony (667). However, it remains true that, for the variety of media-crossing transcription he describes, melody (followed closely by harmony) provides the compositional nexus for most examples. Likewise, Alfred Blatter helpfully discusses many considerations for transcription, nonetheless he suggests (briefly) “melody and a few rudimentary chords” (388) as a starting point of an arrangement.
integrated method of composition. It was the process of attending to such problems that provided insight, pointing towards new possibilities for an integrated approach.

6.1 Early Folio Dual-Medium Experiments

_Flicker_, an early folio work, demonstrates a curious combination of incipient DAW techniques, non-specific mimicry of a variety of IDM sounds, and a somewhat forced assemblage of an acoustic trumpet part with an electronic backing track. Instead of this experiment immediately pointing a way forward, it highlighted difficulties in combining strongly source-bonded sound (the trumpet in this case) with the frequently less closely bound sounds of electronic music.

At the time I simply assumed that the denser, more labour-intensive electronic component would need most attention first, and that the acoustic element might follow along in its wake, being, somehow, the ‘smaller’ of the two components. This demonstrates how my understanding early in the program needed development. Even though the score of the trumpet part appears to be relatively simple – a monophonic melodic passage - a recording of a trumpet’s timbre is in fact complex.¹

I have always understood that a ‘mock up’ audio rendition of a score is significantly removed from the eventual realisation of that work. “We only have to listen to ( . . . ) lifeless MIDI versions of a great composition to realise how much musical meaning relies on un-notated performance variables” (Zagorski-Thomas 1). Even so, it appears that I conceived the notated part too abstractly. I did not sufficiently anticipate the actual sound of the recorded

¹ A fact encountered directly by electronic music pioneers like Jean-Claude Risset and John Chowning (Holmes 4th ed. 278)
part, and as a result there was at first a very audible mismatch between the acoustic and electronic parts of the recording.

This kind of difficulty proved valuable as a learning experience. After completing the first mix, I attempted to reduce this mismatch by invoking particular strategies; this is evidence of the beginnings of operating compositionally via spectrum and timbre. Some of the live trumpet performance was recorded anew, however in this case without any pitched-playing but rather with breath through the instrument and finger tapping on its metal. Trumpet-derived sounds as percussive elements were then incorporated into the composition (see figure 11).

Figure 11. Flicker, comparison of score and waveform
With various other minor changes, this had the effect of lessening the mismatched sounds of the trumpet and its immediate environment, and the electronic accompaniment. Though I believe the result was an improvement, there remains some mismatch. From here on, I decided to address these sorts of problems by dealing with them earlier in the compositional process.¹

6.2 Arranging Compositions for Alternative Media

In a way closely similar to cross-media experimentation, taking a composition from one medium and arranging it for another appears to be a good starting point for experimentation. This is attempted a few times in the music of the folio. Even as emphasis upon timbre, texture, dynamic relations and glitch observably grows over the course of the folio (first observable in DAW productions) it is notable that a parallel emphasis on ‘standard’ musical elements persists (a remark I will return to later).

*Dragon Lord* exhibits spectrally morphing timbres, while at the same time highlighting seemingly simple, monophonic melodic content. The melodic figures in the first section (bar 1 to 40) are sounded by a composite synthesiser voice. Two analogue synthesisers play in unison at the octave. The lower octave voice is programmed with considerable resonance: a low frequency oscillator targets its filter, providing a rapidly ‘wobbling’ sound; this is achieved because of the self-oscillation (Russ 107) of the resonance. This technique means that the composite sound has a continuously changing timbre; additionally it has both an easily distinguishable pitch and noticeable instability, provided by the wobbling, liquid-

¹ Long before working on *Flicker* I was aware of the breakthroughs of famous composers, which might serve as models for bridging gaps between media. The crossing of music concrète and electronic music in the pioneering work of Stockhausen – in pieces like *Gesang der Jünglinge* – is merely the first of numerous examples. However, it was only in creating my own music that I learned these lessons most intimately.
sounding self-oscillations. Figure 12 is a display of the waveforms of both component synthesisers; the relatively stable higher octave voice is the higher track; the self-oscillating lower-octave voice is the lower track.¹

Figure 12. Composite parts of melodic bass line in Dragon Lord

The melodic approach in this work often depends on the capability of the synthesisers. The rapid, broad-ranging melody of the B section (bar 58), although not impossible for an advanced performer, harnesses a particular quality of the medium as it is performed ‘effortlessly’ by a synthesiser. This effortlessness in itself is a kind of “timbral veneer” (Smalley "Defining Timbre" 46). The pitch glides freely, and unencumbered by any

¹ When mixed together in the final recording, the pitch of this voice is reasonably discernible. However, I have provided an audio example of the self-oscillating lower-octave voice, to demonstrate how its pitch is much more ambiguous, and how it is timbrally characterised. The file is called “Dragon Lord example1” and it is in a directory called “mixing examples,” amongst the other audio-visual items in the folio.
requirements of a real performer, no matter how the pitches are organised, and hence lacks any gestural associations with a real expenditure of energy.

After the production of the audio recording, I arranged the piece for a small acoustic ensemble, on the assumption that its melodically oriented and metrically organised content would serve as a backbone for a successful transfer to the new medium. I assumed that ‘extraneous’ matter – timbral qualities in particular – could be substituted in an \textit{ad hoc} manner in the new arrangement.

The scored arrangement has never received a performance. Following the completion of the arrangement, a review of the score cast immediate doubt upon the potential for a successful live rendition. Even without a rendition, the newly arranged score appeared to lack that which was essential to the verve of the original production: the mutable spectral character of the voices as well as the timbral veneer provided by the automated melodic passages.

Of course, it cannot be concluded that this score would not succeed in performance, as the assessment here is subjective. A rehearsal of the scored music may reveal undiscovered potential in the new arrangement, which could perhaps be enhanced by means of rehearsal-driven alterations. It might consequently possess its own verve. The initial intent was to translate something essential from the original recording to the new medium, and purely abstracted melodic and metric material might serve this role. Nonetheless, transferring them by themselves was only a gamble: that what is essential in the first medium will be preserved in the second.
6.3 New Versions of Recordings

It is possible to create a new version of an audio recording which is not an arrangement but rather a crossover between one variety of recording and another. This relies on a predominantly different paradigm of mixing, editing and processing. This constitutes yet another sort of experiment conducted during the creation of this folio. I produced a series of pieces, called *Adventure Music*, which began as scored works not primarily intended for live concert performance. In the folio, *Asteroids* represents these pieces. A completed score was created for each of these projects; this was accomplished at the same time as the preliminary work with the DAW. After completion of the score (and a MIDI mock up), players were invited to record the parts using their instruments in the studio. The instruments were trumpet, keyboard synths, electric guitar, electric bass and drums.

The first series of recordings highlighted the ‘live’ sound of the instruments. The intention was that a listener would, consciously or unconsciously, imagine a live space in which these instruments played together. To use terms outlined earlier, this recording is more toward the ‘referential’ end of the scale.

These recordings were revised some months later. However, instead of touch ups, large-scale changes were made, with a will to experiment. Large sections of the drum tracks were removed. The remaining drums were locked to the session’s grid using Pro Tools’ *elastic audio* function (Avid Technology 877); this can be seen in figure 13.
The drum mix was then bussed to an analogue synthesiser audio input, whereupon the synthesiser’s filter and overdrive were applied to its signal, and then routed back to the DAW. This distorted, attenuated sound was now layered with synthesised drum sounds. The resulting sound is less a reproduced sound of an actual drum kit, and more overtly an electronic part.

The other voices in the mix were treated similarly, especially in respect to locking their timings to the DAW’s grid. This is a demonstration of how a piece of music may move along a continuum between ‘referentiality’ and ‘actuality’. The second version of the work still references a ‘real’ situation, and there is still significant source-cause bonding between sounds and what is likely to have produced them; yet the music is a degree removed from
an entirely referential work. Instead it uses synthesis techniques and DAW processing to exhibit details of the sounds themselves, and begins to stretch the bond between those sounds and their sources. In other words, the sounds are more intentionally ‘actualised’.

All told, cross-media experiments and new versions of an older recording helped me to understand that a compositional nexus may be more than melody, harmony and metrical rhythm. Though my music still involved those things, it became clearer that the character of the music may be bound up with complexities which regular notation does not emphasise. In Chapter 5, I described how glitch encourages a composer to both embrace and subvert convention. Similarly, traditional aspects of a piece (like melody, harmony and metrical rhythm) may be embraced, and all the while a composer may challenge their primacy.
CHAPTER 7:

Attributional Composition

Chapter 4 describes my reasons for not regularly relying on a formal system for composing harmony or for germinating melodic material. This meant finding alternative schemes for sparking musical ideas and generating content. ‘Attributional composition’ is my term for a method of creating musical material which relies primarily on the limitations and features of the medium. It is more like a mindset than a system, yet I am able to demonstrate how I have consistently employed it in a reasonably dependable manner, especially for the later folio works.

7.1 Parallels Between Idiomatic Features of Instruments and the Restrictions and Limitations of the Recorded Media and Electronic Sound

“The grain of the medium” (Emmerson Living Electronic Music 84) is a phrase used in relation to a medium’s limitations, which are sometimes obscure (see Chapter 2). Like glitch, I have found the idea to be relevant to live acoustic music, if it is conceived broadly enough. This provides a utility. A sensitivity to technology – the composer working as a technologist – has the potential to strongly relate different media.

I have occasionally noticed others’ tendency to refer to electronic devices as ‘technology’ at the exclusion of other devices, even if they are comparably sophisticated. Computers and audio equipment require dedicated attention; however, if the word ‘technology’ is employed broadly, care must be taken not to habitually imagine only electronic media as ‘technology.’

Not only are acoustic instruments of the Western tradition correctly referred to as items of technology, they are in some ways commensurable to more recent technology in their
sophistication of development and design. As the folio has progressed I have become increasingly involved with a consideration of acoustic instruments as technological articles – here at least there is no distinction between composition for acoustic instruments and electronic media, despite what other important differences there are. Thus a conceptual bridge between the media is available at this level for a composer (this point will be returned to in Chapter 8).

In this folio, my technological conception of acoustic instruments has played out as a growing awareness of their physically-imposed idiosyncrasies and a performer’s approaches to these. This has proved directly analogous with the discovery of limitations, restrictions and idiosyncracies inherent in audio recording (that is, those discussed in Chapter 2) and its methods and devices (that is, those that can be exploited by glitch as described in Chapter 5).

Certainly, it is traditional and remains customary for a composer to cultivate knowledge of an instrument’s features, such as their range, timbral characteristics, and the ease or difficulty of executing a given technique. Yet, instruments as technology can be chosen as a special focus, to help supply creative impetus and compositional material.

To illustrate how this diverges from another method of composition, it can be contrasted with music utilising a strict system to organise pitches (such as pieces I composed early in my program when I briefly experimented with serialism and pitch sets). In that case, the relationship of pitches are, to a degree, isolated from a consideration of the instrument which realises them. Of course an aural awareness remains crucial to the composition, but it is the numerical interrelationship of the pitches which governs the process of composing in music using sets (Cope 77-88), rather than, say, an explicit concern for the spectral location that a
pitch represents. For example, to refrain from distinguishing between pitches within a pitch class is to disregard their spectral locations. Without some alteration, a system dealing solely with abstractions makes no remark on spectrum.

However, even the early contributions to the folio exemplify a focus upon instruments instead of abstractions. Allegro for string quartet suitably demonstrates a strong attraction to idiomatic features of each instrument. As a result my creative decisions and the musical material were directly impacted. In its opening bars, each of the sounding instruments is provided a gesture founded on open-string bowing. Every entry of the first violin involves an open string double stop until bar 6, and continues making extensive use of this technique throughout the first section of the piece. The viola and cello similarly are provided material extensively based upon open strings and open double-stops. The rapid semiquaver passage supplied by the second violin at bar 9 is founded upon a natural finger position (Blatter 438) – G♮, E, and C♯ – and the straight-forward interchange between this position and open strings.

Figure 14. Allegro example
Similar methods are relied on throughout the entire composition. Chordal structures in bars 27 and 28 depend on hand positions of the first violin and viola; unison chords in bars 31 and 32 utilise open string double-stops in all parts; in bar 80 the melodic figure supplied by the first violin, besides being a development of the second violin’s initial entry, is founded upon a series of natural hand positions – the resulting harmonic motion via the violin’s arpeggios is relatively rapid – yet all this harmonic motion is traceable to a reliance on a relatively straight-forward hand position.

The intent in employing these methods was to prompt musical content, not especially as a way of lessening the difficulty of performance. It is crucial to note that a technological concept – or in the case of Allegro a focus upon the physical attributes of the instrument – gave rise to harmonic entities. Utilising open strings, thereby allowing the basic tuning and resonance of the instrument to directly provide harmonic and motivic material, is something I consider an acoustic parallel to the ‘grain of the medium.’

7.2 Attributional Composition: a Description

Fully convinced that combinations which have at their disposal twelve sounds in each octave and all possible rhythmic varieties promise me riches that all the activity of human genius will never exhaust... I am always able to turn immediately to the concrete things that are here in question. I have no use for a theoretic freedom. Let me have something finite, definite—matter that can lend itself to my operation only insofar as it is commensurate with my possibilities. (Stravinsky 66)
‘Attributional composition’ is my term for a process of building musical material via an intentional preoccupation with attributes of the instrument and environment. These would be, for example, the hand positions of a player; the complexity of a timbre in a specific range. ‘Attributes’ in this sense encompasses technical, technological and practical limitations, features and important characteristics, and other idiosyncrasies of instrument, performer-instrument relationship, ensemble and performance environment. Some of these will be apparent after an initial acquaintance with a medium, others will only be revealed with experience, or gradually understood after many thousands of hours spent working with a medium. I will continue to use the term ‘attributes’ in this sense for the remainder of the document.

Attributional composition is observable in many of the subsequent folio works. The piece Concerto for Trombone and Strings shows that player’s hand positions are a stimulus for harmonic choices: The opening eight measures in each part include arpeggios comprised of, in most cases, two out of three open strings. A single stop per bar for each player is the result. It is ancillary that this may facilitate an easier technique. Rather, the aim was to use a player/instrument attribute to generate musical material.

In Impulse, the choice of key is directly founded on the decision to rely extensively on open strings (G and D) in the violin 1, violin 2 and viola parts (see bar 51 and onwards). Yet in this piece attributional choices are not only limited to what results in determined music. They also account for a player providing nuance that is not easily indicated on a score, or possibly even hampered by excessively overt direction. Intentionally loose direction is provided at times in this score. During the composition of Impulse, players were consulted about the potential for semi-improvised percussive techniques. This meant intentionally ambiguous directions to the performers were acceptable, with the knowledge that their interpretation would be just as effective, or more so, without overt instructions. For example, at bars 7 and
9, the performers are instructed to provide “some percussive effect”. Though this meant relinquishing some control, I could count on this attribute – the player’s ability and relationship with their instrument – to function effectively. Loosening my control of initial scored material increased later in the folio. As explained, this in itself is using an attribute.

This attributional method of composing is by no means unprecedented. The choice of the first chord of Stravinsky’s Violin Concerto in D, which underpins the whole piece, strongly depends upon its feasibility for the performer, and we may conclude that a concern for idiomatic features of the instrument significantly affected the composer’s creative decisions. It seems to me this shows Stravinsky avoiding an “abyss of freedom” (66).

I still find this an engaging method of composing, although this is not why I have written about it here. The reason I make special note of attributional composition for this folio’s scored music is because it becomes a crucial part of working amongst divergent media. For the scored medium, it permits what is analogous to a growing awareness of limitations and idiosyncrasies in the DAW medium. In this way, a focus on ‘technology’, in the broad sense referred to above, or an ontological involvement (Brown *Music Composition* 40) with media, provides a bridge between them. Preparing a work for a concert performance can strongly involve the grain of the medium in this wider sense: not just the timbre of a single note played by a violin, but a deeper conception of the instrument as a physical device and the overall space which encompasses the relationships between player, technique, instrument and environment. This way of composing is an important part of integrated approach to operating at different times with different media. I will cover this in the following chapter.
CHAPTER 8:
Late Folio Works, Towards an Integrated Approach: Cross Media Attributional Composition and Manifold Composition

The method of composition discussed in Chapter 7, and other concepts detailed earlier in this document, led to a new way of imagining the existence of a composition. It may be a realised performance or recording, while at the same time the composition may exist as a potential, or metaphorically (Brown *Music Composition* 12). Attributes of divergent mediums create a space which nurtures a composition. I name this idea of a piece realised amongst multiple-potentials a ‘manifold composition’. Though a work may only ever appear in a single medium, and though the media might change from one project to the next, it is this cross-media attribute space which allows an artist to move from one to the next more single-mindedly; in other words, with an integrated approach. This chapter details the relationship of this idea with concepts examined in previous chapters, as well as the implications of its identification.

8.1 Working with Single Mediums and the Identification of Core Concepts

The *Electromechanics* project demonstrates the most intensive involvement with electronic processes of the entire folio. Core concepts, namely, limitations of the media, spectral location and temporal arrangement of sound components in the construction of singular sound objects, the spectromorphology of synthesised parts, textural arrangement and concern for masking, hyper-detail, and the role of glitch in exploring the limits of convention are all centrally significant in the production of these works.

At the time that *Electromechanics* was being produced, I had already gained an understanding that intentionally composing a piece of music across two mediums presented a number of unanticipated pitfalls (see Chapter 6). Though the folio’s early cross-media
experiments provided some important insights, these ‘failed experiments’ temporarily
provoked me to create music *singly in one or another medium*. *Electromechanics* is an
example of this.

Yet it was in these late-folio, single-media studies that I acquired new ideas about a potential
integrated approach to composition. My concept of a manifold composition developed
directly from an increasing awareness of *core concepts*.

### 8.2 Attributes of One Medium Affected Aesthetic Choices in the Other

Of the music composed toward the conclusion of the program, it may be observed that my
practices associated with core concepts (see section 8.1) were beginning to influence my
composition of score-based media.

#### 8.2.1 Attributes from the DAW medium appear in *Ecstatica* for orchestra.

Composition of my orchestral piece *Ecstatica* commenced at what eventually became bar 34
(rehearsal mark A). Critically, an heightened concern for texture is clearly apparent. Also
observable is an awareness of composite sonic objects, where many voices of the orchestra
may be understood by the listener to represent a composite voice, which resembles a
method of creating composite sound objects in DAW production, as described earlier. It can
be seen at bar 34 that, prior to the entry of the melody, for the most part there is no more
than one composite voice at a given time, until the arrival of the melody in bar 40.

Antiphony of this sort is observable at many different times in this piece. For example, the
iteration of the principal thematic material at bar 76-87 demonstrates a texture reducible to
two or three composite voices, often avoiding each other in time: A large orchestral force of brass and strings on beats 1 through 3; an antiphonal response by trumpets, trombones and tuba beginning beat 4 of bar 76; horns supplying a second response in bars 78 and 79.

In a traditional analysis, the terms ‘register’ or ‘range’ would be used to describe the main pitch locations in both the lower and higher voices from bar 34 onwards. Yet I composed these passages with an awareness of spectrum in time, not solely register or range. Specific pitches were not chosen at first: an early sketch (figure 15) reveals that general spectral area was considered prior to composition of particular pitches or chordal structures. The piano and handwritten score were used as short-hand tools for plotting approximate chords; their value at this stage was their spectral occupation in time, rather than a particular concern for their pitch relationships. It is because of this that there is considerable distance in range between the lower voice’s extent and the upper voice’s extent, in the final scoring.

Figure 15. An early sketch of Ecstatica
The chords themselves were composed with a spectral influence: the chords of the upper voice were chosen because they are loosely similar to the upper partials of tones with the pitches E♭1 and E♭2, not specifically as an E♭ minor chord with colour notes (A♭ and D♭). I originally intended the high-register chords to seem like ‘aftershocks’ or brief upper spectrum reflections of those original low strikes – the accented E♭s. This is noteworthy, because when I commenced the folio I conceived of harmonic relationships exclusively in terms of specific pitches; by the time Ecstatica was underway, my ability to imagine music spectrally, and at yet simultaneously conceiving pitch relationships, was better developed.

It was only after completing Ecstatica that I noticed a DAW experience had influenced my compositional choices in an orchestral piece, in the ways described above. Limited dynamic range is not traditionally a concern for a live orchestra: at its disposal is a dynamic range from the softest discernible sounds to somewhere approaching the loudest sounds a human may safely experience. Yet the exploration of hyper-detail during my experience with DAW production prompted me to compose Ecstatica with an honed awareness of the role of texture in avoidance of masking, even in absence of the limitations of audio recording. My understanding of a listener’s tendency to either hear singular or multiple sonic objects depending on the timbres present and their temporal relationship (Plack chp. 8), fostered by my experience with DAW production, provoked an heightened focus on the orchestration of restricted composite voices even when using multiple instruments.

8.2.2 Consciously referring to DAW attributes in scored compositions

From this place and onwards in the folio, I consciously permitted my DAW production experience to affect the way I was creating scored works. Several scores can be seen to adopt a phrasing pattern similar to that of my electronic productions using textural motion, spectral awareness and ducking, even though these scored pieces are otherwise dissimilar.
In short, the technique required to expose and distinguish specific sounds in one medium (for example, in *Eletromechanics*) became aesthetically influential and a means of making musical choices in another.

This is evident at bar 59 of *Dubaphone*, commissioned by the Queensland Conservatorium Saxophone Orchestra. Here, bass notes provided by the tenor and baritone saxophones are intentionally left unobscured. Two composite voices are created: sopranos 1 and 2, alto 1, and tenor 1 provide a syncopated ostinato phrase with short pentatonic fragments moving in contrary motion. Sopranos 1 and 2 have a dual purpose here, and join an alto 2 in providing a melodic figure. The texture here is again mainly antiphonal. Most notably, keyslaps in bars 59 and 61 performed by soprano 2 and alto 2 (again expanding the role of these performers yet further) are carefully left as sounding solo – all other parts rest momentarily on beat 3 of these bars.

Music in both mediums starts to converge rhythmically. Most overtly, structure at the mensurable level becomes consistently similar, with a simple pattern of downbeats and upbeats (usually in 4/4 time), and within this very simple framework more complex gestures arise. This takes place in much music past this point in the folio, regardless of medium. In the electronic works, I had already begun exploring the continuum of rhythm, pitch and timbre. For example, in *Electromechanics*, the kick and snare operate not simply as metrical accents driving the music, but also as a framework. Between them, short-lived departures from the metric framework provide much more rhythmic complexity. For instance, rhythms increase in frequency, even within a bar, subtly showing rhythm’s relation to pitch.

Until the very end of the folio, these rhythmic ideas were only tentatively explored in the folio’s scored works, yet their beginnings are evident in these examples. Here they are
represented by finely resolved syncopations. For example, the triplet quavers in beats 3 and 4 of bar 59 in Dubaphone have rests on beat one, resulting in a syncopation which provides a small threat to the music's metrical stability. The triplet's rest on beat 3 also happens to duck the rhythmic strike provided by other instruments. Similar temporary metrical obscurities and departures take place in “Reawaken” (Three Years Beginning Again, Mvt.3), and an identical rhythmic device occurs in bar 40 in Concerto for Trombone and Strings, Mvt.1. In Gossamer Parley, the transition between rhythm and timbre is epitomised. For example, at bar 72 (and onwards), the performers are instructed to increase the frequency of pitch oscillations for trill-like gestures.

Figure 16. Dubaphone, bars 19-24
Similar phrasing patterns and antiphonal textures are observable in *Impulse* at bar 102 (rehearsal mark E) throughout that section until bar 125; and variously in *Three Years Beginning Again* and particularly in the miniature titled “Reawaken.”

A comparable method for exposing a percussive accent on beat 2 is visible in Concerto for Trombone and Stings, beginning bar 40. A tratto indication is provided to the violins, and the violas are required to produce a Bartok pizzicato simultaneously. Again, this sound is intentionally left bare, highlighting its grainy timbral details. Figure 17 shows the score at this point.

![Figure 17. Concerto for Trombone and Strings Mvt. I, bars 40-43](image)

*Gossamer Parley* is an overt example of an awareness of attributes from one medium employed in another, affecting musical choices. As in the case of *Vagabond Suite*, I
anticipated an audio-visual recording as a primary vehicle of performance. Yet Gossamer Parley is a late-folio work, and I was able to capitalise on the insights discussed in section 4.3. In particular, I was consciously aware that attributes across dual media would affect my composition.

I was able to use textural structure to deal with concerns that affected Vagabond Suite.\(^1\) In several sections (e.g., at bar 70) I consciously restricted polyphony, and the effect of creating a composite voice became a major element of the composition. Both techniques ensure that masking is frequently avoided and that timbral details are better exposed in this piece, even in its existence as an audio-visual recording.

Timbre and texture here become a principal compositional concern, and though melody and harmony are by no means discounted, my earlier concerns about harmonies are sidelined in favour of these new focuses. I could now envision harmony as spectral componentry of a composite voice, as well as a collection of complimentary tones. Superficially, the harmony stays simplistic. From bar 70, it is predominantly quartal pitch arrangements. Yet the whole vertical arrangement is intended to form a single composite voice, and the overall sound was mainly conceived with an awareness of the spectral nature of that composite voice, rather than as a harmonic combination of individual pitches.

There is an important proviso about all the above. I am not suggesting that few established composers consider spectrum, timbre or texture; nor am I suggesting that I would be incapable of making music like this if I had not worked with a DAW. Composers have explored ideas similar to mine without having learned the same way. Those composers may well create music which avoids masking in orchestration in order to expose details, for

\(^1\) See section 4.3.
example. I am suggesting, rather, that DAW production encouraged compositional choices
due to an awareness of limitations inherent in that medium, and these choices have been
wilfully applied in another medium. This has occurred because I found intrinsic aesthetic
value in working amongst features of a medium. So, what is most notable here is the
occurrence of pathways developing between media; much more so than a singular result in
one composition or another. In my case, it is an exploration of deep-seated limitations of
one medium highlighting and encouraging musical utility in the other. What I have described
as attributional composition occurs here across media.

8.3 Manifold Composition

From this, I conclude that a space of attributes exist, which extends to the limits of the
various mediums in which a musical composition is potentially realised. The more
thoroughly a composer is involved with a medium, the more he or she becomes familiar with
(and interested in) its attributes. An immersive experience with more than one medium
gradually extends an attribute-space. An awareness of this inter-media attribute space may
itself augment a compositional nexus, while at once encouraging its unification.

Chapter 6 described my earlier exploration of cross-media music and how finding a
compositional nexus is a way of extending a single composition across different media.
Harmony and melody might provide a strong foundation for transferring a piece between
reasonably similar media (for example, wind ensemble and orchestra). However, they may
still be insufficient to convey the essence of the music if the initial medium encourages a
spectral, timbral or rhythmic orientation. In this way I came to understand that a
compositional nexus would often need to be broadened.
For media which is strongly contrasted, attribute space will augment and unify a compositional nexus. The aggregate of attributes across both mediums may stimulate the composition of material in one of these mediums (see 8.2), and simultaneously permit a compositional potential in the other. This aids consistency in a composer’s methods. Additionally, a composer can be aware that, although a piece may exist as a realised performance or recording, it concurrently exists unrealised but potentially across media. A composer who chooses to approach the work attributionally may conceive of multimodal realisations of a single piece of music. Different realisations might have readily identifiable sonic differences, yet in spite of this they may retain an identity as a single, manifold composition when the composer makes use of a satisfactorily broad compositional nexus.

As such, a manifold composition describes a general composition-space, where a single piece of music is potentially or actually realised in different ways across any variety of media. This is made feasible by a composer’s immersive experience in both mediums permitting a cultivated awareness of an attribute space which serves to augment and unify a compositional nexus.

8.4 Late Folio compositions: Examples of Manifold Compositions

The folio’s final compositions reveal a growing awareness of this idea. For example, the final movement of Concerto for Trombone and Strings is a new realisation of an electronica work originally titled, “Electromechanics” (of the Electromechanics EP). It is here that a compositional nexus, based on an aggregate of the attributes of a score-based medium and DAW production, underpins the newer work. Though much shared melodic and harmonic material is identifiable in both versions of the composition, here a compositional nexus is broadened because of this aggregate attribute space.
8.4.1 Late-folio cross-media experiments

This cross-media realisation was intended as an experiment. I had no strong intention to link the pieces for any other purpose, nor did I expect that both realisations would preserve a singular identity. Yet, looking back, it is arguable that *ElectroMechanics / Movement III* is an example of manifold composition.

An aggregate attribution space stimulated musical choices: an antiphonal textural arrangement (examples: bars 11 & 84), exposure of detail (example: con legno in bar 1, beat 2), and hand positions, hence choice of key. Additionally, rapid chromatic movement in the violins was conceived spectrally, rather than in terms of pitch. Early drafts of the score employed graphical notation without specifying particular pitches. I did not expect the new realisation would mimic the original. Instead, I had at my disposal a concept of the composition existing potentially across various media, enabled by an aggregate of attributes from each medium. *I expected the music would sound different*, with a different character and style, yet exist as a realisation of what remains a single manifold composition.

8.5 Contemporaneous Modes of Composition

The music of the folio, including its later works, clearly includes what Smalley refers to as culturally imbedded pitch and rhythmic systems ("Defining Timbre" 44). At the same time, the electronic works in the folio progress from utilising these systems as primary material to a situation where the most central character of the music is equally defined by other elements.

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1 I interpret this to mean melodies, harmonies and rhythms which are recognisable as such by most listeners, and able to be scored without extending the Western system beyond its present-day capacity.
In creating this folio, I eventually had experiences of composing in different modes simultaneously. Pursuing glitch in the music of the folio has meant adhering to conventions and acknowledging limitations, while at the same time subverting these things. The later music of the folio has an emphasis on melody, harmony and metrical rhythms, while simultaneously prioritising qualities best described spectromorphically, and sometimes at odds with a pitch-reliant analysis. As already discussed, Cascone’s aesthetics of failure may be broadened here to accommodate this. What is culturally embedded itself becomes something where cracks may appear: for example, where non-metrical rhythms increasingly threaten to undo a regular metrical pulse (such as in *The Retrofit*), or where a melodic voice becomes so spectromorphically rich that unanticipated melodic forms arise spontaneously from its own timbre morphing in time (for example, in *Post Apocalyptic Fortress Architecture*). A convention is required, if it is to be subverted. Beyond the ubiquity and convenience of commercial systems, beyond the boon of any anticipated connection with an audience (Pennycook 563), this traversable field beckons me to be involved with music technology and its conventions.

Yet Smalley claims: “Gone are the familiar articulations of instruments and vocal utterance; gone is the stability of note and interval; gone too is the reference of beat and metre” ("Spectromorphology" 107). Actually, Smalley is referring to electroacoustic music in particular and presently his claim is entirely true of some varieties of electroacoustic music. Clearly it is not true of music in general, despite how much our understanding of music and sound developed during the 20th Century. Is spectromorphology – a way of regarding electroacoustic music – useful only for that music? He offers a criterion for when a spectromorphological approach is and is not helpful: whether or not a piece is “note based [and/or] metrically organised” ("Spectromorphology" 109). But this does not account for why music, which can be listened to and understood in other ways, might not also be considered spectromorphologically. It seems to me that only the composer should be the judge, rather than relying on a criterion. Holmes mentions several advantages for understanding the
“components of sound” (4th ed. 284), while Emmerson questions the exclusion of dance rhythms in electroacoustic music, (Living Electronic Music 64), which is to foster a related criticism.

Many of this folio’s compositions possess what may be described as tonal or modal melodies, monophonic or antiphonal textures, and metres of the simplest kind. Yet, the full significance of those works depends on qualities which can only be related in terms of spectromorphology, or a similar scheme. The orders of surrogacy (“Spectromorphology” 112), encapsulating different stages of remoteness of sound source-cause from physical gesture, proffer no justification for exclusivity. In fact, thanks to the capabilities of digital technology there must surely be a continuum which exists between these orders. The idea that music might exist in more than one such order at once, depending on the experience, skill and willingness of the composer, is a persuasive one for me.

The development of the compositions in the folio supports a claim that a composer can hold contemporaneously an appreciation for the sounds of technology (old or new), an understanding of traditional musical practices (that is, systems of pitch relationships), a vision of spectromorphology (that is, an intuitive understanding of timbre/s in time) as well as other musical facets or physical attributes not traditionally highlighted in analysis, and use these together as a basis for compositions.

Where the folio’s music is seemingly simple, having retreated from an association with Western Art Music’s harmonic complexity and experimentation, it has begun exploring harmonic complexity via a growing awareness of spectromorphology, and subversion of convention. The outcome is music originating in an attribute space – where a composer fathoms the mediums even to their hidden limits. In the way that a pianist, who is also a
violinist, might at once ‘see’ strings and keys when imagining a melody, so too might a composer be able to simultaneously envision both pitches and spectrum with no impairment. Or, for that matter, harmony and timbre may be at once imagined by the composer, he or she may be able to work freely between referentiality and actuality when creating a musical recording, and may be both conventional and subversive.

8.6 Final Folio Works

*Chalumeau Orbits* and *Piano Grains* are the final composition of the folio. I refer to them as manifold compositions: The realisations present in the folio are part of their wider sphere of potential. Neither work possesses a full score; I utilised some amount of notation during their composition, and *Chalumeau Orbits* includes a complete bass clarinet part. *Chalumeau Orbits* is realised as an audio-visual recording, but it also exists – potentially – as a piece for live concert performance, as well as other remixed electronica. *Piano Grains* was recorded in a similar way; it could similarly be reinvented as a scored work for live performance. Both works consciously explore several avenues between the familiar and the subverted (epitomising my expanded description of glitch). Metrical rhythmic structures with strongly emphasised beats along with synthesised timbres immediately offer a stylistic connection to EDM or IDM, which is contemporaneously undermined by bass clarinet and prepared piano – instruments which are foreign to EDM (and most IDM). Some familiar elements are clear: the tones of the bass clarinet and piano exist over various layers of Smalley’s extrinsic matrix (“Defining Timbre” 37); additionally, source-cause connections are made explicit via the videos. More subtly, several synthesisers chosen for these productions are analogue subtractive monosynths: This is an “old school” means of synthesis (Russ 358) which inevitably encourages Smalley’s technological listening (“Spectromorphology”
Both works make use of clearly pitched material and regular rhythms, as well as source-bound sound.

These familiarities are set up only to be subtly dismantled. Both works were recorded by inputting the synthesisers’ signals into the DAW via Direct Inputs, resulting in dry signals; additionally, the same signal was amplified and outputted to loudspeakers in the rooms, and the resulting sounds were recorded by microphones, in turn fed back into the DAW. Re-amping provides a ‘wet’ version of the original signal, which is the sound of the synthesisers in the concert hall environment.

Later the dry sounds with their wet counterparts would be mixed together. The bass clarinet and piano were of course recorded acoustically (that is, wet). However, a close microphone and room microphones (several feet away) provided an adjustable balance between a slightly drier and slightly wetter sounds. The intention is to give the listeners or viewers an impression that they are witnessing a live recording, where all sounds are apparently generated together and recorded as sounds in the acoustic environment. However, at the same time, this impression is undermined: the dry electronic components exist throughout each work, at times with increased intensity, so that the impression of a live recording is disturbed when natural reverberations are displaced by dry electronic sounds (and an occasional preponderance of the close microphone signal in front of the acoustic instruments). I intend the listener to hear these works as residing somewhere between a live concert performance and a production of electronica.

1 Smalley warns against technological listening, but he does not specify how musical meaning is blocked. Therefore I think his claim is contentious. Composers sometimes willfully encourage technological listening, and this has its own meaning. For instance, the familiarity provided by the sound of a technology or a “processing timbre” (“Defining Timbre” 46) serves as yet another foundation which is laid with the very purpose of undermining.

2 Although, due to a different emphasis in each work, Chalumeau Orbits is more like a concert recording, where Piano Grains is more ‘electronic.’
In Piano Grains, the piano is not at a fixed location in Smalley’s extrinsic matrix, where its preparation could be both familiar (harking back to Cage and other composers) and unfamiliar (as every piano preparation can be completed uniquely). At times during the music the acoustic instrument’s sounds are digitally processed. They are occasionally coupled with delay – discernible at 2’05” (bar 38); 3’12” (bar 61); 3’20” (bar 64) in Chalumeau Orbits – which serves to slightly dislocate the instrument from its live context temporally. This is also achieved with other methods of altering the signal: The bass clarinet is heavily distorted at the end of Chalumeau Orbits (4’37”), and in Piano Grains the piano sound is disassembled and reassembled via granular synthesis (an example is the prevailing piano-like sound at 2’11” (indeed, this technique is what lends the piece its title). The distortion is created post-recording and has no wet element. This serves to call into question the listener’s perception of liveness. The sound of the acoustic instruments remain associated with their extrinsic matrix, and yet the variety of disassociating tendencies described above subtly, intentionally conflict with this.

At the same time, I heavily relied upon attributes of the acoustic instruments in the creation of the music. Experiments with microphone positions provided clues as to which keys and which notes provided most spectral interest. I capitalised on the notes which produce a complex spectrum to extend the capacity for relating the bass clarinet to the electronic instruments, which are also capable of producing spectrally broad timbres. The first tone produced by the bass clarinet in its piece is spectrally broad: we perceive its pitch as a low B♭ yet its harmonics audibly extend into the highest quadrant of the spectrum. This instrument’s facility for rapid and range-extensive arpeggios was also considered as a relatable element. Automated synthesisers can produce very rapid, broad ranging arpeggios and patterns of notes; although the acoustic instruments cannot reach that extent
they can compete significantly. The bass clarinet’s initial entry is an example of this kind of
gesture, as are the arpeggiated figures at 3’17” in Piano Grains.

Digital production techniques and processes, applied to acoustic and analogue instruments,
served to undermine their technological veneers. This also offers a unification of timbres by
affecting both similarly. Following the recordings, dry synthesiser signals and the somewhat
dry acoustic instrument signals were bussed to channels with a bit-crusher (Preve) process
enabled. These digitally distorted sounds – with extra harmonics generated (Dodge and
Jerse 49) due to the squaring of the waveform inherent in the distortion process – were
returned to the mix at various levels. Both of these pieces can be contrasted with Flicker (an
eyearly folio work) to illustrate how my skills in combining media advanced, mainly because of
the development of my ideas about manifold composition.

Conclusion

The folio of compositions taken as a whole demonstrates the progression of techniques
across separate media toward an integrated method. This means I can continue to
compose in radically contrasted media, yet work more single-mindedly. Moreover, my ability
to compose cross-media music has also developed. At the same time, I have a clearer idea
about my personal style. I am able to dispense with some peripheral stylistic potential, as
the entire process of becoming more familiar with these mediums has deepened and
focused my interests. This document has explained how these things are achieved with the
concept of a manifold composition, and the final examples of the folio show some stylistic
solidification.

Such a composition relies on an aggregation of attributes across the media, which is called
an attribute space, using a method called attributional composition. ‘Attributes’ in this
context encompasses technical, technological and practical limitations, features and important characteristics, and other idiosyncrasies of instrument, performer-instrument relationship, ensemble and performance environment.

Attributes of the DAW medium could only begin to affect my composition once an immersive experience had revealed some of its hidden limitations and idiosyncrasies. From composing with a DAW I learned about dynamic range and playback systems and explored loudness and referentiality versus actuality. Referentiality and actuality are different modalities of recorded production; recognising them enables a composer to willfully situate himself or herself anywhere between them. Such activity promotes the development of spectromorphological and textural techniques. Amongst the many possibilities offered by these, a composer may enhance sound objects, and I refer to this as hyper-detail. Glitch in audio production inherently permits exploration of the limitations of a medium, and requires an understanding of the medium’s conventions. They can be embraced yet simultaneously undermined, either subtly or overwhelmingly. All these concepts originate from an awareness of the limitations, restrictions and idiosyncracies of the recorded medium, and as such constitute attributes, in the sense described above.

The scored works of the folio demonstrate how attributional composition may involve an understanding of the physical properties of acoustic instruments, a player’s relationship with them, and their environment. These can be taken together with the idiosyncrasies, limitations and restrictions of the other medium. I could eventually rely on a space of attributes across different media to prompt artistic choices and compose music a) singularly, in any of those mediums; b) dually, in both; or c) potentially, realised in different ways at different times. In essence, a composer’s involvement with technology uniquely enables a manifold composition. Most of my mid-program scores exhibit this only in subtle ways (particularly regarding texture, timbral-harmonic relations in monophonic voicing, exposure of
So in some respects they appear to remain at odds with the DAW-created music. Yet, I have explained how they exemplify a gradual progression toward a kind of composing which makes use of a pan-medium attribute space, irrespective of the realised medium. This has implications for my music in the future. For example, the way that I can employ the concept of glitch to scored works intended for live performance; this may mean a reappraisal of techniques I once avoided due to a perceived avant-garde historicity (see section 5.4), like extended techniques or graphic notation. The beginnings of this are displayed by the latest folio items.

Overall, there is a twofold result for the future of my composing. Firstly, the global view of attributes over both mediums has resulted in increased stability of my methods. Secondly, there is some convergence of styles across my compositions in both mediums. Nonetheless, I still create music which is stylistically diverse, and often realised exclusively in one or another medium. Even so, I am now more confident that my pursuits in each medium are not at odds. This amounts to what I describe as an integrated compositional method.
List of Works Consulted:


