Digital Hybrid:

Correspondence With Digital Materials, Exploring a Hybrid Composition Practice Across Multiple Domains

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Abstract

This thesis proceeds from a discussion of hybridity between electronic and acoustic forces in contemporary classical ensembles and composition, proposing that such ensembles demand a hybrid skillset. This can be supported by the manner in which the digital technology itself is applied (for example: finding novel ways of integrating digital processing of sounds into an ensemble on stage, or by merging digitally synthesised elements into the process of composing), or by including additional composers/artists in the creative process (hybrid authorship). By 'creative process' I am referring to everything leading up to the premiere of the work from the notation of musical ideas, recording and processing of audio material, generation of visual material, and the assembly of all these into a single whole.

  I will further argue that while working on the digital aspects of such projects one's practice is benefitted greatly by knowledge of pre-digital methodologies, and vice-versa. Hybridising the two domains prompts ideas in each of them that would be unlikely to arise if the composer did not have experience of both.

  The notion of hybridity shall be explored further by considering it in other contexts – in particular, hybridity between aural and visual content (hybrid *media*), hybridity between spoken word and music, as well as pieces whose texts merge multiple languages (these two latter being construed as hybrid *text*). In exploring these subsets of hybridity I will document how my use of this term moved from a practical consideration to describe my practice at the beginning, towards describing a personal aesthetic later, and finally to becoming a pointer towards a more integrated form of compositional practice which transcends the notion of hybridity altogether.

  My research aims to contribute to composition methodologies by providing a personal, autobiographical account of a particular time in my practice. It will offer a portfolio of my work from 2018-2022 and accompanying commentary containing reference points which could be referred to in future by other composers and researchers. I will also touch on the question of standardisation, and how this may affect the longevity of new works with significant technical requirements.

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Contents

List of Figures

Chapter 1: Hybrid Starting Points

Composing via scored notation for acoustic instruments and composing within a digital audio workstation (a DAW from here onwards) are related but distinct disciplines. In my experience it is becoming more and more common place for composers to be experienced in both, and to work within either medium as they see fit. In addition to those who could be viewed as 'pure' score creators in the vein of traditional classical composers up to the middle of the 20th Century, the territory of composition from that point onwards has expanded to include sonic artists, electronic music producers, DJs and others who may create original musical work entirely within a computer, sampler, or with combinations of electronic devices. Many may not have the ability to read or write notation, or perhaps operate within the frame of graphical scores or other styles of instruction/communication. And such territory further incorporates a large fraction of all those composers and music makers who use combinations of all approaches mentioned above; or who have experimented with acoustic instrumentation and electronics, and perhaps made use of both within a single work/multiple works.

  For the purposes of this thesis I would refer to this latter group as composers with a *hybrid* skillset, and those works in which they include both acoustic and electronic elements as *hybrid* works. This is not intended to be an exhaustive definition of such categories, and there may be many borderline cases which still merit mention, due to their having a relevant bearing on the marriage of traditional composition techniques with those of the electronic and digital age. Stockhausen's *Gesang der Jünglinge* for instance, I would classify as a hybrid work, particularly for its blending and interplay of acoustic sound sources (the voice of the boy soprano Josef Protschka) with the sine tones, pulses and white noise which comprise its sonic palette. This is in spite of the fact that in performance it does not require the presence of an actual boy soprano on the stage. For those performances where both acoustic forces and electronic sound production are included in the live instrumentation, this thesis will consider the ensembles in question to be *hybrid* ensembles. Through the works discussed here, I intend to give examples of how working with such ensembles

involves application of a hybrid skillset, which can cover the use of technology as well as other skills which lie outside of 'pure' composition using sounds.

 Mapping the ever shifting, expanding and evolving artistic territory described above is something I would not attempt, given the essential impossibility of accurately tracking all of its subtle contours and intersections, not to mention the general hubris of attempting to capture so many categories whose members may not even agree on my particular categorisation. However, here we may consider Dick Higgins' work on the concept of *intermedia* – a term he popularised in the 1960s to describe the many inter-disciplinary art works which were becoming prevalent at the time. His mapping of that territory was likely not intended to be exhaustive or accurate in a mathematically precise sense, yet it undoubtedly offers a useful provocation aiding and expanding our ability to imagine how disciplines interact and overlap (see Fig. 1). 'Intermedia' as a term also speaks to notions of hybridity, liminality and blends of distinct artistic genres or approaches:

> … the word "intermedia," [was originally used]… to define works which fall conceptually between media that are already known. (Higgins, 1981, p. 52)

> The term shortly acquired a life of its own… It was picked up; used and misused, often by confusion with the term "mixed media." This last is a venerable term from art criticism, which covers works executed in more than one medium, such as oil color and guache. But by extension it is also appropriate to such forms as the opera, where the music, the libretto, and the mise-en-scene are quite separate: at no time is the operagoer in doubt as to whether he is seeing the mise-en-scene, the stage spectacle, hearing the music, etc. (p. 52)

Higgins' clear distinction between *intermedia* and *mixed media* is an area in which he differs from my use of the term *hybrid*, since for him it seems that what I describe as a hybrid media work (including visual and audio elements), need not be considered *intermedia*, since it is clear to the viewer where the visuals end and the audio begins – as in the case of his opera example above.

 With specific reference to music, Higgins states:

> There are parallels to the happening in music, for example in the work of such composers as Philip Corner and John Cage, who explore the intermedia between

music and philosophy, or Joe Jones, whose self-playing musical instruments fall into the intermedium between music and sculpture. The constructed poems of Emmett Williams and Robert Filliou certainly constitute an intermedium between poetry and sculpture. (Higgins, 1965, p. 50)

So Higgins' notion is explicitly directed at works which blur the boundary between mediums. In this sense, many of the works discussed in this thesis which fall between electronic and acoustic music practices could be considered intermedia (such as *Slushball Earth,* with its blurring between the live clarinet and the treated electronic clarinet, or *Zygote* with its combination of live string quartet and remote, broadcast string quartet), but other works I discuss such as *Blodeuwedd* could be considered more as *mixed media*, certainly when considering how the visual and audio components are combined. But in all cases the intermedia concept will provide a lens to aid discussion of how, and to what degree, hybridity is present.
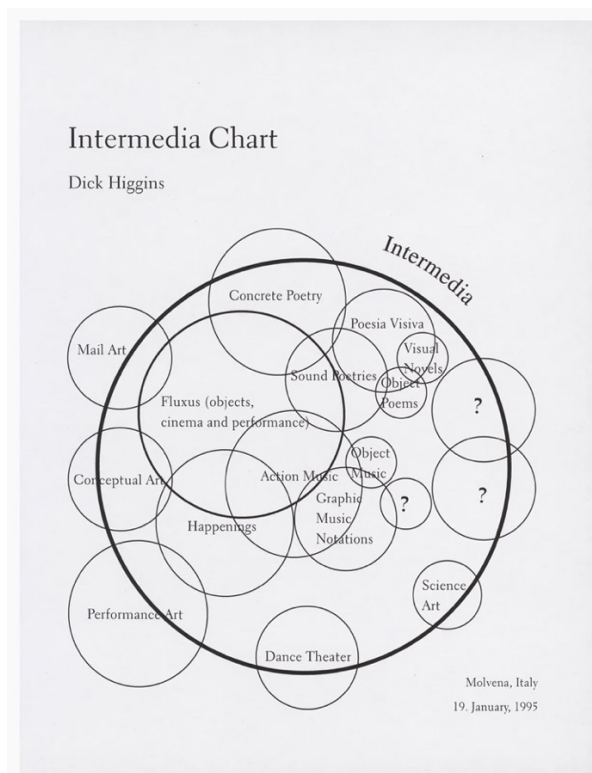
Figure 1 - *Intermedia Chart* (Higgins, 1995)

A similarly useful concept in this regard will be Jennifer Walshe's *New Discipline*:

> The New Discipline is a way of working, both in terms of composing and preparing pieces for performance… Composers working in this way draw on dance, theatre, film, video, visual art, installation, literature, stand-up comedy. In the rehearsal room the composer functions as a director or choreographer, perhaps most completely as an auteur… This is the discipline – the rigour of finding, learning and developing new compositional and performative tools… how to dissolve the concept of a single author and work collectively; how to dissolve the normal concept of what a composition is. (Walshe, 2016, p. 342)

The piece discussed in this thesis which most overtly resembles a *New Discipline* approach is *Study for Laptop, Guitar and Voice*; but Walshe's notion that The New Discipline is "a *practice* more than anything else" (p. 342) and that it demands the composer bring tools from other disciplines to bear on compositional problems, becomes highly relevant in my discussion of the operations and organisation of the UnHeard Collective, and the UnHeard Hybrid Orchestra. Moreover, Walshe's concept is certainly closer in spirit to my use of the term *hybrid*, and as such is another reference point in the following discussions.

This thesis proposes that hybrid ensembles demand a hybrid skillset, and that this can be supported by the technology itself or by including additional composers/artists in the creative process. In order to cast further light on this proposal the notion of hybridity itself shall also be explored by considering it in other contexts – in particular, hybridity between aural and visual content (hybrid *media*), hybridity between spoken word and music, as well as pieces whose texts merge multiple languages (these two latter being construed as hybrid *text*). A work such as *The Cave* by Steve Reich – a multimedia opera, first performed in Vienna in October 1993 – can be seen as a fruitful case study in this regard; given its blend of acoustic writing, electronic samples, pre-recorded monologues, and film. These qualities would all qualify *The Cave* as a hybrid work within the context of this thesis, as well as being one which features aspects of hybrid media, and a direct relevance to the concept of hybrid language.

The contribution to knowledge this thesis makes is the documentation of my composition work since 2018, which covers a number of case studies in hybrid composition (i.e. composition which makes use of a hybrid skillset), hybrid media works, and additionally

explorations of hybrid language. I will argue that hybrid composition benefits greatly from a deeper knowledge of pre-digital methodologies. But additionally I will argue that sonic composition techniques originating from electronic/digital means extend and augment the practice of 'pure' acoustic writing, by suggesting possibilities which in all likelihood would not have occurred to the composer had the technology not existed to demonstrate them. For example: the approach to melody, rhythm and timbre adopted by artists such as Autechre likely evolved as a consequence of their engagement with specific technologies, which prompted melodic ideas which may never have occurred to composers working before or outside the mediums in which Autechre have specialised.

This commentary will then build towards a discussion of *hybrid authorship* and *hybrid agent.* The latter concept refers to the agent or self that is the composer, the director/curator of a musical project, a performer, the visual media creator, as well as considering how all these roles and practices may then intersect with one's relationship with the group, with one's own practice, and with the music itself. A discussion of Tim Ingold's concept of *correspondences* will support my presentation of these ideas.

The concept mentioned above of *hybrid authorship* refers to the notion of distributed creativity. My practice was significantly impacted by the onset of the COVID-19 pandemic, and the notion of hybrid authorship/distributed creativity will be particularly relevant in discussing that impact, as well as exploring the role which technology played in dealing with those challenges.

In this commentary and portfolio I shall be documenting my experience as a contemporary composer during a very particular period in history. My aim is that this documentation may act as a useful case study, having relevance to the technological currents which are determining the evolution of composition during this time. The tools and techniques available to composers are evolving and proliferating at such a rate that musicians may be constantly challenged to adopt new skills and knowledge bases. Specialising in a handful of programs or digital music tools may no longer be an optimal approach, since any one of these can be rendered obsolete within a short number of years. Composers working with software and digital technology are therefore incentivised more to become flexible, more adaptable, and to have a certain technical agility which may enable them to pick up a new skillset in a relatively short timeframe as each new creative endeavour demands. Such considerations were informing my thinking throughout this project. As such the portfolio

contains a large number of works which use a variety of different approaches to working with the instruments and technologies available, and the commentary acts as my personal account of navigating from one to the other and considering how my practice was affected as a result.

At the outset of this project the term 'hybrid' emerged during presentations and discussions of my work primarily as a useful descriptive which captured my focus on placing electronic forces and acoustic forces together in my works. My original intention was to treat this pairing as a limitation or fixed variable which could act as a compositional challenge running throughout my research project; potentially raising interesting creative problems (both in performance and during composition) as well as prompting novel solutions to those problems and an interesting aesthetic dialogue between my electronic practice and my instrumental writing. I also considered how setting this limitation might push me to develop effective new technical means of having electronics performed on stage, or otherwise integrating them into a concert setting alongside more traditional instrumentation and teasing out new ways of having the sounds from each complement both.

As the project proceeded my notion of hybridity expanded and demanded to be explored in different ways. More examples were therefore required in order to demonstrate how the core concept manifested under these more specific subsets and interpretations. This thesis charts how these ideas evolved, and how they caused me to respond to each commission differently throughout the course of the whole project. It therefore can be read as an autobiographical document of my experiences that may provide other composers, performers and researchers with substantial information that can be used as a 'toolkit' to serve them when they embark on similar creative projects or need to study such endeavours from an outside perspective.

The other types of hybridity which presented themselves to me could sometimes act as lenses for better understanding my practice. This would then bring other questions to light: "How might text, recorded speech, and other ways of incorporating language be fruitfully used to inform and guide the composition process for a mixed ensemble?", "How can a mixed ensemble with diverse skill levels and instrumentation be effectively curated and coordinated into collaboration, maximising opportunities for creative input from each participant?", "Does hybrid authorship/distributed creativity offer an effective means of

tackling complex hybrid compositional tasks?", "Does the visual element of a work also impact the sonic element, at each stage of the process of composition?"

Exploring these other forms of hybridity allowed me to reflect on the broader notion as I was applying it. Over time I began to find that the term was also acting as a fruitful prompt for artistic ideas, and that it was moreover taking on the character of a personal aesthetic for me. The manner in which Blodeuwedd (June 2021) incorporated so much imagery pertaining to hybrid creatures, hybrid objects, as well as entities undergoing transitions from one thing into another perhaps serves as an illustration of how I began to adopt the idea in this way.

This commentary is not intended to put forward hybridity as a formal term to be defined and deployed, but more a term that I have adopted as a useful means of describing my activities and practice during this period. In this sense it differs sharply from Higgins' *intermedia* (a means of clearly categorising certain artistic practices and output) and Walshe's *New Discipline* (which acts as a manifesto). Throughout this project I used hybridity as personal guiding principle, a creative restriction, and a prompt which could be brought to each new commission so that they could be brought within a common rubric.

Having reached the point where 'hybrid' and 'hybridity' act as terms which serve to describe my personal aesthetic more than they define the practical considerations of my compositional work, I would say that I am now seeking to move beyond the need to rely on them as concepts – either when describing my work or embarking on new creative projects. To hybridise is to take two or more whole things and find a way to combine them into a new entity. My hopes for hybrid compositional practice (at least in my own case) is that it becomes no longer necessary to perceive this initial dichotomy, and that instead the process of hybridisation gives way to a more seamless and intuitive view of the elements already being part of the same whole. An indicator that this result had been achieved would be a case where an entity that initially could be easily identified as a hybrid – because the parts of which it consists are still noticeably distinct and 'stuck together' – instead takes on a seamless new identity of its own and becomes a true synthesis of the parts which came before. In my compositional practice this naturally would imply my letting go of the stipulation that my works should treat the pairing of acoustic and electronic forces as a fixed variable, and moving to view these musical forces as contiguous parts of my personal creative vocabulary, with an attendant and established way of working. My concluding

sense is that this project represents a valuable step towards that goal and points strongly towards it, while not itself being a demonstration of that result. Hence why the notion of hybridity is still the most appropriate term to place at the centre of this thesis.

Biological, Mechanical, and Digital Ages

My musical background consists broadly of two contrasting strands: my experience as a sonic artist; working almost entirely with fixed media, and my experience as a performer (electric and acoustic guitar). It is from these two aspects that the impetus for this research project arose.

I have already mentioned the term 'sonic artist', and here I should note that I use it following Trevor Wishart's concept in his 1996 book *On Sonic Art*. His contention is that sonic art includes both 'acoustic and electro-acoustic music' (p. 4), but also that his book focuses on areas that have traditionally 'fallen outside the scope of [conventional music theories]' (which Wishart refers to as 'lattice sonics' (p. 8)). It is those practitioners working within the fields of electronic and electro-acoustic music, who are primarily – though not exclusively – interested in the same areas on which Wishart focusses in *On Sonic Art* whom I am referring to as 'sonic artists'.

While I have experience as a free improvisor and post-rock guitarist, the most salient part of my instrumental training took place in a non-commercial, holistic, and somewhat atypical context. The lion's share of my musical understanding and listening skills came from within the well-defined principles and performance practice of Guitar Craft; the series of holistic seminars founded by Robert Fripp in the 1980s, and which later evolved into various Guitar Circles across the world in the 2010s. Play and practice within Guitar Craft is almost exclusively undertaken with acoustic instruments tuned to Fripp's 'New Standard Tuning' (C-G-D-A-E-g).

On the other hand, Sonic Art and electronica have given me a tantalising sense of what might be possible within music and art given the rapid progression of digital technology from the latter part of the 20th century onwards. Composer-performer Richard Barrett, both in his 2017 PhD thesis (*Music of Possibility*) and elsewhere, has remarked on the shift from the *biological age* of music – in which technique and compositional practice were essentially restricted by the limitations of what the human body could execute either with the voice or

with simple stringed instruments, bells, percussive objects, and columns of air – to the *mechanical age,* in which contraptions and systems were devised to make not only new timbres possible (such as that of the harpsichord) but also new phrasings, harmonies, and rhythms. His contention is that this earlier phase shift mirrors the progression we have been undergoing since the mid-20th century from the mechanical age to the *digital age*:

> … the arrival of electronic and digital technology has brought about a shift in the way that music is made and perceived which is at least as profound as any previous such shift in history… this process is continuing and indeed shows no sign of coming to rest… (Barrett, 2017, p. 19)

> What is of more concern here is… not conceiving of the electronic/digital domain as replacing either or both of the biological and mechanical domains which until the twentieth century were the sole terrain upon which music was created, but complementing them in an analogous way to that in which they complement one another. The advent of electronic music has also from its beginnings engendered new ways of thinking about instrumental music, just as, in the course of the seventeenth century, the possibilities of vocal composition expanded through the influence of the development of independent instrumental music. (p. 19) (footnotes omitted))

Digital technology creates whole constellations of new possibilities within musical/sonic practice, and conversely can prompt musical ideas which may have been near inconceivable before the apparatus was there to suggest them. This blooming of sonic potential casts the former, mechanical paradigm in a sharper light in which we can be more sensitive to its conventions; and may even suggest an imperative that we look beyond them; so that we are not imposing mechanical limitations on the digital canvas. The principle is to *transcend and include* what came before (Wilber, 2001).

Contextualisation of Research

My research aims to contribute to composition methodologies by offering prominent reference points which could be referred to when writing for groups including both acoustic

and electronic (and sometimes visual) elements. Arguments have recently been put forth –
for example by Celeste Oram – that there should no longer be a treatment of musical works
with electronic elements as if they have an 'outsider' status:

> … tech inhabits the lives, behaviours and communications of new music practitioners
> with an unremarkable ubiquity. And yet, tech in new music is a specialty, a novelty -
> even a ghetto… While we no longer notice the weight of the computer in our pocket,
> there persists scepticism about how (or even whether) this foreign object belongs in
> art. Continuing a Modernist tradition, technology is still regarded as the Other: an
> object of critique and suspicion. (Oram, 2015, p. 57)

I hope in this thesis to add further clarity to this discussion and help the process of
normalising the status of such technological works and hybrid practices, by delivering
examples of my own work.

  Progress has certainly been made in the attitudes mentioned above over the decades.
Aesthetic or philosophical contentions are not the same stumbling blocks against the
seamless integration of electronic elements in the concert setting as they were in the mid
twentieth century. Stark examples of such tensions faced in the earlier stages of the digital
age can be found in Jennifer Iverson's *Electronic Inspirations:*

> [Several] critics and audiences received early electronic music with much more
> skepticism. The 1948 French radio broadcast premiere of Schaeffer's early music
> concrète work Concert de bruits {Concert of Noises} scandalized listeners, who
> fiercely debated the controversial new sounds. The Schaeffer-Henry collaboration
> Orphée 53 was shouted down at the Donaueschingen festival in 1953, though it is
> unclear whether the audience detested its sounds, its aesthetic incoherence, or
> both. German audiences and critics dubbed the new electronic music "unerhörte
> Musik" {"shockingly unlistenable music"}, complained that the sonic materials were
> extracted from the realms of both music and noise, and asked, "Is this really a
> concert? Wouldn't this be just as good on the radio? (2019, p. 9)

  In 2022, the acoustic and the digital compositional skillsets need not be construed as in
conflict or tension with one another. Yet in order to expose the assumptions underlying the
use of each and to reach a deeper understanding of both; I shall occasionally postulate a

devil's advocate stance, whereby perhaps they are not in such a harmonious relationship as we who work with both might assume. From this perspective audiences may cleave closer to the attitudes outlined by Iverson above than those of us in the contemporary music world may realise. Indeed, Oram's accounts suggest that not only is technology still regarded as 'other' by non-trivial numbers of audience members and organisers, but that many practitioners who make heavy use of digital or electronic elements have nonetheless imbibed a subtle attitude of scepticism and negativity towards the very technology they use, and that this is expressed in their choices of aesthetic:

> Where is the technological optimism amidst this fetishisation of technology's glitches and corruptions? (Oram, 2015, p.57)

> … Already, tech-heavy works can suffer from poor reception: due not only to shaky understanding of the craft, but more crucially, to a Modernist prejudice that the live, human artistic utterance contains a more primal truth than the digitally synthesised. If tech works project a technological cynicism, then no wonder tech works get the short shrift: the discipline itself is perpetuating scepticism about its own validity. (p. 58)

Part of Oram's solution is to put forward a more obvious technological optimism in the aesthetics of new technological works:

> There is a pressing need for a technological optimism that steers away from these Modernist tropes of technology-as-Frankenstein's- monster… A meaningful critique of a technological system necessitates engagement with that system in its specificity, and in its current iteration… (p. 58)

Through my musical work and this commentary I would seek firstly to remain open-minded towards the critical audience perspective that technology on stage represents an 'other', or that there is something 'missing' in the digitally synthesised that normally is present in the direct, human artistic utterance. After all, if such concerns are still being raised three quarters of a century after the arrival of the digital age then it is quite possible that there are real challenges in integrating the old with the new which are not always met, and which cannot be ignored. On the other hand my approach also postulates that these are opposing

ends of a continuum which are to some extent artificial; and they are invoked primarily to provide a useful framework for composition to proceed while working with distinct and contrasting elements.

Also relevant to the context of this research is the role of standardisation, especially with regard to digital technology and software. There was an implicit question behind my composition work for this project: "Will future implementations of these pieces be affected by shifts and developments in the hardware and software I am using?" The cultures of software development and the internet tend towards making standardisation difficult – hardware can quickly become obsolete, upgrades and updates can make old versions of programs faulty or unusable, and much software requires consistent maintenance in order to remain functional and compatible with the latest systems. Furthermore engagement with any given piece of music technology can occur simultaneously and chaotically across the globe by huge numbers of individuals with diverse backgrounds and interests, without any particular form of intentional coordination so they may settle on shared best practices.

This dynamic has benefits given that there is no authority stipulating how tools or techniques *should* be used, but at the same time it brings with it the trade-off that standardisation may become difficult, or even impossible. As will be discussed later in a discussion of Michael Nyman's writings: given the multifarious range of technologies and techniques being brought to bear by uncountable numbers of musicians and creatives across the world, the possibility in this period of agreed paradigms of composition emerging for hybrid ensembles seems extremely unlikely, and this also touches on questions around the shelf-life of a work. If a work depends on a particular contemporary technology, for how long will it remain performable? If it does remain performable, are its technical requirements streamlined enough that ensembles will be able to perform it without specialist knowledge? My aim in this thesis is to offer a limited case study of one composer's practice that may shed some light on such questions. This circumscribed research project may then be useful both to those navigating the space of contemporary composition in the present, and to those studying this period in the future who seek a primary source account.

Methodology

For this research project I used a practice-led approach to create different forms and levels of integration of acoustic and electronic instruments in live performance. My original intent was to focus on precision of execution, fluency of technique, and a freer; more expressive performance practice for those performers using digital or other electronic devices on stage. This evolved a great deal through the course of my work, especially in light of the long period during the COVID-19 pandemic in which it was not possible to have performers on stage, and so I became more focussed on the creation of ideal studio 'tracks' and then in finding the best ways to arrange these for the stage.

A second key aspect of my method was the attempt to expose the shared musical vocabulary between the two classes of instrument (acoustic and electronic) through composition and identify compositional techniques in the electronic domain which have analogues in the acoustic domain, and vice-versa. This approach mirrors Barrett's notion above that electronic composition has opened up new ways of working with what came before it.

Thirdly, the bulk of my research output shall be comprised of a portfolio of compositions generated using a variety of approaches. These are accompanied by the commentary below. Across the portfolio the above ideas will be explored using hybrid ensembles with a broad range of instrumentation, and a variety of compositional strategies. Sometimes the forces will consist of only a soloist plus electronics, and at other times the groups shall be larger (ranging from trios to large chamber ensembles) and feature different types/implementations of electronic forces.

My original aim was also to have this work culminate in a flowing, dynamic concert in which the repertoire consisted of the composed material. This would serve to demonstrate the findings, and provide an opportunity to streamline them so that the works could be readily deployed in venues of different kinds whenever needed – so that the music could have a reproducible, future-proofed quality, and was not limited only to one specialised time and place. During the final stages of the project, a number of hybrid concerts with the UnHeard collective were organised, and these represent the culmination of that original aim in an adapted form. The programmes in these cases did not consist only of my compositions, and my role was instead broadened to also include that of curator. In the

conclusion I will go on to discuss how this broader curatorial role is also part of the hybrid skillset which has been relevant throughout this thesis.

For the portfolio I have composed and recorded a number of works which all make use of digital technology coupled with acoustic instrumentation, with varying types and degrees of integration, and which also incorporate hybridity of other kinds. Sometimes the use of technology is varied (networking devices, AI, live sound processing), while at other times the authorship can be itself a mixture of parties, or the application of language can include hybrid qualities. These case studies are then documented as potential examples of approaches to hybrid compositional practice for other artists.

My intention was to represent all of the above technologies on stage together as much as possible, and use that juxtaposition to have each domain's accompanying approaches to composition and performance fruitfully influence each other's direction. To make this possible I decided to spend a significant amount of effort upskilling my abilities as a composer of contemporary classical music for acoustic instruments in addition to proceeding with my existing practice.

Many of my pieces would begin with the composition of instrumental motifs before branching out to electronic explorations. At other times I would begin from the opposite direction by seeking recorded motifs, samples or other materials which could act as the starting point for a piece of sonic art. In either case I would then consider how to merge what I had made with contrasting forces from one of the other domains (biological, mechanical, digital) while either imparting similar qualities to them (whether tonal, emotional, sonic, or other identifying qualities), or else complementing what was already present.

For example in *Stroke Mimics* for wind quintet and electronics I began by constructing short phrases for the instrumentalists. I then used recordings or synthesised versions of these phrases and began exploring what electroacoustic potential they could generate, and

created a series of sound objects[1] and short sound sculptures[2]. These then found their way back into the piece to complement and contrast the scored wind elements.

As my composition practice develops, I notice myself applying my techniques in different and unexpected places. So certain electronic methods find their way into my acoustic writing and vice-versa, and this ultimately expands my broader musical vocabulary. As this process continues I note useful gestures, better standardising methods of conveying them to live players, and my overall vocabulary expands.

By sharing this process my methods of writing for electronics and contextualising computers in a performance environment may offer composers with a similar practice more precedents, particularly when establishing bounding conditions when composing for electronic forces. This can be of particular use to laptop-based performers; since their field of possibilities will be better defined, and they will be better equipped to develop technique outside of practicing specific pieces of repertoire, while also offering some optional degree of structure. One additional goal would be for the notion of 'practicing the instrument' as applied to electronics to be advanced further forward as a meaningful term. Obtaining a higher resolution image of what it means to have a computer in the ensemble should be of benefit to developers, composers, players, conductors and audience alike. Carrying this forward is one of core intentions behind my project, and as such it is the potential contribution to knowledge it will offer as my compositions continue to be presented to more and more audiences and research communities.

Chapter 2: Hybrid Composer

In the early stages of this research project I focussed firstly on how my relationship to the computer as an instrument should be characterised, especially as this related to the performance of my compositions, and my previous experience as an instrumental

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[1] 'Sound object' (*l'objet sonore*, (Schaeffer, 1966)) is a common term in musique concrete and electronic music, to refer to the primary unit of sonic material: https://en.wikipedia.org/wiki/Sound_object. They are commonly constructed by combining the attack of one or more short sounds with the decay(s) of others, and this is the primary operation which I am referencing in my use of the term.

[2] In contrast to a sound object, I would refer to a sound sculpture in electronic music as compound of sounds whose structure extends beyond that of the basic unit. They may easily qualify as whole pieces in their own right, or may be contextualised as one segment of a larger work along with other sounds as in this example.

performer. *Study for Laptop, Guitar and Voice* was written as a deeper inquiry into this question. Secondly I sought to map different aspects of my studio writing technique into the acoustic domain and vice versa. *Stroke Mimics* and *Zygote* are discussed below as case studies of this work.

Portfolio #1: *Study for Laptop, Guitar and Voice* (Key Work)

Many of the concerns outlined in the first chapter were at the front of my mind when the conceit behind *Study for Laptop Guitar and Voice* arose. It came from contemplating the proper way of characterising the computer as an instrument, especially in a performance context.

I wished to interrogate this notion further, because various experiences in concert environments have led me to question whether the computer has been prematurely defined into a restricted role in the ensemble, and perhaps by default tied too superficially to our traditional conceptions of instruments-as-objects. I began asking whether there may not be a more accurate way of conceiving of the computer in such situations. Manifestly it has musical capabilities, and these can be leveraged in an immediate, spontaneous, 'live' manner – not only via fixed media recordings. Therefore it would clearly be incorrect to claim it does not (at minimum) have some *relationship* and elements in common with objects which we would unambiguously refer to as musical instruments. But, nevertheless, it could be that we risk adopting a reductive and limiting view of what role computers can serve in relation to performance, and perhaps music in general.

We might also concede that *any* object when contextualised on stage in front of an audience, being manipulated in a focussed manner by an individual in the role of performer – whether it be an empty cardboard box, a MacBook Pro, or a harp – can be assumed to be an object which meets the definition of 'instrument'. While this is fair I would argue that it creates a misleading equivalence between – on the one hand – the musical potential represented by inert materials (i.e. those which can only generate sound through direct physical interaction), and on the other objects which offer access to a whole universe of *digital* interactions. Acknowledging the characteristics which computers have in common with unelectrified or otherwise non-digitally interactive items is useful for ensuring that they are not spuriously excluded from performance situations, but by ignoring their *unbounded*

potential it may ultimately confuse us in the act of delineating the myriad possible ways they might be used.

In Michael Nyman's discussion of *The Instrument as Total Configuration*, he addresses similar concerns, but as applied to instruments in general:

> [… In experimental music] the use of a musical instrument need not be limited by the boundaries erected by tradition. Experimental music exploits an instrument not simply as a means of making sounds in the accepted fashion, but as a total configuration – the difference between 'playing the piano' and the 'piano as sound source'. (Nyman, 1999, p. 302)

In this passage Nyman is addressing the shift among the experimentalists[3] from viewing instruments solely in terms of their basic design mechanisms, towards viewing them each as a totality of potential located around the objects themselves. By referencing prominent examples by John Cage, Cornelius Cardew and La Monte Young; Nyman illustrates that this potential may be purely sonic: "… Thus the piano becomes a kind of 'umbrella' covering a range of sounding activities whose only direct connection with the piano may be the fact that they take place with reference to the 'piano space'." (p. 303), or that it may be manifested in other ways to serve alternative goals in performance: *"… the piano can be treated as an object with surfaces to be hit or painted, have things thrown at, left on, hidden in, moved about or fed with hay."* (p. 303)

Computers – viewed as musical instruments – have never been limited by the boundaries erected by musical tradition; at least not with any level of purchase. Their 'tradition' is still in the process of being established, and owes as much of a debt to the conventions of software engineering as it does to music history. As the current conventions warp, bifurcate, collapse, and restructure themselves; it is difficult to even conceive of a stable form of

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[3] Cage's definition of an 'experimental action' is: "…one the outcome of which is not foreseen" (https://en.wikipedia.org/wiki/Experimental_music). Nyman "…starts from Cage's definition, and develops the term "experimental" also to describe the work of other American composers (Christian Wolff, Earle Brown, Meredith Monk, Malcolm Goldstein, Morton Feldman, Terry Riley, La Monte Young, Philip Glass, Steve Reich, etc.), as well as composers such as Gavin Bryars, John Cale, Toshi Ichiyanagi, Cornelius Cardew, John Tilbury, Frederic Rzewski, and Keith Rowe." (Ibid.) In my use of the term 'experimentalists' or 'experimental composers' I will be referring to those who fit Nyman's conceptions as outlined here.

music-making emerging from this period of constant flux and innovation, in an analogous way to the emergence of the orchestra in its first era. The computer under this view is always being (and has always been), exploited experimentally, and seldom as a means of 'making sounds in the accepted fashion'. Part of this is no doubt due to the culture of customisation, hacking and adaptability embedded within software development, and thus in the computer's very design.

  The proposal I sought to demonstrate with *Study for Laptop, Guitar and Voice* is that the computer can indeed be a musical instrument, but it should properly be viewed always and only as a *total configuration*. It is the composer and/or performer who draws arbitrary boundaries in each performance to determine what its configuration at that time and place shall be. Unlike the piano or the guitar, the computer does not have the default *musical* design mechanisms to which we can always return when we are not creating experimental music (as Nyman seeks to define it). The computer itself has no 'basic configuration' in musical terms – no analogue for the piano seen *not* in its total configuration.[4] What we might see as its 'basic configuration' constitutes its original design functions: that of an advanced modelling/calculation device, a tool for wielding algorithms, or else an interface for exponentially compounding the efficiency and productivity of office workers. Take the design of the QWERTY keyboard (originally established for typewriters in 1874) and mouse (invented in the 1960s, and which entered standard usage in the 1980s) – these were not selected for their specifically musical applications.[5]

 In a recent online Q&A, contemporary composer Samuel Andreyev offered his opinion on the computer as a musical instrument:

> The biggest limitation of [computers] as a musical instrument is that they have no limitations… this is actually a fatal flaw… I don't consider the computer to be a musical instrument, simply because it is not a bounded object. For something to be a musical instrument, there [have to] be limitations in terms of what it can and can't do. That's what makes a violin a violin, and what makes an oboe an oboe: [it's] the fact that they can't do the exact same things… really it's the limitations of an

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[4] Note that I am here explicitly considering the computer as a totality, and not referring to isolated pieces of software or peripherals.

[5] Discussed in: https://www.tomshardware.com/reviews/history-of-computers,4518-37.html (accessed 10th October, 2022)

instrument that make it what it is, rather than what it is actually able to do as far as I'm concerned.

A computer is really a <u>proxy</u> for an instrument, it's something that can simulate what an instrument actually is, but it's not really an instrument… (Andreyev, 2017, 13:40 onwards[6])

An object that's completely unbounded, that you can do almost anything with, that has no limitations - that's just not an instrument as far as I'm concerned. It's something else, it's a different *category* of object… I think there's just a question of terminology there that I wouldn't agree with. (16:40 onwards) [emphasis added my myself]

The characterisation of the above as a 'fatal flaw' is probably not a useful one for electronic musicians – here it would be more constructive to apply a model analogous to Ken Wilber's Integral Theory, whereby each previous stage 'transcends and includes' all those that came before it (Wilber, 2000). The digital age of composition is not incompatible with the tools and techniques of the biological and mechanical ages – it necessarily must include them in its broader palette.

To give Andreyev a more charitable reading, he is taking this point of view as a composer in the classical tradition – for whom the expectation is that each instrument may be defined by its limitations. One's craft as a composer is guided by an intimate knowledge of each instrument's peculiar characteristics, quirks and possibilities. This perspective will surely find difficulty accommodating an object like the computer; unless arbitrary boundaries are assigned so that the expressive options can be more clearly delineated. Specific software packages, plug-ins or physical controllers are some means of accomplishing this.

Bill Thompson, in his 2010 article *Scrapyard Aesthetics and the Swansong of the Inspiron* details many similar or related criticisms levelled at laptop performers, and how his 2010 work *dismantle for laptop (solo)* – in which he slowly destroyed a laptop with power tools – responded to them. One such notion was the interchangeability of laptops:

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[6] https://www.youtube.com/watch?v=ml5B1sQk_xI

This lack of physicality relates also to the laptop's almost infinitely malleable ability to "play anything" that denies its unique material aspects as a physical object; one can be replaced by another with similar specs and software with little difference to the resulting sound. (Thompson, 2010)

Here Thompson speaks directly to the typical irrelevance of the laptop's physical presence in the performance space: its physical characteristics are usually of little or no consequence to the resulting sounds, for they are not bound by acoustic properties of the object (as other instruments tend to be) but by digital ones, sharing the theme of Andreyev's earlier point.

 Thompson's *dismantle* responds to this by leveraging – in possibly the most dramatic and forceful way possible – the acoustic properties of the laptop, by amplifying the sounds created as it is destroyed. The performance he describes, and the recorded excerpts, are heavily reminiscent of Nyman's words above:

the [laptop] becomes the 'umbrella' covering a range of sounding activities whose only direct connection with the [laptop] may be the fact that they take place with reference to the '[laptop] space', or its potential may be manifested in other ways to serve alternative goals in performance…

In so doing Thompson is offering an outside perspective on 'basic' or typical computer music practice. In his view this also acted as: "the perfect antidote to much of the excessive formality and rigid concert etiquette that one finds at so many religioso-electroacoustic improv, EA, and classical concerts." (2010) So the performance served as a two-pronged response – firstly via the original sonic material he was able to extract in his physical manipulations of the object, and secondly in the stark contrast the event presented to contemporary performance practices (via the scrapyard venue aesthetics, the event's spontaneous and chaotic format which also involved the audience, etc).

In addition, Thompson states that:

…[*dismantle*] responds to many of the objections to laptop performances that are so often bandied about, such as the typical email comment, the lack of movement-to-sound association, the almost autistic relationship between laptop performer and audience… (Thompson, 2010)

These have always been common complaints levelled at laptop performers, and *dismantle* offers a compelling counterpoint. From my perspective it points towards a similar solution to those which I explored in 2019's *Study for Laptop, Guitar and Voice*, where I sought to bring aspects of what I recognise as physicality in performance from my guitar practice to laptop performance on the stage. By notating sections of the laptop part as if it were a percussion instrument, I intended to bring about a genuine embodied physicality as part of the performance – also creating a direct link between the sound and the movement, by amplifying the keyboard clicks with close microphones or contact microphones. I contrasted these with sections of the piece where 'the typical email comment' would actually be a somewhat appropriate response, since I would literally be typing into a word processor. But by explicitly making this part of the performance and exposing it onto the projected screen I intended to explore more deeply what laptop practice can or should look like on the stage, given that it can incorporate actions which do not need to have demonstrative or theatrical physical movements attached to them. If these movements are completely superfluous and disconnected from some of the musical activities executed with a laptop, then they may rightly come across as forced or embarrassing.

For those of us who create music and sonic art with computers it seems obvious and unquestionable that our activities are analogous to the activities we undertake with guitars or analogue synthesisers – the ultimate goal being the production of music we believe in. However if one considers the prodigious number of applications unrelated to music which the computer provides (particularly since the engineering which drives its design is not focussed primarily around creating musical instruments), it should be abundantly clear that the infinite-but-bounded set of actions which we can undertake with it consist of a *different order* of infinity than the set of actions one can undertake with the piano, the flute or the guitar – even viewed in their total configurations.

This surface - which I am currently interacting with in order to type these words - is the same surface on which I compose music, write emails to my family, have both professional and social conversations via Zoom or Skype, play games, watch YouTube videos, listen to music for entertainment, maintain notes and lists of all kinds, keep track of my accounting/budget, conduct various life admin tasks with the bank, the council, energy suppliers, insurance companies, edit photos/images/videos… the list goes on, and as it does

so the more it seems that the computer is a vibrant complex; able to support and carry out a near-limitless list of tasks and purposes. It is unbounded, as Andreyev points out. Or in the words of Holly Herndon in her essay *Laptop Intimacy and Platform Politics* (2017):

> … the laptop is the most intimate instrument the world has ever seen. It mediates all aspects of our lives, connecting with the good and bad of the world around us. We do our banking on this instrument and use it to connect to our friends and family. Our employer interrupts us as we make art through this instrument. Our view of the world changes in accordance with how we customize it. (p. 555)

Pondering this amorphous, evolving quality which can be recognized in interactive digital devices (particularly their most modern iterations), led me to conceptualize my laptop more in terms of it being an entry point – a *portal* into a digital room or environment. Once one is in that space, further actions can be taken. Such actions include loading a DAW and using it to perform music. DAWs can of course be described as musical instruments without ambiguity, or at least as applications in which music and sound were baked into their design philosophy from the very beginning. We can therefore say that the computer acts as a portal to a digital environment, in which we *then* take control of a musical instrument, and manipulate it to send music back out through that same portal, and finally to our senses in the physical world. This construction is my proposed means of addressing the question of terminology which Samuel Andreyev pointed towards in the earlier quote, and the denial of the laptop's unique physical aspects which Bill Thompson stated.

Andreyev's comment that the computer is a *proxy* for an instrument was – for me – a doorway into the idea (which lies behind *Study for Laptop, Guitar and Voice*), that the computer may better be conceived not as something with predefined musical capacities, but as something other (or *more*) than an instrument – perhaps a *hyper* instrument. Or if we maintain the portal analogy, then it can give us access to a space in which musical instruments (made of the stuff of software), which *do* have well defined boundaries and limitations, can then be played.

In *Study for Laptop, Guitar and Voice*, sometimes the laptop is contextualised as an instrument by severely bounding the interactions permitted to the player such that they focus more on pure physicality and the limits set by the original 'information technology' constraints of the device. The first two sections in particular focus attention on these

aspects. This would be my attempt at coming as close as possible to the computer in its 'basic configuration' in a performance context, reversing Nyman's notion and applying it to a different category of object.

Figure 2 - Introduction segment of 'Study for Laptop, Guitar and Voice', taken from the premiere in the Royal Northern College of Music's Carole Nash Recital Room, 5th February 2019

The piece opens with a segment in which the laptop – whose screen is projected for the audience to see – entirely takes centre stage (Fig. 2). Minesweeper is open, and the performer simply plays a round for as long as they can – with the other performers instructed to mimic the clicks of the mouse as the game progresses (their actions are tied to those of the laptop performer). This serves to generate an atmosphere which will be associated in the minds of the audience with that of any office environment, or with sitting at the family computer at home – an ambient room, sparsely populated with occasional clicks of a mouse. On losing or winning the game, this is immediately followed by a series of communications manually typed out via any word processing application. These sentences describe the concept of the piece in a light-hearted fashion, inviting the audience to further project their minds into the digital surface which the piece seeks to explore. At this point

the vocalist and guitarist continue to mimic the actions of the typist, though now they also add the rattling of the keyboard to their utterances.

At other times (particularly the third section) this is contrasted with actions being taken *within* the digital space. The other live instrumentalists are required to interact with both – allowing the ensemble and the audience together to experience the terrain and boundaries between computer-as-office-tool, computer-as-instrument in basic configuration, and computer-as-environment (*total* configuration). All of these are included in the overall concept of the *computer as an instrument in total configuration*, and the piece primarily seeks to simply lay this truth bare, partially by drawing out the humour inherent in contextualising the laptop in an unfamiliar way for the stage. In this sense I would say that I was seeking a more integrative approach than that explored by Thompson in *dismantle*, since I aimed to incorporate acoustic properties of the laptop, as well as typical and atypical digital properties which are available in laptop performance practice.

I began developing the piece by asking: which aspects of the computer's functionality or construction are ever-present in a live performance, core to its functional design, but not commonly leveraged in service of the music? For one, the keyboard and mouse clicks are the physical means of interaction with the device but the sounds generated by these would more commonly be considered a superfluous by-product of each interaction. Something similar could be said of the CD tray operation (if the device is old enough to have one), the USB device insertion and removal sounds, internal operating system sounds, and so on. As such I decided to write sections of music in which such functions were the *primary* techniques adopted by the laptop performer, so as to draw attention to the limitations of the object if it were essentially divorced from its higher capacities – that *portal* to a whole universe of hyper-musical software devices mentioned earlier.

I wanted to include another live player alongside this material, because this juxtaposition would help cast the actions of the laptop performer in a clearer light when contrasted with more typical musical performance practice. I chose the electric guitar for this purpose, as it is my primary instrument and I felt most prepared to write in an idiomatic fashion for it – which was advantageous since the laptop writing would either have very few idiomatic points of reference, or else I would be specifically avoiding such conventions.

Following early experiments using the laptop as described above in duet with a live guitarist, I decided to keep the restriction that no audio or music software could be used in

the piece, but that all other interactions with the computer were valid. This rule was intended once again to invert the typical concepts of computer-as-instrument and computer-as-environment, and proved useful as it allowed the device's wider functions (which are always present in laptop performance, but seldom invoked) to come to the forefront.

In these early tests we experimented by improvising in a duet of laptop and guitar, and I sought to make use of as many 'native' computer and operating system sounds as possible. These included the 'critical stop' sound, the USB device inserted/removed alerts, the sound of the CD tray being opened and closed, the Windows 2000 'welcome' sound, the sound of the laptop lid being closed and opened. The goal of using this audio palette would have been to locate the listener in a sound world which would normally be familiar to them in an office setting, when completing admin tasks, or when otherwise interacting with the operating system on their home computers. The playful and musical aspects of the work could then arise from the intentional setting of these sounds with an accompanying guitar arrangement.

In the final piece I made use of Minesweeper, Notepad, internet browsing and especially YouTube (including uploaded pre-recordings of all three members of the ensemble), to explore these intuitions as broadly as we were able. Here there is another resonance with Celeste Oram's writings. In the same essay quoted earlier she discusses composer, performer and conceptual media artist Johannes Kreidler, and mentions that:

> YouTube is a medium; gifs are a medium; twitter is a medium. Each has its own unique conventions and practices – even highly condensed art history – that define their medium specificity. Kreidler's work affirms this; he uses the term 'YouTube installation' to describe some of his more heavily conceptual works, like an 11 -hour sonification of a binary translation of the collected poems of Georg Trakl. (Oram, 2015, p. 62)

Study for Laptop… is a piece for performance rather than an installation, but Oram points out an interesting connection that places Kreidler's work in a similar hybrid compositional space, and even specifically as intermedia given the true blending of poetry with sonification. Teasing out the different *mediums* available within the computer as Oram describes here, and gesturing at their distinct qualities was part of my goal behind *Study for*

Laptop. Given the vast diversity of sounds which can be created through these mediums, I decided eventually to also include a singer in the forces, since they would be able to handle specific sonic terrain which would be inaccessible to the guitar.

   The second section of the piece is the most heavily notated, and here I wanted to tie the clicking of the laptop keyboard more directly to the sounds made by the guitarist and vocalist. Given my background as a guitarist, I was drawn to certain similarities between the fretboard and the keyboard. The fingertips are heavily used to interact with both, both have six separate 'rows' of keys/frets, and both have discrete 'cells' representing each note or symbol. This led me to the notion of typing a series of sentences and using the keystrokes to map out an equivalent series of musical phrases on the guitar (Fig. 3):
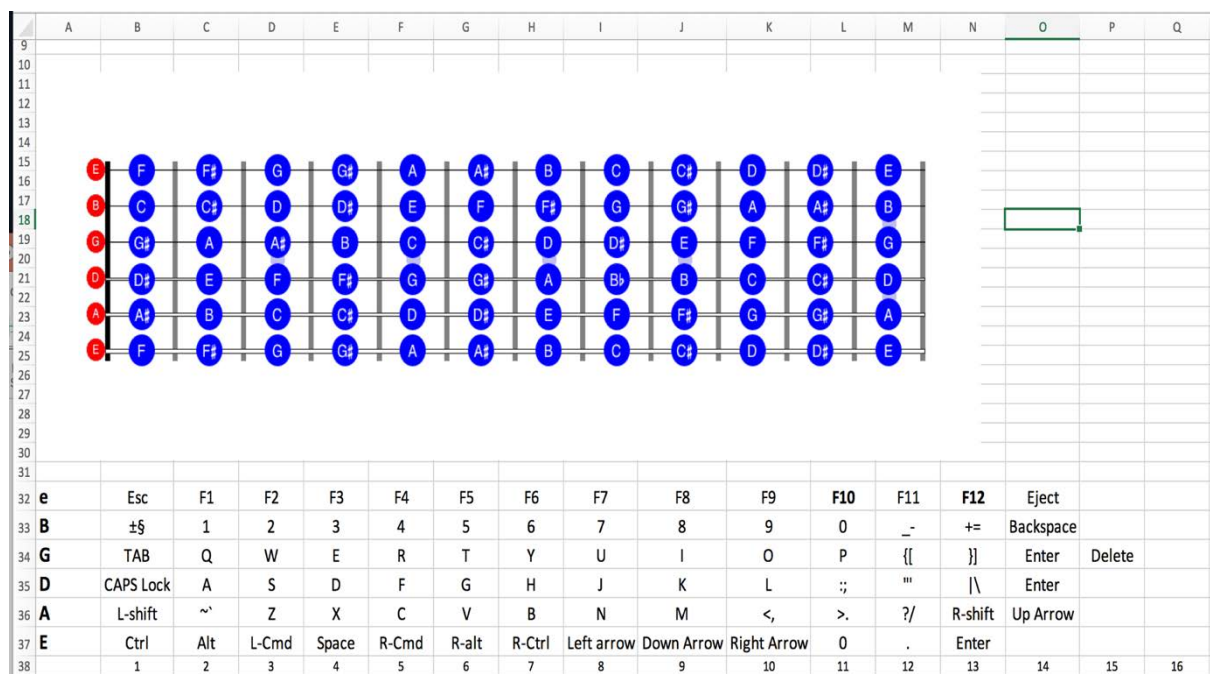
Figure 3 - Still of the guitar fretboard to keyboard mappings used to generate musical material in 'Study for Laptop, Guitar and Voice'

Figure 4 - Beginning of the second section of 'Study for Laptop, Guitar and Voice'

So following this schema, the letter 'T' would correspond to C# in the sixth fret of the guitar's G string. 'H' would correspond to A in the seventh fret of the D string, and so on. In this manner I aimed for every keyboard action during the second section to have a matching note value, which would govern the singing and playing of the other two performers. In order to facilitate a certain musicality, I did make some adaptations to this schema – for example, I felt that the 'Enter' key should play a decisive role and be distinct from the other sounds, since it would be pressed at every moment when the text shifted to the next line. To give it a separation from the other notes I therefore decided that 'Enter' would be represented by a spoken word for the singer, and a full muted strike of all six guitar strings for the guitarist (Fig. 4). Having generated the notes, I also tested the musical figures on the guitar and adjusted the fingerings where necessary so that the phrases were playable and practical, but still matched the original note values.

In this second section I also wanted to contrast the above – using keyboard strokes to generate the music – with the opposite approach in which I decided the notes first and used those to generate the keystrokes. This is most evident in the bars from 51 onwards, in which the 'lyrics' consist of the letters and numbers 'Q – S – T – Y – 5 – T – Y – 5 – T' (Fig. 5). Here I chose the notes executed by the singer as a simple form of harmony to match the figure repeated by the guitar – consulting with our singer (Clare Hood) so that it would be more

idiomatic for a human soprano. I then used those note choices to reverse engineer the notated keyboard strokes, using the same mappings shown earlier. This is the reason for the apparently random choice of letters and numbers typed at this point of the piece.

The keyboard itself is close miked throughout the performance, but particularly in service of this section where it acts as a form of percussion instrument.

Figure 5 - Section of 'Laptop, Guitar and Voice' in which note choices dictated keystroke choices

The third and final section of the piece focusses on interactions between the guitarist and the singer, with YouTube selections made by the laptop performer. The primary conceit is that the guitarist and singer take their cues from the projected screen, and are required to mimic the sounds of the chosen YouTube videos with their instrument/voice (Fig. 6). All three performers initially wear headphones at this point so that the audience are only able to hear the sounds made by the performers, as if they are 'dubbing' the videos on display.

The performers are also aware of an imaginary vertical line dividing the screen in two – any videos playing on the right side of the screen are dubbed by the singer, and any videos playing on the left side by the guitarist. This is initially set up in a way which makes it clear to the audience – the laptop performer opens one video to begin with, and shifts it from the left side to the right side and back again. The intention is that this demonstrates the rules of the 'game', so that what follows is more transparent. The laptop performer then opens a second browser window and reorganises the screen so that a separate instance of YouTube is playing on either side. At this point, they are free to spontaneously challenge the other performers to mimic whatever YouTube content they can think of. The split-screen system

also has the additional benefit that it can be used to issue other specific 'instructions'. For example a video can be stopped or started at will which causes the corresponding performer to stop or start making their sounds. A video can be played at half speed or double speed, or specific short sections of the content can be replayed by skipping through the video timeline, causing the performers to have to respond accordingly.
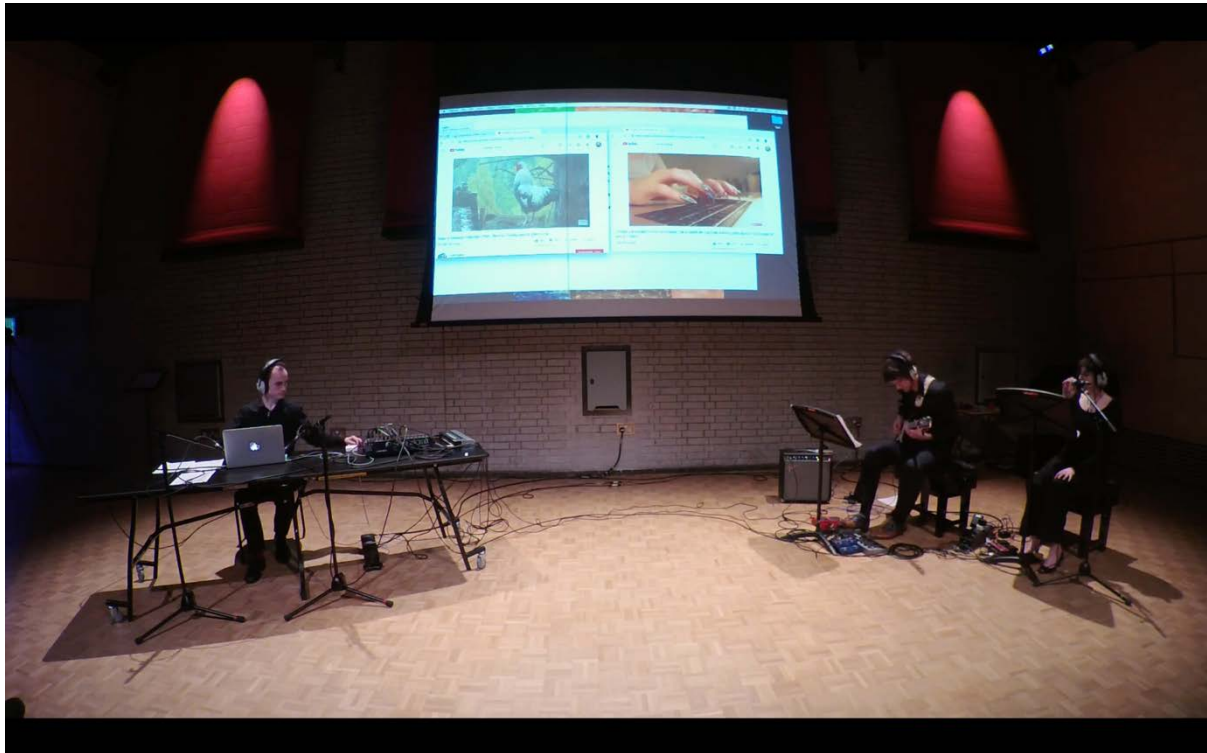
Figure 6 - Still from third section of 'Study for Laptop, Guitar and Voice'. The guitarist (Nate Chivers) is mimicking a compilation video of roosters crowing, while the vocalist (Clare Hood) is mimicking a video of 'ASMR typing with fake nails'

Our performance team for this piece included Nate Chivers (guitar), Clare Hood (vocals), and myself (laptop). During rehearsals we developed a pool of specific YouTube videos which formed the basis for this third section. Although the piece allows theoretically for any video whatsoever to be selected from the entirety of what is available on YouTube, in practice this could be quite difficult to execute without causing pauses or hesitations on stage. This was because the performers often needed to adjust their approach so they could begin making appropriate sounds for certain videos (the guitarist in particular made use of a variety of effects and found objects such as sponge scourers to mimic what was heard). It was also due to the fact that certain videos may contain long sections without audio or video, or with other issues which could interrupt the flow of the performance. Some of this

chaotic potential was accounted for, such as in the case when YouTube would play an advert before showing the selected video. The performers were instructed to mimic these adverts as if they were any other video, and my feeling was that such spontaneous occurrences drew even more attention to the vastness and unpredictability of the digital world to which we were connected merely by virtue of having a laptop on stage.

But in many cases during the rehearsals it was clear that certain unexpected occurrences would appear more as mistakes than as part of the intended performance, and that some videos gave the performers more and richer opportunities to respond than others. So over time we developed a repertoire of videos which Clare and Nate could respond to quickly and effectively, and these were the ones we used in the final version. Over time I could envision that a team which played this piece on stage regularly would broaden that repertoire more and more, that the laptop performer would become better at locating the best content choices, and that the other two performers would build up further techniques to respond in each instance. Eventually the experience would more closely approach a truly improvised, completely free and spontaneous revelling in the unbounded potential of the internet – the spirit of which this section of *Study for Laptop* is intended to represent and invoke.

The third section of the piece later evolves so that the video choices consist entirely of content uploaded ahead of time by the performers themselves.[7] To signal this change the amplified sound of the laptop is finally unmuted in the house speaker system so that the audience can also hear what the performers are hearing. The laptop performer then begins loading the aforementioned content. In the case of our performances these consisted of video recordings of myself playing single notes on the guitar, speaking letters rhythmically (recalling the second section of the piece), tapping out rhythms with different household items, recordings of Nate improvising simple repeating guitar figures, and Clare speaking letters rhythmically or singing them to simple melodies which we agreed during recording. These are all used as a basis for a loosely structured improvisation – the laptop performer can load these videos in whatever order they choose, load specific videos multiple times so that they can be heard echoing each other, stop and start them at will, and arrange them visually on the screen as they please. Both the guitarist and vocalist have access to guitar

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[7] These are all still publicly accessible here: https://www.youtube.com/@tywiroberts5973/videos.

loop pedals, and they are instructed to use these at this section of the piece to build up textures of looping patterns, sounds and phrases.

Given the above discussion of YouTube as a *medium*, I was particularly interested in the potential it could offer if the composer and/or performers set up some of the available videos ahead of time. By including this pre-uploaded material in the structure, it would be more possible to allow the piece to demonstrate a contrast between the unboundedness of the digital world, and a certain control and discipline which is available when certain boundaries are drawn within that space (even if they are arbitrary).

In summary I would say that *Study for Laptop* is a piece which incorporates many ideas into its framework, but that they all involve the application of a hybrid skillset and a hybrid compositional mindset. The hybrid skillset in this instance even extends beyond an understanding of typical music software such as DAWs, and involves a broader knowledge of information technology in general – including word processors, internet browsers, spreadsheets, typing technique, and online content curation. The open manner in which the piece was arranged in the rehearsal room and the many points at which the performers have room to improvise their own responses to prompts from the laptop performer also prefigures some of the notions of hybrid authorship and curation which will be discussed in more depth in chapter 4.

Portfolio #2: *Stroke Mimics*

As touched on in chapter 1 the material for *Stroke Mimics* (a short piece for wind quintet and fixed-media electronics, commissioned by Connected Health Cities) began as a series of scored sketches for the winds. These sketches then became the basis for a number of sound samples which were generated primarily via synthesised renditions of the notated music using NotePerformer's[8] interpretation of flute, clarinet, oboe, horn and bassoon sounds. These samples were then fed into a patch in the creative coding environment Max (previously Max/MSP), which was an earlier project of my own: a polyphonic sound file jumper, with various additions and customisations (Fig. 7). This process provided a venue

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[8] NotePerformer is a playback engine for music notation, incorporating a very large sound library and the ability to execute musical phrasing in an advanced manner.

for play and improvisation with the phrases I had originally notated, allowing me to generate new sounds which were nonetheless derived from the original sources, and so possessing the same origin.

Figure 7 - Polyphonic Sound File Jumper patch, for Max/MSP

This generation of diverse sounds which still retained a familial connection to each other via their sources was one of my means of interpreting the *mimicry* theme of the piece. The interplay between true woodwind instruments and synthetic 'mimics' was part of the central conceit. This was another aspect of my exploring a method of setting meaningful boundaries on the possible contribution the computer/electronics could make to the music in performance. Andreyev's notion above that 'the computer… is not a bounded object', may additionally be read as a comment on the process of selecting sample sources for inclusion in a piece of music. The range of options for available sounds is infinite – there is no traditional fixed/defined system for organising them together, and there is not always an obvious method of illuminating which sounds are more or less salient to the needs of the music as a whole.

Figure 8 - Bars 10-14 of 'Stroke Mimics', showing some of the extended technique instructions included for the wind players

In addition I would say that *Stroke Mimics* is a good example of my hybrid compositional skillset between studio techniques and scored acoustic techniques being used in action. Aside from the process described above for generating sounds which were realised both by the players and by myself using software tools, when writing the final score for the quintet I included techniques which were informed by my processes of creating sound objects using a DAW. These can be seen in bar 25, where the players are requested to rattle the instrument keys as loudly as possible into the commencement of their notes, in order to add different sonic elements into the compound sound of the attack. I use many variations on this technique through the piece – for example in bar 5 where the air sounds from the horn and bassoon are intended to modify the compound sound generated by the notes of the flute, oboe and clarinet. Or in bar 12 where all the players are instructed to create a strong plosive blow which again modifies the sound of the attack, especially when taken all together at once (Fig. 8). These are all ways in which I sought to mirror techniques from my studio writing in my acoustic writing (and vice-versa) through the course of composing *Stroke Mimics*.

Portfolio #3a: *Zygote* – Future of the String Quartet Version (Key Work)

Figure 9 - Full score of 'Zygote', including the time (seconds) markers, used to coordinate changes between the two quartets

Zygote is written for two string quartets in different locations and linked by remote networking technology, and was premiered in March 2019 in a concert titled *The Future of the String Quartet*. It represents an effort on my part to engage with my interest in ambient music, or music which operates on longer timescales – the latter of which offers an interesting connection to electronic music composition, where the operation of 'time-stretching' a sound is a core technique.

The original concept of the work was a response to a commission for the RNCM's Ensemble+ networking system, involving a piece for two string quartets linked from different locations with a low-latency connection; visible and audible to each other via large monitor screens and PA systems. Ensemble+ was primarily intended to be used to broadcast performances and classes, and to allow performers to play together across a large distance. It is somewhat ironic that this piece was written and conceived a year in advance of the onset of COVID-19, given that it makes heavy use of similar technology which would become orders of magnitude more prevalent for everyone during the pandemic. During that

time musicians and performers around the world would all be forced to begin asking similar questions connected with how performance may take place via remote connection, or even whether this can be undertaken at all.

 I attended some tests of the Ensemble+ system during its development phase and became aware of certain limitations which it presented. In the first case players had difficulty synchronising together. Even though the latency was almost imperceptible, anything rhythmically complex or requiring subtle bodily communication was challenging. The technical separation between players introduced a significant interference in their ability to play together, even for experienced duos and other groups. In the second case: for audiences witnessing an event streamed via the system, the sense of 'watching something on television' overrode the immediacy of attending an in-person live event; with its palpable experience of being mutually involved in something initiated by the performers, rather than coldly observing them from a distance. There was a disconnect, risking a loss of the vitality and intimacy one would normally wish for from a live concert.

Neuroscience researcher, psychiatrist, and author Iain McGilchrist's work frequently deals with problems closely related to this topic, particularly in connection with concepts of *presentation* and *re-presentation*. But his notion that music should properly be encountered as if it were a living being points towards the solution:

> The empathic nature of the [musical] experience means that it has more in common with encountering a person than a concept or an idea that could be expressed in words… works of art – music, poems, paintings, great buildings – can be understood only if we appreciate that they are more like people than texts, concepts or things. (McGilchrist, 2009, p. 96, references omitted)

 In writing 'Zygote', these concerns were at the front of my mind. In order to work around the issue of synchronising the players, I chose to compose material that did not require rhythmic precision, particularly between the ensembles. This was informed by my fondness for composers such as Lawrence Crane and Brian Eno, who can use a small selection of chords to create long, sustained textures with very little harmonic motion – see Crane's *Riis* (on *Sound of Horse* (Hubro/Grappa Musikkforlag, 2016)) or Eno's *Ambient 1: Music For Airports* (Virgin Records Limited, 2004) for examples. This thinking also bears a relationship to Robert Fripp's Soundscapes, in which sparse musical loops of differing durations are set

in motion, allowing the music to evolve through their near-endless interaction and asynchronous periodicity. Fripp himself commented on this characteristic in his diary:

> There is an area of Soundscapes that do not develop (in the musical sense of developing variations) but just stay where they are – sonic pleroma: a warm, safe place to be but not going anywhere. Being where it is, is already where it's going. Even there, as with the changing-durations of the repeated themes, being-where-you-are is usually far from static. (Fripp, 2006)

I hypothesized that this approach to writing could make the fact of playing together across a large distance a feature of the piece, rather than an obstacle. One question this raised, however, was the degree to which communication would be encouraged between the two quartets in this arrangement – if at all. This led me back to the second issue: how to ensure that the living, active reality of the players in the remote location could be immediately available to the audience.

  In this case I wished to find a means of sharply drawing the attention and awareness of the audience – as well as the local players – to the 'life-ness' of the players who would be performing remotely, and only visible via the monitor screens. While technically robust, the connection between the two rooms and two quartets is actually fragile in its nature – relying solely on what the remote microphones can pick up, and on the chain of energy and data transformations and transferrals which bring it to the local PA system. The microphones therefore struck me as the fulcrum of the piece and of the oscillations of musical energy and attention shifting between the concert venue and the remote location of the second quartet. Simply playing into the microphones and hearing the results on the other end of the line is the expected behaviour, and therefore at risk of being taken for granted and experienced without freshness or sensitivity – again, as one might passively watch any static content via the 'black mirror' of a tablet, television or smartphone.

  In response to this concern, I was led to include sections in the piece which required the performers to interact in intimate and gentle ways with their instrument microphones, thus drawing attention to the reality and fragility of the connection which was making the performance possible. Here I would propose that this idea bears a relation to Walshe's New Discipline practice. The solution is not solely a compositional one, and also invokes elements of theatricality, since witnessing the performers bring their mouths close to the

microphones is a large driver behind the intended shift of attention; in addition to the new sonic artefacts which the breathing creates. It is a compositional problem, solved with a slightly broader skillset than only the organisation of sounds.

The thinking was to impress the remote quartet's presence on the audience by having them breathe audibly into the microphones, and also include sections whereby they gently rub, scrape, tap, knock, or bow the surfaces of their instruments. They could also use delicate slides and scratches – any small sounds which would be less perceptible in a regular concert environment, but in this instance would be amplified to such a degree that they could be experienced as intimate. Depending on how closely the instruments could be miked, one's ear might almost be experienced as within the instrument itself. In terms of the audible breathing later in the piece, the players are instructed to breathe – naturally, fully, and in a relaxed fashion – directly into the microphones. This is intended to impress on those present the interaction with living others.

When considering the ambient direction of the piece with reference to the musical touchstones mentioned above, I was reminded of the famous '*Windows 95 sound, slowed down 4000%*'.[9] This process essentially turned a ubiquitous 7 second fanfare into an ambient piece lasting almost 4 minutes, with its own characteristic structural contour. In light of my research into the interplay between digital and acoustic composition techniques, I became interested in applying a similar 'manual' process to my work.

I began generating a new score from an unused string quartet of my own by treating the length of a sixteenth note in the old score as a whole note in the new score (with flexibility to shift notes around intuitively, if it seemed to make more musical sense). On top of this I assigned a metronome mark of ♩ = 20 – which ultimately only served as a guide, since I ultimately wrote the expected duration in seconds above each bar. This tempo is almost impossible to feel in the body, and certainly for a group to reliably feel together without a conductor. As such the advice was for the first violin player in each ensemble to cue every 12 seconds – and for those two players to additionally take cues from each other via the screens.

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[9] Various individuals may have created some version of this audio and uploaded it online, but these tracks by ideoforms are generally deemed the definitive versions: https://soundcloud.com/ideoforms/sets/windows-startup-sounds-slowed-4000

This arrangement was most effective at forcing a high degree of communication between the players, and especially between the two separate quartets. The aim had been to make sure their awareness reached out to those on the other end of the network connection – which was successful, and by extension hopefully the audience were also sensitive to this interaction. This was very much a useful project for my research, as it highlighted the techniques one can use to maintain a human element through layers of technology, revealing the importance of focussing and directing attention, and also potentially paved the way for more involved arrangements using Ensemble+. Finally it again exemplified that aspect of my hybrid skillset whereby studio techniques are applied to acoustic compositional problems, particularly in my interpretation of time stretching as applied to string quartet writing.

In February 2020, the score for *Zygote* was repurposed so that it could be performed by the UnHeard Hybrid Orchestra, and this version will be discussed in greater detail in chapter 4.

Hybrid Composer: Summary

With the term *Hybrid Composer*, I am here describing a composer applying studio composition techniques and acoustic score writing techniques together in a single piece, especially if the two are in a fruitful synthesis with one another and generating useful new ideas. *Zygote* and *Stroke Mimics* illustrate this via the manner in which I made use of my abilities in the digital or acoustic domain to arrive at specific compositional ideas in the other domain. The process of bringing *Study for Laptop, Guitar and Voice* to the stage also required a *hybrid composer* mindset, particularly since I needed to apply knowledge from my experience as a performer and from working with performers to develop the different sections of the piece, each of which invoked different aspects of the computer as musical instrument. My knowledge of one informed my approach to the other, and the fact of the laptop (and information technology in general) being such a ubiquitous and all-pervasive feature of my life informed the decisions I took in how to interact with the device on stage, and how the other performers should respond and interact with these actions in turn. I would also say that some of the decisions I took in *Zygote,* in having the performers take actions which would draw the audience's attention to the technology being used and the

fragility of the connection, were similar in spirit to many of the performative aspects of *Study for Laptop, Guitar and Voice.* Both pieces also demonstrate how my aesthetic began to take on a hybrid character given the foregrounding of keyboards, use of computer monitors as a key means of communication between performers, inclusion of pre-recordings of the performers on screen alongside the performers themselves, as well as microphones and looping technology being integrated into contemporary chamber ensembles as prominent features of the music itself.

Zygote may also act as an interesting document of musical practice at a particular moment in time, given that it made use of live streaming technology for performance as an intentional part of its design. This was approximately one year prior to the onset of COVID-19, when questions around uses of live streaming in performance became highly relevant for musicians across the globe.

Chapter 3: Hybrid Text

Since *Study For Laptop, Guitar and Voice* at the beginning of this research project, the building blocks of language (text, words, letters, symbols) have been playing a significant role in much of my composition work. In that instance the ASCII characters used both to construct text and the language of computing were leveraged as a source for generating notation, and the names of each character featured as the 'lyrics' of the middle section of the work. This could be viewed in a similar fashion as the use of alphabetic characters in Alva Noto's[10] work with Anne-James Chaton – especially *Alphabet* (NOTON, 2019), *Unitxt* (NOTON, 2008), and pieces such as *Uni Dna* and *Uni Acronym* from the albums *Unieqav* (NOTON, 2018) and *Univrs* (NOTON, 2011) respectively. The abstracted nature of the utterances is a thematic tie to the digital palettes of the pieces; their computer-driven worlds.

In the middle-stages of this project language and text assumed more important roles in many of my compositions. My methods of incorporating the text into each piece differed,

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[10] Alva Noto (Carsten Nicolai) is an ambient electronic musician and sound artist, frequently working in the transitional area between music, art and science. He also works as a visual artist, and his output is often described as having a heavily minimalist aesthetic: https://noton.info/about/.

and often involved different uses of software to achieve the final combination of music and words. These methods leveraged similar skills as discussed in the previous chapter in relation to the notion of *hybrid composer*. Sometimes the resulting texts in the final works were atypical or unconventional representations of the languages in which they were written, or included a blend with another language as in the case of *Blodeuwedd*. In this sense I will suggest in this chapter that these pieces can be considered as covering different forms of *Hybrid Text*, and that their composition involved an extension of the sorts of techniques which are central to a hybrid composer.

Portfolio #4: *Streets in the Sky* – Rosamond Prize Version

Streets in the Sky was a collaboration with poet Sammy Weaver (who provided the text in its entirety) on the theme of Park Hill Flats in Sheffield, and was originally written for spoken word vocalist, two marimbas and electronics.

  The piece played with similar motifs as mentioned earlier in connection with the text portion of *Study for Laptop, Guitar and Voice*, with the syllables of the spoken word vocalist being rigorously tied to the metronome; discontinuities in grammar entirely ignored as they are forced to enunciate isolated syllables in cooperation with a pre-recorded voice (Sammy Weaver's), with only the two together forming the whole lines and stanzas of the work. The dismembered, abstracted nature of this text was actually built-in from the ground up by Sammy herself; who took the decision to compose her poem in a grid format, with words forcefully disconnected from each other in an allusion to the brutalist architecture from which the piece took its inspiration; and its compartmentalisation of human individuals and families (Figs. 10, 11 and 12).

STREETS IN THE SKY

[enter the grid, geometry, idealism, order]

The	train	pulls	into	the	station,	ticks	to	a	halt.
the	exhalation	of	automatic	doors	above	tracks.	You	look	up
to	Park	Hill	Flats.	A	rhythmical	grid	of	cladding	and
concrete,	windows	and	balconies.	Slum	clearances,	the	first	streets	in
the	sky,	homes	fit	for	heroes.	The	silence	of	a
thing	left	absent	and	standing.	Squares	repeated	and	duplicated	on
the	beat.	Four	by	four	and	ten	by	ten	repeated
and	duplicated.	With	each	repeat,	generation	loss	as	something	is
added	to	something	is	deleted.	Rough-cast	concrete	beautiful	symmetry	brutal
liturgy	falling	from	the	sky	with	the	pull	of	gravity.

Figure 10 - Sammy Weaver's text for 'Streets in the Sky' (omitting the final stanza), retaining its original formatting.

Like	a	mass	grave	holds	its	lines	of	sudden	sorrow
in	rows	of	anonymous	headstones	sinking	slowly	into	earth.	The
presence	and	silence	of	lives	lived	and	lives	lost.	Its
hive	mind,	collective	and	dormant,	repetitive,	self-	same	mind,	collective
and	dormant.	The	wind	making	itself	heard	through	the	smallest
openings,	a	door	bangs	somewhere	inside	its	hive	mind.	Speaks
in	square	windows	reflecting	squares	of	sky,	rain	and	sudden
light.	Clouds	distil	for	seconds	then	gone.	Windows	want	to
lose	themselves	in	reflection.	Boarded	up	doors	boarded	up	pubs
boarded	up	windows	no	longer	reflect	the	sky	turn	inwards.

Figure 11 - Stanza 2 of Sammy Weaver's 'Streets in the Sky'

[enter time, nature, human stories, disorder, entropy, how we appropriate the grid]

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You scale      the      bank,           narrow      tracks   in   the   scrub   worn   down
        by      something   making   its   way   again   and   again,   human   or      fox.
A     singular    teasel.    A    scattering  of   crumpled   Tyskie   cans,
      nests       woven with     twigs,   feathers and      human hair     clotting   the   veins
of     leafless    trees.     Three   shrivelled   red   balloons   caught   by   a   branch.   Below
the     balloons,    a  pile   of   used   syringes.          Glass   bottles   are   greenhouses
for   algae  to   grow.     You      draw      closer      to   Park   Hill   Flats,
peeling     white      paint      like   flaking   skin,         cracked   windows,
    rusting   satellite   dishes.      A   copy   of a   copy   leads   eventually to   entropy.
         The    wind    makes  a   door   bang   somewhere   inside
its   hive mind,    ricocheting      through the empty flats,     the deserted homes.
   A car pulls up,       hot-boxed,     to look across     Steel City,      columns of rain in the valley,
      the still-life          of a mill chimney        the pennine horizon      there's always a siren
a good place to get out of it,      a good place for perspective,      the      sky      widening.
                how our passing leaves a trace
                  how our passing leaves a trace
```

Figure 12 - Stanza 3 of Sammy Weaver's 'Streets in the Sky'

Presented with a poem formatted in this novel and severe manner, I opted to fix the vocal part of the piece in a similarly severe way to the metre of the music. In addition I made use

of a plug-in effect[11] (Fig. 13), which via a stage microphone took the vocalist's speech and subjected the sounds to various distortions and augmentations.

Figure 13 - Example still of 'Buffer Shuffler 2.0' plug in

The resulting output when speaking or singing into the microphone is a distinctly digitised sound, with evidently quantised timing. It is recognisably connected with its source, yet stretched and coarsely chopped into discrete chunks, which may be reordered (shuffled) and differ in their degree of effects processing.

It is also worth noting that since the text of *Streets in the Sky* needs to be delivered in part by a live vocalist and in part via the recordings contained in the electronics, it is itself a hybrid of human and digital components. In our discussions on the theme of this piece Sammy and myself drew a number of comparisons between the grid-like design of Park Hill Flats and its potential effect on the humans living in it, and the role of grids, regularity, straight lines and utilitarian design in the digital technology which is all-pervading of our lives at this time in history. As such the thematic content of the piece is partly a comment on the relationship between humans and technology, and their effects on one another.

Phrases, Stresses and Melodies

The experience of using speech in *Streets in the Sky* described above, as well as in other works composed during this period, led on to my exploration of similar techniques in three pieces which all featured pre-recorded human speech as part of their sound worlds: *Planetary Boundaries – Human Needs, Slushball Earth,* and *Kairos and Chronos*. The first two of these were both written as part of the *Changing Music in a Changing Climate* project organised by RNCM's centre for Practice & Research in Science & Music (PRiSM). This time

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[11] *Buffer Shuffler*, Version 2.0, as supplied with *Max for Live* in *Ableton Live! Suite*, version 9 upwards – see here for a more in-depth description: https://www.mi.edu/in-the-know/3-max-live-devices-using-ableton/. The plug-in was originally designed by Darwin Grosse.

each composer was able to collaborate with a climate research scientist from the University of Manchester, and the pairings would work together to generate a unique artistic output in some way responding to the topics connected with climate change and environmental concerns which we had discussed together over the course of a series of workshops.

In my approach to this brief I found much of Steve Reich's work inspirational. In particular a work such as his multimedia opera *The Cave*, which "…addresses a potent political subject: the Israeli-Palestine conflict" (Ebright, 2019). In *Writings on Music*, Reich describes how he and his wife Beryl Korot conceived of *The Cave* as: "… a new type of music theatre, with aspects of both opera and movies…" (Reich, 1993) Their in-depth use of documentary material is instructive here, since it gives an implication that their intention with the work goes beyond merely aesthetic considerations or entertainment, and aims to impart information in some capacity as well. *The Cave* can also clearly be viewed as a form of hybrid work in multiple dimensions, given that it is part opera, part musical theatre, part a collection of recorded interviews, part film, part instrumental performance for chamber ensemble. In this respect I would propose that it certainly qualifies as mixed media in Higgins' sense (1981), and as a New Discipline work in Walshe's sense (2016), although its status as *intermedia* may be more debatable (Higgins, 1981).

Reich and Korot's use of spoken word from documentary material to fill a didactic role within an artistic work struck me as potentially the most simple and indisputable means of creating an unambiguous link to the central topic of *Planetary Boundaries* and *Slushball Earth*, and situating it within the work itself. Even if a completely unacquainted listener was exposed to it; they would still be able potentially to glean what it is 'about' through the speech woven into the whole fabric, even if only to a limited degree, as long as they understood the English language. Additionally, Reich's approach to generating musical material by using short recordings of speech as the basis for cells of notes (a technique which can also be heard in *Different Trains* (1988)) is certainly something which inspired my own methods of writing the music for the pieces discussed in this section. In *The Cave* the speakers can actually be seen at the same time as being heard via the five screens displaying Korot's edited visuals, while simultaneously the musicians are heard doubling their speech melodies as they talk (Reich, 1993).

In an interview with Jonathan Cott printed in *Writings on Music,* Korot says of the five video screens: "the work, even though you are viewing multiples, remains fiercely frontal,

and is to be read as one" (1993). She also took inspiration from the ancient programming tool of the loom to find inspiration on how to work with multiples and "conceived of each channel as representing a thread" (1993). This sourcing of parallel techniques in other mediums as well as the notion of uniting multiple disparate threads into one unified whole is another manner in which *The Cave* is a highly instructive work for composers interested in hybrid compositional strategies.

Later the interviewer comments on how when seen together the visuals and music are like 'one thing', and Korot and Reich respond by stating that: "The speech melody of each person really is… a kind of musical portrait of that person." The hybridisation of spoken word with melodies performed on live instruments already goes some ways towards creating this portrait, but the piece also includes the additional layer of the multimonitor video installation displaying edited videos of the speaker. These combine to create a new whole, and the speech melodies become inseparable from the actual person speaking in the context of the work. The role of the singers also evolves as the work progresses, in that they move from singing the biblical text in Act 1 to singing what the interviewees said in Act 2, to finally doing both in the third act. As such the sung text becomes a blend of biblical text and material from recorded interviews, and present day reflections can be juxtaposed with "an ancient reality" (1993) so that the two may shed light on each other in the viewer/listener's mind.

In the first and last acts Reich also makes use of a "typing instrument" developed with the help of a consultant from MIT Media Lab (Ben Rubin) to rhythmically type out texts from the biblical sources, and thus use it as a percussive force in the instrumentation. The sounds of keyboard strokes are paired with the appearance of the visual text which is presented on the multiple monitors in languages including the original Hebrew, English, German, and French. *The Cave* thus brings together modern technologies and techniques in its hybrid approach, additionally going further by incorporating modern aesthetics alongside its handling of ancient themes and historical documentary material. This could be viewed as a parallel to the way in which the piece presents the audience with modern opinions and responses to the questions about ancient legendary figures which Korot and Reich posed their interview subjects ("Who for you is Abraham? Who for you is Sarah? Who for you is Hagar? Who for you is Ishmael? Who for you is Isaac?" (1993)). *The Cave* certainly

represents a notable attempt to create a synthesis of materials from all three of the biological, mechanical, and digital ages discussed in chapter 1.

Another reference point for *Planetary Boundaries-Human Needs* and *Slushball Earth* was the short film *Do You Think Science…* created by the multimedia artists Semiconductor (2006). In this work the artists interviewed a series of scientists working in the NASA Space Sciences Laboratory, UC Berkeley, California. Only the interviewees' answers are shared in the video, but the implication is that the only question they were all asked was: *"*Do you think science can understand everything?" The resulting edit is not precisely a documentary, although it resembles portions of mainstream scientific documentaries such as the BBC's Horizon. The string of sound bites form a stimulating artistic/philosophical prompt which gives the viewer an insight into how the scientists think about bigger existential questions, while inviting them to contemplate their own answers at the same time. As such the work makes extremely effective use of the spoken word, while also leaving plenty of space for audience conclusions to be formed, and I was interested in seeking these as goals in *Planetary Boundaries* and *Slushball Earth*. *Do You Think Science…* is another interesting example of a piece which occupies a liminal zone of artistic categorisation. It certainly has qualities of a formal documentary, yet its editing suggests a more poetic or philosophical result, which could place it as an intermedia work.

Portfolio #5 and #6: *Planetary Boundaries – Human Needs* and *Slushball Earth*

Planetary Boundaries – Human Needs and *Slushball Earth* are fixed media pieces which use recorded speech, recordings of Johanna Leung playing the Bb clarinet and the bass clarinet, myself playing the electric guitar, digital synthesiser sounds, drum programming, and other processed electronic sounds. They were both works written for the PRiSM project *Changing Music in a Changing Climate*, and my starting point was to isolate the speech which would serve as a foundation for the music. For *Planetary Boundaries…* I used a lecture delivered via Zoom by Professor Julia Steinberger titled *"What Wellbeing Can Teach Us About Sustainability"* (10th June 2020).

In addition to selecting specific spoken phrases and structuring motifs around them, I chose certain segments of the audio for repetition, collage, and multi-layering. The audio

concatenation program *AudioGuide,* created by Ben Hackbarth[12], proved an immensely fruitful creative tool in this regard. Hackbarth is another example of a composer operating today with a heavily hybrid skillset, given that he lectures on and writes music for both acoustic instruments and electronic sounds, has been a composer in research at IRCAM multiple times, has created a number of multimedia installations, and has also used his substantial coding knowledge to create tools such as *AudioGuide* itself.

By submitting a list of audio file selections to *AudioGuide* and setting various parameters to stylise the result in different ways, one can generate highly dense mosaics of sampled sounds. The section from 4'10" to 5'35" in *Planetary Boundaries…* is particularly dense with material generated in this manner, as well as many sections of the later *Slushball Earth*.

This process of generating sounds for the piece could additionally be viewed as a form of collaborative practice between myself and Hackbarth. *AudioGuide* is a creative engineering project, and its palette of options are governed by decisions made by its designer. Hackbarth's development work is responsible for how large chunks of *Planetary Boundaries* and *Slushball Earth* sounded in their final productions, and they would both have been very different pieces otherwise. This may serve as a clear and discrete example of how the tools available to composers in the digital age make possible and incentivise a certain form of distributed creativity, both via open source software practices and via the free flowing information culture of the internet. Standardising compositional tools becomes a vastly different (perhaps impossible) challenge in these circumstances, but the other side is that a multifarious range of compositional options are available, exponentially broader than in the previous ages.

The unpredictability of *AudioGuide* could furthermore be seen as a factor of indeterminacy during the composition process – although the results become curated and fixed in the final work, their creation was controlled by probabilities set within certain boundaries by the composer using the software and triggering the algorithm. This was a key theme of Dr Scott McLaughlin's *Garden of Forking Paths* project, under which both *Planetary Boundaries…* and *Slushball Earth* were additionally conceived and planned[13].

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[12] Plus Norbert Schnell, Philippe Esling, and Diemo Schwarz: http://www.benhackbarth.com/audioGuide/, accessed 29th April 2022.

[13] https://forkingpaths.leeds.ac.uk/, accessed 29th April 2022.

Slushball Earth acts almost as a sequel to *Planetary Boundaries,* and additionally has a score which can be performed live (for Bb clarinettist and electronic backing track). The version premiered as part of the *Garden of Forking Paths* concert in March 2021 was executed in one take by Johanna Leung.

The focus on clarinet multiphonics and indeterminacy in the *Garden of Forking Paths* project felt resonant with the theme of climate change, given the qualities of *instability* inherent in multiphonics. A plethora of variables control whether a given multiphonic will sound including humidity, temperature, condition of the reed, the build of the specific clarinet in use, and so on (Liang, 2018).

Figure 14 - Opening bars of 'Slushball Earth'

Figure 15 - Bars 25 - 42 of 'Slushball Earth'. The three line stave is used to indicate which clarinet register(s) the player should focus on in the resulting multiphonic (chalumeau, clarino to altissimo)

Slushball Earth's music was generated through my treatment of a number of spoken word recordings supplied to me by Dr Katherine Turner of the University of Liverpool, with whom I made contact through the *Changing Music…* project.[14] Her words were responses to five questions on the topic of climate change and her own research, which I put to her via email. After receiving her recordings I began experimenting in a similar fashion to how I began with *Planetary Boundaries*, by generating musical cells from short clips of Dr Turner's voice. The key conceit which gave this work its character was the use of the Gate effect. This effect can – using a Sidechain[15] – be configured either to mute the output of a channel based on some trigger; or to do the opposite. In the case of *Slushball Earth* I configured the Gate such that essentially *all* instrumental voices were controlled by the output of Dr Turner's voice, so the channels only sounded when she spoke. This bound the instrumental tracks heavily to the rhythm and phrasing of her speech, creating a distinctly 'jerky', halting sense of movement

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[14] It should again be noted here that our method was restricted by COVID-19 lockdown measures, so we found our own solutions in order to continue collaborating in spite of this.

[15] 'Sidechain' refers to the practice of controlling an effect on one sound/channel based on the output from another sound/channel. Probably best known examples of this technique appear in electronic dance music, in cases where the output of the kick drum is used (via a compressor) to control the levels of one or more of the other voices in the mix – thus 'ducking' the other sounds when the kick drum plays.

through almost the entire work. I see this as another example of *hybrid text*, given how the speech is present in an explicitly musical role and not solely as a means of communicating propositions, yet the music is also being forced to conform to the patterns of the English spoken word. It is also another example of the hybrid composer role, since knowledge of the Gate function is assuming a key role in the direction of the piece, while at the same time the score and knowledge of how the clarinet may behave in real time informs how the electronic elements will blend with the live elements in performance.

   The fixed media backing track for this piece was completed before the live score, and in my view it functions well as a piece in its own right. The stage version for live clarinettist and backing track can therefore be viewed as an alternate interpretation, particularly since it allows for many variations based on the decisions the player takes when working through the score, and based on the unpredictable element in how the clarinet itself will respond in reproducing certain multiphonics in different locations and circumstances (Fig. 16). The elements of player choice also makes this work relevant to the notion of *hybrid authorship* and distributed creativity, which are discussed in greater depth in chapter 4.

Figure 16 - Bars 161 - 179 of 'Slushball Earth', including different examples of player choice which bring another layer of indeterminacy into the live execution of the piece

Portfolio #7: *Kairos & Chronos*

Kairos and Chronos is a piece for violin, cello and electronic backing track, commissioned by the Nexus Duo and premiered online (in an abridged form consisting of sections I, II and V) in March 2021 as part of the RNCM PLAY Festival. The complete cycle of the work (all five sections) was released online in November 2021.

  As in the two pieces discussed above much of the melodic and rhythmic content of *Kairos and Chronos* was structured principally around recorded speech. This time the source was futurist thinker and co-founder of the technology company DivX Jordan Hall, giving an answer to a question in an online Q&A session with alternative media channel Rebel Wisdom during the early stages of the COVID-19 pandemic in April 2020.

Figure 17 - 'Kairos and Chronos' – opening bars

In constructing the principle melodies of this piece, I was also heavily influenced by certain pieces created by well-respected and highly innovative electronica duo Autechre – in particular some of their earlier tracks with moderate tempos, in which sequenced melodic figures play out over a long series of bars. For example *Inhake 2* from their *Peel Session* EP (Warp Records, 1999) contains a synthesised motif reminiscent in timbre of a theremin, which enters at approximately 01'00". The pitch content of this melodic sequence spans a large amount of time, and can even be difficult to orient oneself within while the piece is playing – to identify precisely where the phrase begins and ends. The theme from *Slip* which appears on their 1994 release *Amber* (Warp Records, 1994), also captures this quality in my mind – a certain sensibility of melody in which the notes 'meander' without an obvious harmonic trajectory, but since they are rigidly sequenced they continue to regularly return to the same intervals and gestures. This in turn lends a sense of inevitability when they are paired with the other sequenced elements of the music (drum programming, synthesised pads, etc). One is aware of the sequenced and digitally managed structure of the piece, yet it is almost as if it is playing out on a broad enough and stretched enough canvass of time that the repetition does not become predictable or feel mechanistic, and consistently throws out novel combinations of sounds, harmonies and patterns. Other Autechre tracks such as *Garbagemx* from *Garbage* (Warp Records, 1995), or *Cipater* from *Chiastic Slide* (Warp Records, 1997) also evoke a similar sense for me.

Figure 18 - Opening of section V of 'Kairos and Chronos'

I was interested in bringing this sensibility to my instrumental writing, and being able to experience it with live players. The five-bar melodic motif which begins at bar 409 and repeats at 414 is the best example of this approach, and my treatment of it through the final section (V) was informed by the considerations above. In particular, from mark DD (bars 426 onwards (Figs. 19 and 20)) the violin and cello play the same motif but offset from one another, which was a method of evoking the feeling of setting two synthesised sequences in motion, but out of synchronisation so that rhythmic and harmonic interplay between them can emerge. I would cite this as another case in which electronic compositional techniques/sensibilities informed the approaches I took to composing notated music for acoustic instruments, and therefore an aspect of the hybrid composer role.

Figure 19 - Section V of 'Kairos and Chronos', showing the section from DD where the violin and cello become offset from one another

Figure 20 - Bar 433-441 of 'Kairos and Chronos', showing the violin and cello coming together again at EE

Figure 21 - Beginning of section II of 'Kairos and Chronos'

In the second section of the piece, *Kairos Time,* my compositional approach in Ableton Live shifted towards sound collage. One of the main sources of sonic material available was taken from recordings of a workshop with the Nexus Duo prior to the commencement of the pandemic lockdowns.

These audio files later became the basis for a series of studio edits – beginning first with the creation of sample banks for use with a Novation Launchpad[16]. Andrew and Chloe's various gestures, musical outbursts and attacks – in both clean and processed forms – were sliced into chunks via Ableton's algorithms (the function *Slice to New MIDI track*), and I began 'improvising with their improvisations', recording the results in MIDI form so they could be reproduced automatically via the MIDI instructions. I began combining these with other sampled sources – most pertinently, those which were accessible within the confines of my flat (desk drawers opening and closing, the glass breakfast table, old bongos and miscellaneous percussion, improvisations with my acoustic guitar). These latter additions

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[16] The Novation Launchpad is a physical controller with a grid of pads which can be used for triggering sounds. Creating a sample bank is a way of mapping the surface to a list of audio files so they can be played at will.

were influenced by Matthew Herbert's work, in particular his electronic album *Around the House* (Accidental Records Ltd, 1998-2012), which as its title suggests was created entirely from recordings harvested from items found in his home.

Figure 22 - Example of indeterminate pitch scoring in 'Kairos and Chronos'

When it came time to create a score for the piece for Andrew and Chloe, I wished to capture the rhythmic, heavily-edited feeling of this section in their playing. To almost have them approach their playing as if they were percussionists I included a section where the score is reduced to two lines, and I transcribed rhythms which I heard in the Ableton sound collage over to the score for them to interpret (Fig. 22). They were free to choose their own sounds and pitches to fit the rhythms indicated – the only restriction in this respect was an implication that some pitches would be higher or lower than the ones that preceded them. The rest of this second section also consists of a direct transcription of the sounds which I could pick out from the sound collage that could sensibly be mapped back to the violin and cello, but represented on the 5-line stave (Fig. 23).

Figure 23 - Transition back to determinate pitch notation in 'Kairos and Chronos'

Aside from the observations above I would note that *Kairos and Chronos* is a good example of my including the text as a key part of the composition process, given how many of the melodic phrases were derived directly from sentences spoken by Jordan Hall in the recordings, and how present the recordings of his voice are in the final result. In this respect the hybridity of the work follows similar principles to those discussed earlier in relation to *The Cave* (1993) and *Do You Think Science…?* (2006), especially since in much larger sections of *Kairos* I allowed Hall's monologue to play in full without editing, recalling the documentary qualities of the works by Reich and by Semiconductor.

Portfolio #8: *Blodeuwedd* (Key Work)

Blodeuwedd was conceived for the Machine Learning For Music work group *Unsupervised*. It is a hybrid chorale in Welsh and English, for four sopranos and electronics, with the text again provided by Sammy Weaver. It is based on the Welsh myth of the character Blodeuwedd, from the Fourth Branch of *The Mabinogion,* which is Wales' primary mythic corpus. The piece currently only exists in a fixed media form with no recorded live performance. The visuals for the work (discussed further in chapter 5) were entirely generated by Advadnoun's *Big Sleep* algorithm, while the music heavily featured PRiSM's

sampleRNN algorithm – which uses machine learning for sound creation[17] – placed alongside the four-part female voice choir.

  This piece was the culmination of many aspects of my research, and the approach to language no less than any other. However, during the planning and early preparation work for it, I was studying in greater depth Arvo Pärt's approach to setting a text via Paul Hillier's biography and analyses of Pärt's music. The key feature which stood out to me was Pärt's strict and essentially unwavering procedures for subordinating the music to the text, obeying stress patterns without fail and often accounting even for different forms of punctuation (Hillier, 1997). Pärt's *tintinnabuli* technique itself follows precisely defined rules, but these in turn become augmented with great specificity when they are mapped onto the patterns of religious text: "Pärt's approach… works outwards from the structure of the text as a whole (historically, spiritually, and liturgically)" (p. X). Hillier notes in his book on Pärt the resonance of this approach to the views held in the Orthodox Christian tradition towards the text of scripture. The ancient notion was that the very words partake in the divine essence of God; who is in some sense present within them; and hence they demand to be treated appropriately as Holy manifestations:

> To the religious initiate, the words of a ritual are not symbols of a greater reality, but actually possess and are possessed by the thing they name. (p. 79)

  Keeping this perspective (and – crucially – *believing* it) will undoubtedly push one towards a reverence for the words themselves which precludes a casual attitude. We may expect it to cultivate a sharp sensitivity to any treatment which possesses even a hint of the parochial, the trivial, the profane, or the narrowly subjective:

> … it is not the precise manner of working which I would draw attention to here… but the sense of conforming to a tradition, of working with given elements, the content and disposition of which lie beyond the particular whim and character of the artist-composer. (p. 5)

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[17] "*… the code prism-samplernn, [is] a computer-assisted compositional tool released on GitHub in June 2020… and PRiSM's first major contribution to the field of Machine Learning. It generates new audio outputs by 'learning' the characteristics of an existing corpus of sound or music. Changing parameters of the algorithm and how the dataset is organised significantly changes the output, making these choices part of the creative process.*" Quoted from: https://www.rncm.ac.uk/research/research-centres-rncm/prism/prism-collaborations/prism-samplernn/, last accessed 13th December 2022.

Influenced by these sentiments I aimed to take on the task with *Blodeuwedd* of subordinating my musical choices more securely to the text of Sammy Weaver's poem than I had previously attempted in my other works. This was a natural progression from the works discussed above in which I was already experimenting with the creation of musical material by paying attention to stress patterns in spoken word.

Sammy Weaver's poem is itself written in a hybrid of Welsh and English – beginning with the latter, and gradually shifting towards the former, and ultimately blending the two – which makes it a different form of hybrid text than I have discussed so far. I was interested in discovering how the different rhythms and cadences of each language would impact the resulting music. Hillier also notes how Pärt himself slightly shifted his technique when dealing with Latin, English and German texts – particularly in the case of English, which features a much greater proportion of single-syllable, particulate words.[18]

Pärt's 'tintinnabuli' composition technique involves a melodic voice (the 'M-voice' in Hillier's analysis), which moves mostly by step towards or away from a central pitch; and which then forms the basis for constructing the *tintinnabuli* voice ('T-voice') which sounds the notes of the tonic triad around the former (pp. 92-97).

In my case I opted to make use of a tintinnabuli approach to the melody and harmony of *Blodeuwedd*, but within this to assign slightly distinct rhythmic treatments to the primarily Welsh lines and the primarily English lines of the text. Sopranos 2 and 3 occupy the 'M-voices' in the above schema, while voices 1 and 4 represent the 'T-voices'. I did not fix the latter on one of the particular forms of T-voice identified by Hillier[19], but rather made use of each of those approaches in different situations while constructing each passage.

Observing the predominantly English portions of the score, it can be seen that the stressed syllables are represented in the main by half notes while non-stressed syllables are assigned quarter notes. However, Welsh syllables make an appearance as early as in the first bar (in the proper noun 'Blodeuwedd'), and these I assigned a dotted quarter note. In general

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[18] *"Pärt now opted [in his setting of the English text of The Beatitudes] for a more sustained manner of recitation in which only stressed syllables are offset from the pitch centre (a step alternately in either direction) and using a pattern of chromatic shifts quite rare in tintinnabuli music"* (p. 182).

[19] The T-voice may take the next note above or below the M-voice in the tonic triad (first position), or the next-but-one (second position). Finally the T-voice can either remain fixed above the M-voice ('superior'), fixed below ('inferior'), or alternate between the two positions ('alternating').

Welsh is assigned dotted rhythms, while English is not. This pattern is confirmed soon afterwards in bar 9 at the first mention of 'Gwydion', but only becomes a regular feature of the rhythm when Welsh becomes more predominant in the second section of the work. It may also be noted that the time signature shifts to 4/4 when the lines of the poem take on a greater portion of Welsh words – as such the first section of the piece is entirely in 7/4, but the second section shifts between the two metres. When Sammy had explicitly placed a comma in the text, I interpreted this as a whole tacit bar (for the singers), honouring the time signature at that point in the score.

Figure 24 - Harmony shifts to chromaticism (from V)

In certain instances I deviated from these general rules, for example in climactic or emphatic passages. The first two notes of the piece corresponding to 'We are…' are given half notes and dotted half notes, as are the notes of 'we sigh' in bar 43, while the final: '*ar ffin gwybodaeth*' consists entirely of whole notes and dotted half notes. The tonality also experiences deviations in a similar fashion – for example, certain lines in the second section are entirely chromatic in their harmony, such as the line '*Say it say it dwi'n dodd yn wreiddiol*' (see figure 24). This line expresses a confusion between English and Welsh, in the urgent repetition of 'say it' and the broken Welsh translating to 'I come originally…'. This latter phrase is left hanging, indicating a certain disruption of pattern, and so all of these

features seemed appropriate to represent with a shift to a less secure (even absent) tonal centre.

   This is contrasted with the return to the established harmony in the next lines: *'wraidd is in wreiddiol rhedol, along yr afon gyda'r nos '*, which though also uttered in broken Welsh speaks of 'root is in originally running along the river at night'. The references to 'roots' and 'origins' here coupled with the romantic – even picturesque – image of a river at night located these lines more in a secure, 'homely' feeling which lent itself better to a return to recognisable harmony.

Figure 25 - Voices staggered in two parts (from A)

Figure 26 - Voices staggered in four parts (from bar 87)

Sammy had also adopted an interpretation of the character of Blodeuwedd which construed her as a multiplicity, or legion – referring to herself always in the plural, and to reflect this in the music I decided to sometimes stagger or offset the four voices from each other to emphasise a sense of multiple wills expressing the same thoughts, but not in perfect synchronisation with one another (see figures 25 and 26). This was also influenced by Louis Andriessen's treatment of soprano voices singing in ancient Greek in *De Staat* (1972-1976).

With regards to how AI was used in the context of *Blodeuwedd*, the tacit portions of the piece were intended to be left open so that I could craft electronic motifs to fill them, making use of sounds generated by sampleRNN. This was partly a means of following Pärt's technique of filling such bars – tacit for the singers – with a short instrumental figure, punctuating lines in agreement with the literal punctation of the text.

My choice of sounds to use in the corpus which we fed to sampleRNN was heavily influenced by the original story of *Blodeuwedd*, which comes from *The Mabinogion*. Occurring towards the end of the Fourth Branch; it tells the story of a woman, Blodeuedd, conjured from flowers in order to become the wife of Lleu Llaw Gyffes ("Bright Skillful Hand" (Davies, 2008, p. 243)) – a lord, and hero of the myth. A love triangle emerges when

Blodeuedd begins an affair with Gronw Pebr, lord of neighbouring Penllyn. The two plot to murder Lleu, though their plan instead transforms him into an eagle and he escapes.

Lleu's uncle, the magician Gwydion, manages to track down Lleu (still in eagle form) by following a sow which eats the maggots that fall from his rotting bird body. After turning him back to a human by singing a magical *englynion* ("poem"), the two enact revenge on Gronw Pebr and Blodeuedd – the former being pierced with a spear thrown by Lleu, and the latter being turned into an owl by Gwydion, effecting the shift of her name to *Blodeuwedd* ('flower face') (p. 244).

Given that Sammy Weaver's poem is narrated from Blodeuwedd's perspective, I determined to use owl sounds as one of the key elements of the corpus, with another large part being taken up with female voices – mainly singing, but also including some speech. My hope was that sampleRNN would generate interesting hybrid sounds, with gradients and transformations from owl to human female and potentially back again. In order to generate as much material as possible – and ideally as many variations – I also added some other sound types to the corpus. These included my own voice reading passages from the *Mabinogion*, my own voice speaking Welsh words, and environmental sounds from natural settings (especially woodlands and streams). These I felt could capture other aspects of the original mythic story – particularly since the character of Lleu is turned into an eagle, so it also contains a male human to avian transformation. This could also have been captured by including my own voice among the bird sounds. The character Gwydion also sings a magical poem to restore Lleu's human form, so the presence of a male voice reciting poetry would be able to represent this, particularly if it emerged from the machine learning process in an uncanny form. Finally, the natural environmental and running water sounds could help to evoke the setting of the Welsh wilderness in which the story takes place. Alan Garner's modern reinterpretation of the Blodeuwedd myth *The Owl Service* (1967) captures this idyllic, yet mystical and vaguely sinister quality of the remote country setting superbly (both in the novel and its television adaptation), and in a manner I was keen to emulate in the final piece.

Many of the sounds which I submitted for processing in sampleRNN were taken from the collaborative database *freesound.org*, and also from the wildlife sound archive *xeno-canto.org*. Both of these sources offered a wide range of public domain recordings of different species of owls and other birds, making many different types of sounds (hoots,

screeches, tweets, etc). A number of these recordings also included substantial sections of ambient environmental sounds such as running water or trees being blown by the wind.

The results returned by the algorithm offered a range of interesting and useful juxtapositions and transformations of the sources. In some cases the environmental sounds had been merged with the choral sounds, to create a sustained background texture which was recognisable as a natural environment such as a forest or stream, but with a layer of sustained female singing embedded within it. In other cases my original hope of acquiring audio in which bird sounds smoothly transitioned into the sound of the female voice (or the reverse) were realised. But this was also contrasted with cases in which the one sound sharply and immediately switched to the other, so suddenly it was almost with a sense of violence.

Another interesting form of hybrid text arose from the sampleRNN results in the form of spoken words which clearly had the timbre of my voice, and seemingly the sonority of Welsh, yet none of the words were recognisable as specific Welsh words. Many of these sounds were included in the final work – especially in the introduction and the ending – since they were able to represent the magical utterances of the magician Gwydion (or 'technician', as he is described in Sammy's poem).

It should be noted that I allowed myself to edit, process or amend the AI-generated sounds as I pleased during the composition of *Blodeuwedd*, and that I did not attempt to represent them only in their 'pure' form, as originally realised by sampleRNN. In this sense the piece was a product of hybrid authorship between myself and the algorithm, as well as being an example of my hybrid practice between the composition of the vocal writing and the studio composition of the whole work. In assembling the final piece in Ableton, I took a great deal of inspiration from experimental music producer Daniel Lopatin (also known as Oneohtrix Point Never), whose practice has included a vast array of genre tropes and techniques from across the spectrum of electronic music. An album such as *R Plus Seven* (2013) includes a surprising mixture of sounds juxtaposed together – including MIDI production, vocal samples, time stretching and pitch shifting, water sounds, samples of children singing or shouting, and more. I find the fluid way in which Lopatin shifts between these sources highly compelling and distinctive, and would say this results in an approach to form which is very unpredictable from track to track. Ideas and motifs sometimes return, but seldom in a manner which is not heavily altered. All this informed my treatment of the samples I had

available in creating *Blodeuwedd*, and while I aimed to keep the recordings of the singers as unchanged as possible, I allowed a much greater degree of freedom in assembling the electronic interludes.

Hybrid Text: Summary

In this chapter I discussed how the grid-based text for *Streets in the Sky* acted as an inspiration for splitting its vocal part between a live vocalist and a pre-recorded one (so that the words heard by the audience were spoken by a hybrid of digital and human voices). This then informed my work on *Planetary Boundaries-Human Needs* and *Slushball Earth*, in which I sought to create a form of musical/digital portrait of the speaker in each case. In this I was taking inspiration from Steve Reich and Beryl Korot's handling of interview recordings to generate musical and visual material in their operatic work The Cave, which is itself a hybrid work in many dimensions and which juxtaposes a number of old/ancient themes and techniques with contemporary ones.

Kairos and Chronos then also presented a musical portrait of a different speaker, whose voice acted as the basis for the motifs that appear in the final work. I finally moved on to discuss *Blodeuwedd*, whose hybrid text of Welsh and English and its ancient mythological source could act as a centre from which all other aspects of the piece would be effectively derived. It also brings together approaches to setting music for singers that are inspired by older methods of composition, with digital technology of the present (machine learning) and studio composition techniques, in order to tell a new version of an ancient story. On this basis I would cite *Blodeuwedd* as one of the most successful instances of hybrid practice covered in this portfolio, and potentially as a model upon which future practices could be based.

Blodeuwedd is also one of the pieces which has only received a single 'performance', and that was an online premiere of the final video. In this respect I am currently uncertain how or whether it will be revisited in future. It could potentially be performed as a chorale by four singers minus any of the electronic elements (an 'unplugged' version), or as a piece arranged for solo electronics and projected visuals, or as a blend of the two. But I mention this to note that it is currently a piece with a heavy technological focus for which it is currently an open question how it might manifest again in the future, or whether its

longevity as a work which reaches an audience is determined by its inclusion as part of this portfolio. It could be the case that many pieces composed during the COVID-19 pandemic – especially those which rely on specific technologies in order to be executed – currently exist in a similar state as *Blodeuwedd*.

Chapter 4: Hybrid Authorship and Hybrid Agent

During the COVID-19 lockdowns working at-a-distance became the norm, heavily facilitated by the internet and its associated technologies. Because of this various projects began to take on a distributed character even if this was not the original vision. In this chapter I shall recount experiences with pieces written and premiered during that period (along with some earlier foreshadowing works), in order to give a sense of how notions of distributed creativity came to play a role in my compositional and collaborative work, and of how digital technology facilitated and interacted with the creative process. Such distributed activity can be construed as a form of hybrid authorship, and it is in this sense that I link it to my discussion of a hybrid compositional practice.

 The work which I undertook with the Nexus Duo on *Kairos and Chronos* discussed in chapter 3 also prefigured this topic. We adopted a back-and-forth style of collaboration during that project, beginning with Andrew and Chloe improvising while recorded, then myself 'improvising with their improvisations' via sampling and a Novation Launchpad, then with the creation of a score which featured further prompts for Andrew and Chloe to improvise further, and then finally with all of the available material being edited in place by me. Many of the contributions and creative decisions in that project came not directly from myself, but from Andrew and Chloe, and through cycles of us responding to each other's recordings and prompts, and this is a similar pattern as shall be discussed below.

UnHeard Hybrid Orchestra

This ensemble was conceived as a means of fully integrating laptop performers into the performance context of a large chamber ensemble, with the sound sources for the

electronic forces being drawn entirely from the sounds of the acoustic instruments in the group.
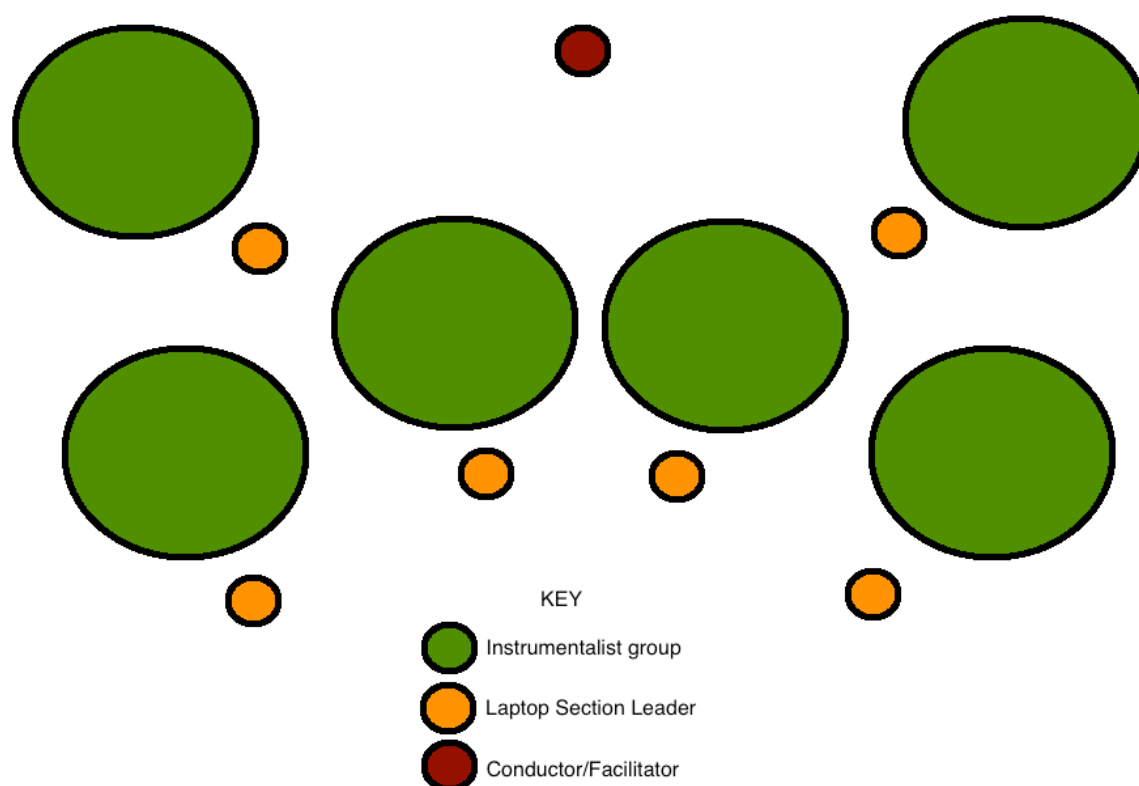

KEY

Instrumentalist group

Laptop Section Leader

Conductor/Facilitator

Figure 27 - Diagrammatical concept for UnHeard Hybrid Orchestra

The figure above shows the original concept behind the group. Each section is assigned a laptop/electronics performer who acts as 'leader' of that section. Each instrumental group is picked up by its own microphones, which are routed into the electronic musician's audio interface, and thus the electronic material is generated by processing the sounds created by the instrumentalists in the moment of performance.

Portfolio #9a and #3b – *UnThing* and *Zygote*, Lab Week 2020

In February 2020's Lab Week project with the UnHeard Hybrid Orchestra (UHO) an early experimental version of *UnThing* was performed (Fig. 28). In rehearsing this piece, the players were handed parts which functioned more as musical prompts. The arpeggiated figures which reoccur through the work were shown on the page, and to be treated as separate voices or modules, rather than instrument-specific parts. We then experimented,

playing through the lines in a variety of permutations and arrangements – for example with pairs of players executing a single module, before being followed by the next pair in a clockwise rotation. In another case the players were instructed to play only single notes from their module, one player at a time, 'passing' their note to the next player in the clockwise sequence. This would rotate around the entire group, and on each rotation the players would play the next notes in their module until the entire phrase had been played.

Figure 28 - Sketched version of 'UnThing', used to arrange the piece for RNCM Lab Week, February 2020

'Circulating' in this manner is a technique which was presented to me through Guitar Craft, and has been a foundational part of my musical vocabulary ever since. In its original

form a group of guitarists would be arranged either in a circle or a semi-circle. One player would play a single note of their choice, simultaneously giving an indication of whom in the circle should 'receive' it.[20] In its most basic form this would be the player adjacent on either side, and they in turn would proceed to pass a note to the next player, and so on around the entire circle. To this core structure a multifarious range of operations, qualifications and permutations can be applied. These range from fixing the key signature, fixing rhythms or time signature or introducing multiple active notes, to introducing rules for changing direction/skipping seats, combining multiple concentric circles of players, or circulating fixed melodies or sequences of notes.

Circulations offer a particularly hospitable environment in which amateur musicians can participate. Since non-professionals comprise a large portion of the players involved in Guitar Craft and Guitar Circles in general, this makes circulating a highly useful and inclusive method of music making in groups. Moreover since circulations typically provide players with a large degree of freedom in choosing their note and how it is articulated, the technique can act as a highly effective means of facilitating group creativity and structured improvisation.

Concerts in or associated with Guitar Craft almost always feature circulations of some description, often as the opening piece of the set. Part of the reason for this is that they act as a strong form of both musical and direct communication, which can 'bond' the group together in advance of tackling the rest of the concert. For this reason circulations are often also slotted into key moments in the setlist at which the players may need to ground their attention, and perhaps establish a certain mood for themselves and for the audience ahead of the next piece. Moreover they can act as a means of 'taking the temperature' of the group – establishing the alertness of every player, and opening up their awareness in a reciprocal fashion to the players on their left and right sides, and to the wider group.

Taking the above into account, I was interested in applying a version of the circulating method to the work of the UnHeard Hybrid Orchestra since it could act as a means of testing the spontaneity, responsiveness and communicative abilities of the blended digital and acoustic forces. It struck me also as a useful way of 'levelling the playing field' between

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[20] Many good examples of circulations have been provided via the Guitar Craft & Guitar Circle YouTube channel: https://youtu.be/eH-IiAtoGP8.

the players from the different groupings, since their toolkits diverge so wildly in both in their sonic potential and in the manner in which the players produce the actual sounds. Circulating offered clear moments for the electronic performers to offer their contributions – especially since the design of the Hybrid Orchestra was such that the electronics were to draw all of their buffered sonic materials from the sounds created by the instrumentalists in their particular section.

The simplistic arrangement of this version of *UnThing* was deployed (in part) as a device to cast the contrasting forces and contours of the ensemble in the most well-defined light possible; setting up (for both the audience and the players) how the group may develop the basic musical elements over the course of the concert.

On stage I chiefly made use of the Granulator II effect from Max for Live in Ableton.[21] One of the other laptop performers made use of *sugarSynth* (Fig. 29) by Nobuyasu Sakonda (2011). This is a Max patch also focussed around granulation, which provided a simple and efficient means for the laptop user to draw material from the relevant microphone immediately.
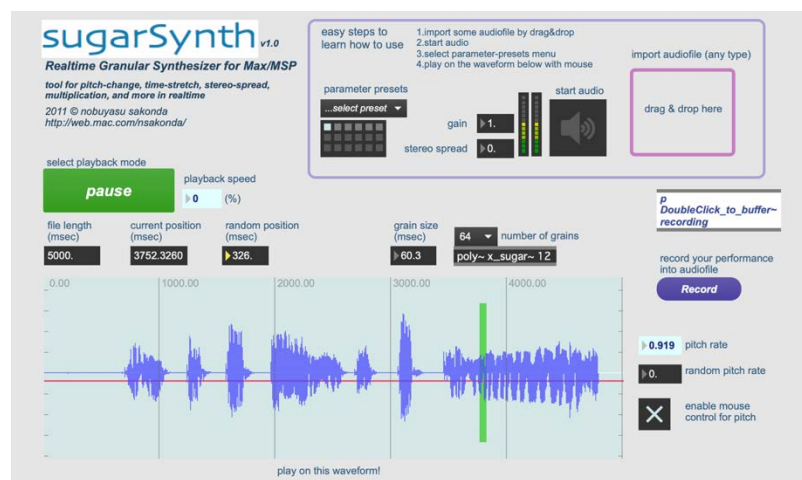

Figure 29 - sugarSynth, by Nobuyasu Sakonda

Given the open nature of the sketch which was brought into the rehearsal room, the fact that we worked on the piece together to arrive at the final arrangement, the manner in

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[21] This is an audio effect which provides an easy interface for controlling granular synthesis of a sound file. Granulation involves splicing the audio down into tiny fragments or 'grains' in the range 1-100ms of duration, and then triggering them with the option of altering various parameters, such as the randomness of the ordering in time, the speed of playback, the amplitude, the size of the grains, the frequency, panning, and so forth. Granular synthesis may fairly be considered one of the core tools in the electronic musician's arsenal – Curtis Roads, for instance, emphasises in *Microsound* that a thorough understanding of it is "fundamental to understanding the other techniques presented [in this book]" (2001).

which the electronics performers were given a high degree of freedom to process the sounds they received as they saw fit, and the fact that the circulating approach gave the players scope to vary many aspects of their playing such as the tempo and dynamics, I would say that this version of *UnThing* demonstrated a direct form of hybrid authorship and group creativity.

The chorale-like nature of the score for *Zygote* also made it an easy choice as a piece to arrange in the first UnHeard Hybrid Orchestra concert for Lab Week. To arrange the piece I simply asked the performers to each pick one of the parts from the score, and follow it to the end. Our conductor Omer Shteinhart kept time by marking every 12 seconds, as the first violins had done in the original performance. The forces consisted of Bb clarinet, Bb trumpet, two percussionists playing vibraphone and crotales, three grand pianos, celeste, violin and four electronic performers (three using laptops, and one using guitar effects pedals).

One especially notable aspect of this performance was the way in which the sections where the players breathed into the microphones or gently tapped, knocked and rubbed their instruments took on a new significance. In this version of the piece the sounds made by the players in those moments could be captured by the live electronics performers and buffered to be used as material elsewhere in the arrangement. This allowed those sounds to not only be isolated to the two original sections where they occur in the original score, but to continue almost as thematic or motivic threads. In the recording, for example, the sound of heavily processed breathing can be heard towards the end of the piece where it is also one of the last sounds heard. The sounds of the players' footsteps when moving to and from the microphones also features. As a result this gave the electronic performers a slightly broader palette of sounds to work with in contrast to the sounds of the instruments on stage, and they were thus able to make sonic contributions that were easy to distinguish from the sounds of the rest of the ensemble.

Portfolio #9b: *UnThing* – UnHeard Hybrid Online Version

UnHeard Hybrid Online was conceived to take the above ethos of the Lab Week UHO project into an entirely online format – another adaptation in order to work around the shifting COVID-19 restrictions between November 2020 and March 2021. This time all

participants in the project would collaborate remotely – with composers prompting ideas via sketches of scores, players recording their reactions and interpretations of these prompts and uploading them to a shared Dropbox, electronic artists then taking these recordings and processing them/remixing them/sampling them into new sounds which would be uploaded again, and finally with the composers taking these recorded results and arranging them into the final works (unless they saw fit to trigger additional rounds of sketching, recording and processing to generate further materials) (Fig. 30).

Figure 30 - Creative sequence of responsibilities in UnHeard Hybrid Online project. At each stage the responsible party uploads the results of their work to a shared folder, where the other participants can access it

This brief was intended to allow room at each stage for the relevant parties to add their own creative input or interpretation to the material at hand. So at the first 'Performers' stage, the players might be given free reign by the composers to extemporise on material provided, or to improvise in response to specific prompts. In all situations the performer would inevitably add some interpretation of their own to the material – to greater or lesser degrees, depending on the composer's instructions, and upon the player's own playing style and musical background. As such this stage adds one layer of distributed authorship.

The electronic musicians were given the most scope for adding novel creative flourishes; since they could take the recorded sounds and implement whichever processing tools from their arsenal they wished. The degree to which they worked within set parameters was a negotiation between themselves and the composers. In my case I gave broad suggestions of the types of material which to my mind would work best to complement the instrumental and pre-composed sounds which were already in play. Here is one example of instructions and broad parameters sent to the electronic musicians:

- *1-2 minutes of textural, melodic material*

- *1-2 minutes of textural, more harsh material (leaning towards noise)*

- *5-10 linear/gestural phrases*

Here is a second:

> For UnThing, *I'm thinking it would be best if the processed sounds keep each instrument separate. (mostly)*

> *For* Rain Spectacle, *it would be good if there were more blended/mixed sounds that combine instruments together. (mostly)*

The motivation for providing this level of freedom was my assumption that the electronic musicians would know their own idiosyncratic tools and configurations far better than I ever could, especially since we were working entirely remotely and I had never visited them and spent time observing them working with their setup and familiarising myself with their sonic possibilities in each case. As discussed in chapter 1 the computer is not a bounded object, and as such it would be difficult to know the full extent of someone else's digital set up even if one could be there working with that person indefinitely. As such perhaps when the electronic musicians encountered the recordings from the instrumentalists; they would each be reminded of specific effects, plug-ins, techniques, software packages or pieces of hardware of their own which would be most sonically effective for treating each new sound. Trusting this judgement seemed the most efficient and effective way of arriving at the strongest results, and is one of the strengths of allowing the creativity behind these compositions to be distributed, to varying degrees.

Here is a third example of instructions for the electronic musicians:

> *I think with the electronics, if you're doing textures would be good to focus them specifically in different frequency ranges? So one file of high/static-like texture, one mid-range hums, one low rumbles if that makes sense, and have them as distinct layers?*
>
> *Some more melodic-type electronic stuff would be cool too, something that maybe follows the contours of one of the recorded instruments but with variations? Happy for this to deviate from the main tonality, but would be good if it happened in a controlled way if so, so not too discordant*
>
> *Just some ideas to work with, don't feel too tied down by them*

Some instrumental players enthusiastically recorded the parts supplied, and went further in recording short phrases, improvisations or variations on the material – this could be heard in the recordings for *UnThing* supplied by the guitarist Mark Reid. Others took a lot of individual initiative when it came to curating their own video recordings of themselves. But more obliquely most of the players supplied additional creative materials without realising

it, in the form of the 'offcuts' of their uploaded audio files – incidental sonic events which they generally did not view as salient parts of their submissions. This will be discussed in more depth in the segment on *Correspondences* below.

  Rose Bartels provided the visual artwork and this side of *UnThing* is discussed in more depth in chapter 5. It is, however, worth re-emphasising the manner in which Rose's contributions reflexively influenced the direction of the music itself, since her images inspired a number of new musical directions and motifs which could be paired up with the visuals in mutually reinforcing ways, and which were not originally part of the musical direction.

Correspondences

The below examples of contributions from the broader *UnHeard Hybrid Online* team also give an insight into the notion of *correspondences* with the digital audio and visual materials, taking after Tim Ingold's use of this term (2013, p. 107), and the creative leverage this concept can provide.

Example of feedback from electronic artists (musician #1):

> *… yes, the parameters are certainly helpful. I wanted to check, for the "melodic" elements, how far can I veer way from the original material's tonality? I just worry that it might clash with compositions' key (unless that's a good thing?!). And yes, I'll concentrate more on gestural segments rather that textures as you mention.*

Further example from musician #1:

> *The rearranged guitar was made with a granulator instrument - I loaded the first two bars of Billy's guitar, and then improvised by altering the playhead start position, and also speed and density of repetitions, as well as some reversing and filtering.*

> *I can certainly do similar takes on the other sound files, I find that the granulator works best with material that have dynamic and tonal variations - less so for textural, say violin and voice, but I have some other toys to use on these, was thinking of making some background drones that can provide a low-end weight base for the*

> *compositions… of course, feel free to send me feedback on these, happy to make any*
> *changes the composers want.*

Further example of feedback from electronic artists (musician #2):

> *For the electronic parts, I chopped up some of the sounds in Ableton Live, then*
> *triggered them and added/altered effects with a push controller.*

Ingold discusses correspondence particularly in relation to the actions of a builder or artisan; interacting with raw and uncut stone, wood or other materials. The artisan, Ingold argues, does not impose a vision entirely of their own imagining upon the raw material; but instead seeks to *follow the cut* (p. 11, pp. 24-25). Each lump or mass has a peculiar internal structure of its own, which may or may not be visible externally to the naked eye, but in working with the material the artisan's tactile senses and instincts guide them to follow the grains, planes and lines which already exist within. These are leveraged to tease out the shapes which in some sense are dormant and waiting within to be revealed in the final form of the work (p. 110, p. 128).

Analogising this process to raw *sonic* materials, I would claim that the goal in *UnThing* was to tease out similar pre-existing shapes, patterns and forms from within the mass of unedited recordings uploaded to the Dropbox by all of the participating players. This included giving attention to quieter moments captured before, after and between each take; mistakes, unused takes, background sound, as well as paying attention to the varied recording quality, ambience and production values which characterised each player's submission. Moreover there may have been additional qualities in each recording which would not be audible in the original files, but which would only be revealed when the sounds were exposed to processes of various kinds – filtering the sounds could bring out artefacts which could only be noticed if the low, mid or high frequencies were removed, or perhaps certain rhythmic qualities would only be accessible if the sounds were put through time-stretching processes to shift them to much quicker or slower time scales. This can especially be heard in the variations on the acoustic guitar figure which appear at numerous points throughout the piece – for example in a stuttering and stretched form from 04:05, in a cropped form from 02:18 (also featuring a short vocal interjection from the guitarist

himself), and in a sped up form from 02:55 (which causes it to resemble a different, higher pitched plucked string instrument such as the banjo or ukulele).

The sculptor/artisan analogy can also be extended to the treatment of the whole arrangement of a work in the studio. Brian Eno discussed this in relation to reggae, in a 1979 lecture which formed the basis of his essay on *The Studio as Compositional Tool*:

> This takes us to reggae... Earlier I said the contemporary studio composer is like a painter who puts things on, puts things together, tries things out, and erases them. The condition of the reggae composer is like that of the sculptor, I think. Five or six musicians play; they're well isolated from one another. Then the thing they played, which you can regard as a kind of cube of music, is hacked away at - things are taken out, for long periods. (1983)

This removal of layers – sometimes for long periods – was certainly an aspect of the compositional process behind *UnThing.*

This also ties into another broader interpretation of the concept of correspondences in connection with the work of the UnHeard Hybrid Orchestra. This is the notion that the composers were not only limited to *following the cut* of the recorded sounds available, but rather were teasing out the pre-existing potential of the ensemble itself, the individuals within it, and the ways in which their interactions and connections could form the basis of creativity and musicality. This in turn ties back into the notion of hybrid authorship – with the relationships between the individuals in the group forming the raw material for the creative act itself. The composer would then constitute the *hybrid agent*, who is not only writing notated instructions on the score and using sounds as their materials, but who is also acting as a curator and facilitator of the interactions and contributions made by the other members of the ensemble. Through all my work with UnHeard and the Hybrid Orchestra during this research project, I have noticed and felt this combined role become a more present part of my practice, and it again has parallels with The New Discipline described by Jennifer Walshe (discussed in chapter 1).

Revising the Compositional Process

A decisive shock was delivered to my creative process via the international pandemic in 2020 which caused me to readjust my priorities in relation to audio production, live performance and scoring, and the hierarchy in which I perceived these three practices. Prior to this time the key artefact to which I was aspiring in each project was its live premiere – less importance was attached to the creation of a studio track, which was more of a by-product of the whole process. But with the opportunity of bringing a new work to the stage pushed indefinitely into the future, I was gravitationally drawn back to the practice of acting as a music producer – a studio artist, whose attention was centred primarily on a fixed media artefact. This happened somewhat imperceptibly, while I was working on *Kairos and Chronos*, since I had temporarily let go of the idea that this piece would have a live component, and as such gave myself free reign to continually elaborate on the original Ableton project, without a concern for the practicalities of translating these expressions to the stage.

   This effectively added a substantial phase to my compositional process which, if it existed before, only existed in an unacknowledged, undeveloped form. This was not only liberatory – speaking as a musician whose training did not originate in the practice of generating scores and using them as the primary basis for bringing new music into the world – but it also pointed me towards a more authentic practice, which more effectively served each piece's idiosyncratic nature.

   The stages for each work now took on more this form:

Studio Track → Short Score → Long Score → Live performance → Formal Recording

Hybrid Authorship and Hybrid Agent: Summary

In discussing the work of the UnHeard Hybrid Orchestra and the execution of the UnHeard Hybrid Online project, I have in this chapter documented my experiences of generating a

composition by including other individuals – in particular performers, sonic artists and visual artists – as part of the overall creative and arrangement process. In the Hybrid Orchestra this form of hybrid authorship was done as part of working in person with the rest of the ensemble during the rehearsals, and in allowing the electronics performers in the group take their own initiative in how to make contributions to the overall sound. In Hybrid Online, this was done by using cloud sharing to provide the composers, performers and electronic artists with the ability to select materials, make recordings, share recordings and create new sounds from what was made communally available to the whole group.

   In this chapter the topic of *correspondences* was also discussed, in reference to the way in which I have aimed when composing with audio materials to listen for features which can be brought to the surface (to 'follow the cut'), as opposed to focussing on my own assumption of what each audio sample should become. I then extended this idea to seeking correspondences within groups of collaborators, to tease out unexpected ideas and creative potential which may be available in any given team of creatives. In documenting these experiences – especially during the challenges and limitations experienced during the pandemic lockdowns – I intend to provide other composers and researchers with reference points for their own practices, and to offer alternative perspectives which could be helpful for them to consider in similar projects of their own in future.

Chapter 5: Hybrid Media

   The series of lockdowns and social distancing measures introduced by COVID-19 had a definite impact on my compositional and creative practice. I also noticed how many of my peers who predominantly focussed on acoustic writing in their practice were forced to become hybrid composers in the tools and techniques they used. But another key manner in which the circumstances influenced me, and many others, was in the importance the situation suddenly gave to moving images in accompanying new works.

   The earliest piece which I completed in the period from March 2020 was *Planetary Boundaries – Human Needs*, which made use of spectral imaging of the audio as discussed in chapter 3, and the video for *Kairos and Chronos* also played a large role in bringing that work to life. By the time I completed *UnThing* and *Rain Spectacle* in March 2021 the visual

aspect was a necessary part of the pieces which were being created by me. *Blodeuwedd* (completed in June 2021) represents the culmination of this line of thinking, given that the AI-generated visuals of that work comprised a significant part of the compositional thinking that went into its final production.

Portfolio #10a and #10b: *Rain Spectacle* (Key Work)

Rain Spectacle began as a fixed media piece for large chamber ensemble and electronics, and was premiered as part of *UnHeard Hybrid Online,* which was the headline event in the first RNCM PLAY Festival in March 2021. For this I made use of spectral audio imaging (as in *Planetary Boundaries – Human Needs*) but this time in conjunction with various other video editing techniques, as well as footage of the performers themselves. The video for this piece again represented the challenge of making the most from limited means, due to the ongoing pandemic restrictions and the varying technical resources and knowledge available to each of the musicians. Using footage of the players coupled with images sourced from a spectral representation of the audio, I made as much use as possible of the different transparency effects in Adobe Premiere Pro to generate a much broader selection of image qualities of each performer, and then experimented to see how these could be edited into the final video in different ways.

In addition to these decisions taken in editing, much of the spectral imagery also had an aesthetic relationship with other aspects of the piece – partly via the title; given that much of the vertically and horizontally shifting black and white rectangles resemble large stylised/digitised rain drops, and partly in the sense that these 'blocks' also bear an impressionistic resemblance to shifting piano keys.

The origins of *Rain Spectacle* lie in the repetitive piano figure which begins from letter C. After first playing this figure, I intended to compose a segment which built on it and especially which allowed for electronic elements to be ascendent and represent a sort of collapse or oppositional force to the rest of the instrumentation. This thinking was partly inspired by the work of electronic musician, bassist, record producer, multi-instrumentalist and DJ Tom Jenkinson (Squarepusher), in particular his *Ufabulum* album (Warp Records, 2012). A piece like *4001* could be seen as similar in spirit, in particular during its main theme

in which the drum programming becomes increasingly frantic on each repeat, as well as being paired with more and more granulated/distorted electronic layers of impact.

The section from letter C until J has a similar progression and making use of the Glitch 2 plug-in[22] allowed me to escalate the intensity and frantic qualities of the electronics in a simple fashion, while retaining their sonic connection to the other sounds. This was achieved by dedicating one audio channel ('Synth') to the electronic sounds, and cutting and pasting short segments of the audio from the other instruments into its timeline (Fig. 31). This channel then had the Glitch plug-in applied to it, and through experimentation I could shift the short waveform clips around and collage them together in ways that complemented the wider mix, with the Glitch effect acting as a means of cohering them into a unified sound world (Fig. 32).
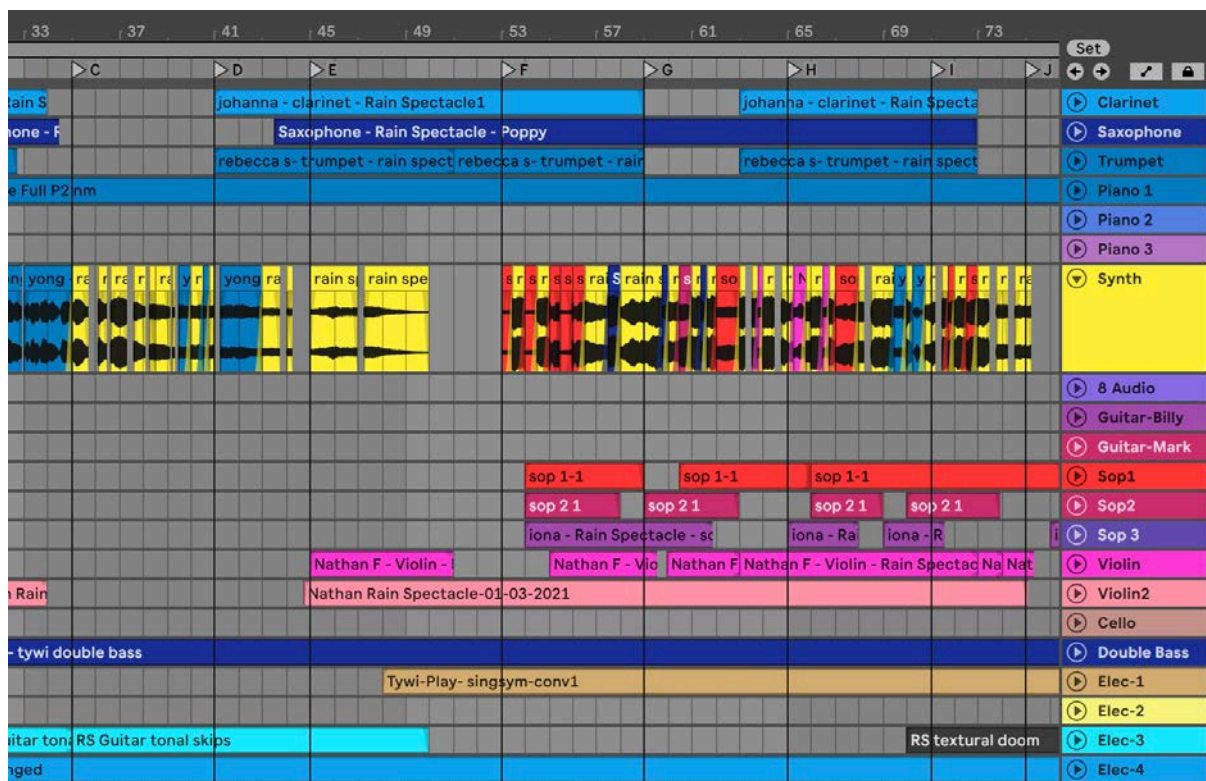

Figure 31 - Segment from the 'Rain Spectacle' Ableton Live! project. The 'Synth' channel is comprised of short samples of audio from the other instruments – the colour coding matches track titles on the right side (e.g. red = soprano 1, blue = piano 1)

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[22] This was created by Kieran Foster: http://blog.dubspot.com/vst-spotlight-glitch-2-effects-processor/

Figure 32 - Illformed Glitch 2 plug-in, created by Kieran Foster. An example of how it was configured for use in Rain Spectacle

Given that *Rain Spectacle* was also created for *UnHeard Hybrid Online*, the process of its creation was very similar to that of *UnThing*, and much of the discussion in connection with hybrid authorship and collaboration with electronic musicians applies here also.

A new version of this piece premiered in November 2022 when the UnHeard collective organised a concert in the Liverpool Philharmonic Music Room for wind septet, electric guitar, double bass, and electronics, with additional artwork by illustrator Chrysanthi Tsichti. I used this opportunity to arrange a live version of *Rain Spectacle*, which completed the revised compositional process outlined in chapter 4 and finally brought it from studio track to concert piece (Fig. 33).

Figure 33 - Opening bars of the live arrangement of 'Rain Spectacle' performed at UnHeard: [Un]Locked in November 2022

UnHeard: [Un]Locked was also an event curated almost entirely by myself, and the decisions I took towards staging the entire concert, and which collaborators we would include in the production defined the direction which *Rain Spectacle* (and the rest of the programme) took. This is a sense in which I would invoke the term *hybrid agent*, since my role in bringing this piece to the stage included a far broader range of responsibilities than only composing and arranging.

  Given that the ensemble was very different from the one which executed *UnHeard Hybrid Online*, we decided to create completely new visuals for the work. By collaborating with Chrysanthi and with writer and photographer Fiona Brehony, we came up with a narrative for the piece which could then be used as the basis of a series of illustrations which would form the new visuals on stage. This further extended the element of distributed creativity involved with *Rain Spectacle*. The original music and concept were used by Fiona – in tandem with discussions between us – to inspire a narrative, which was then used by Chrysanthi to generate her images, and finally these would then be edited together by Fiona with some of her own footage to create the new video.

  For this new version of the piece the piano parts were largely shifted to the electric guitar, although some larger chord clusters and arpeggios were distributed more across the entire

ensemble. The electronics were also merged into the guitar part, and the guitarist (Billy Lancaster) took on the duty of triggering various samples via a physical controller and laptop on the stage.

Visual Media in *UnThing* (#9b) and *Blodeuwedd* (#8)

UnThing represented another step forward in my work with visuals, especially given that it involved collaboration with visual artist Rose Bartels.

Earlier I noted the use of 'offcuts' from the recordings supplied by each performer – content which had been recorded and not intended to be part of the performance. This included the light squeaking of hands moving across guitar strings, slight murmurs while the players counted themselves in or verbally announced their location in the score, vocal warm ups from the singers, or perhaps shoes or other objects tapping the floor or being shuffled around. These 'small' sounds were often only audible by significantly increasing the gain on the given section of each waveform, but the notion of intimate and incidental sounds being 'blown up' to become a foreground element ended by becoming a core aspect in the character of *UnThing.*

This idea found its way into Rose's collage animations in the guise of the ladybird climbing the stem of the flower, and the butterflies congregating together on close-up images of flowers. It could also be related to the idea of the flowers/plant-life becoming so large and powerful that they drag down entire tower blocks, as seen elsewhere in the animation she contributed.

Given the quick turnaround required for this project; we ultimately were required to construct the whole video from limited resources – of which, approximately 1 minute and 30 seconds of Rose's animations were part. As such this was another exercise in extracting the maximum content from a small amount of material, which also included more footage of the performers. The short animations used in *Blodeuwedd* presented the same challenge, and I availed myself of similar editing techniques in both cases. Clips were reversed, slowed down, sped up, overlaid with each other in numerous combinations and with a plethora of transposition styles in effect.

For *UnThing* Rose's animations would form the core of the imagery, and over the course of editing I found a number of ways in which to integrate the performers. One of these was to

populate the façade windows in certain frames with the instrumentalists (beginning at 01:35). In the Zoom-era the sight of another individual in a fixed quadrilateral shape has become extremely familiar – especially when also taking into consideration the numerous edited music videos which feature one or more performers accompanying each other from within separated boxes in a mosaic on the screen. As such it felt like an ironic and playful twist to present the performers as if they were playing from their separate windows in a large block of apartments.

Another approach was to zoom in on the performer's hands or instrument keys, and find a way to superimpose this onto a consonant/complimentary background from the animations. For example, the combination of piano keys with tower block façade at 05:19, or the gigantic trombone in the sky above flowers and thorns at 06:55. This method also had the benefit of tying in with the theme of 'blowing up' small things to much larger proportions so that they take on a new identity or character, or to simply allow us to consider finer details of the subject.

UnThing's video component also presented another opportunity to explore consequence between the audio and the visuals, and vice-versa. At a later point in the composition process the sharp attacks in the percussion (kick drums and drum sticks being hit together) provided a way of structuring phrases around musical 'switch' points – as is a common feature of Andrew Norman's music, especially his orchestral work *Switch* (2014/15). To take the first example from *UnThing*: at 01:20, the main arpeggiated theme of the work appears, played by the violin. During the phrase's ascending portion the kick drum interjects, which also signals a shift from the violin's timbre to the clarinet's – but only for two notes, before the kick drum interjects again and the motif passes back to the violin. In the next phrase the piano takes the theme, and is again 'switched' into the clarinet after the interruption of the kick drum.

While I did not accompany every such 'switch' as this with an attendant switch in the visuals, I sought to add enough such cases that the consequence of the sounds on each other would be suitably emphasised, and thus also add a certain grammar to the visual language of the piece. Sometimes the switches were accompanied by hard cuts to the drummer, simply as an interruption to match the sonic appearance of the kick drum or sticks, and at other times they were accompanied by some other significant shift in the

visual imagery – such as a shift between players seen in the windows of the façade, or which windows were seen as open at that instant (see 01:40 onwards).

Here I should note one key observation which arose from working with these 'switches', germane to the topic of hybrid practices – both in the dimension of distributed authorship, and creativity in both the audio and visual domains. Rose Bartels and I began consulting on the visual direction of *UnThing* when the music itself was around 60% complete. She began sending me short clips, and before the music was finished I already began making visual tests to see if the animations were suitable, and to help prompt our ongoing discussions about what was needed. It was during these experiments that I stumbled on the 'switch' concept – its effectiveness was laid out most clearly via the visual medium. As such I took this knowledge with me back into the compositional aspect of the process, and found these 'switch' motifs becoming a more prominent aspect of the work, perhaps even one of its most identifiable characteristics in certain sections. This seemed notable, given that I may not have followed this creative logic had I not simultaneously been working with the visual component of the piece.

In a related manner, and also in connection with the discussion of hybrid agent in chapter 4, I became aware during the production of *Blodeuwedd* how my treatment of the visual materials was altering my relationship with the music. That the original story is littered with evocative imagery of shapeshifters and hybrids gave it a certain resonance with my research work. The *Mabinogion* is packed with similar transformations and motifs – there are shields created from mushrooms, ships raised from seaweed, men becoming wolves; eagles; deer and pigs, people who shapeshift into mice, as well as a host of enchanted or mysterious animals and wildlife (Francis, 2017). During my research for this piece I took note of each such occurrence and added them to a list. This then became indispensable while generating my material with Advadnoun's *Big Sleep*. The algorithm functions by being passed a series of words, which it interprets as an image description, and then proceeds in attempting to generate that image.[23] After a fixed number of cycles, it saves its interpretation so far – so the process of running the algorithm generates a gradually evolving series of images. When

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[23] https://github.com/lucidrains/big-sleep/blob/main/README.md, and: https://www.reddit.com/r/MachineLearning/comments/kzr4mg/p_the_big_sleep_texttoimage_generation_using/, last accessed 13th December 2022.
A similar algorithm *DALL·E* – now superseded by *DALL·E 2* – has become virally popular since the time of this composition work: https://openai.com/dall-e-2/.

sequenced together these can be presented as a simple animation lasting 5-10 seconds, before the algorithm settles roughly on a single image.

Since the video clips generated from Big Sleep were all so short (sometimes even 3-4 seconds in length), this required me to pay attention to very short time scales more closely than before. Arranging these visuals repeatedly caused me to focus my attention far more acutely on short events and artefacts in the audio, which I had perhaps only noticed in a superficial manner up to that point. From an audience perspective the editing of the sonic events caused me to arrange the activity in the video so that it in turn drew more attention back to shorter/subtle features in the audio, and therefore allowed them to take on a much greater significance and have more impact than they otherwise would have. I would cite this as another example of how a hybrid skillset – in this case between visual composition and audio composition – can lead to novel and productive outcomes which result from a dialogue between the different skills in question.

The list of transformations and occurrences from The Mabinogion listed earlier served as my source of text to be used for image generation on this project. In the case of Blodeuwedd herself, for example, I typed 'a woman made of flowers' into the algorithm and ran the code. I would frequently run the same sentence multiple times to see the (often wildly) different results, or run it with slightly different phrasing. So in the above example I might also run the code for 'a face made of flowers', 'a flower face', 'a flower woman', 'a woman made of roses', and so on.

The text of Sammy Weaver's poem served as an even deeper source of inspiration, since she took these notions of hybridity and transformation and explored them in even further detail – such as imagining Blodeuwedd actually as a multitude; a 'we' – whose 'blood is sap', and whose 'hairs… are loaded stamens'. A great many of these ideas also found their way into my list of transformative motifs, and so into the algorithm for visualisation. The resulting images served as a strong source of inspiration – Big Sleep lives up to its name, in the sense that its fruits often have a deeply surreal, dreamlike quality.

Some examples of phrases used for image generation:

Figure 34 - 'a wolf man'

Figure 35 - 'a man becoming a wolf'

Figure 36 - 'bees in a mouth made of flowers'

Figure 37 - 'eyes made of pollen'

Conclusion

This thesis provides an exploration of hybrid compositional practice from a number of different perspectives, and as such may act as an instructive collection of examples in how such a practice may be grounded. In relation to hybrid audio-visual practice I demonstrate how when working with both aspects they mutually reinforce each other, inspiring new ideas, and that the larger potential in hybrid practice between acoustic and electronic writing is similar – with both dimensions triggering ideas in the other in mutually beneficial ways. This model is also demonstrated in a limited way in hybrid authorship, and illustrated in the deployment of hybrid language as a means of representing how two mediums can enrich one another and generate a fruitful synthesis.

In philosopher Lydia Goehr's landmark book *The Imaginary Museum of Musical Works* (2007) she notes a "disenfranchising tendency exhibited when works are treated [by philosophers] not as alive and particular, but as dead or thinned out in the act of their being made to fit an already established ontological category." (*Introductory Essay: His Master's Choice,* pp. xxxvii-xxxviii). On one level this is reminiscent of Iain McGilchrist's notion that music should be approached as if it were a living being, discussed in chapter 2 in connection with *Zygote*. But Goehr's point regarding the treatment of the music as being 'in the process of being crafted or constructed rather than as ready-made or belonging to the past' (2007, pp. xxxvii) is something which I feel resonates strongly with the approach I have taken throughout this research project, especially in the work of the UnHeard Hybrid Orchestra. The aspect of curation which UnHeard concerts demanded made it clear to me how much of the production was mutable or in a constant struggle to be realised at all, and how much finally relied on the coordination of the different team members and what their actions and interactions produced in response to the circumstances on and off the stage.

In my discussion of hybrid authorship, I noted how the types of musical project I have been engaged with (particularly in the case of the UnHeard collective) demand a *hybrid agent* role. This may require a composer to also become a curator – one who facilitates the drawing out of creative potential from the ensemble by managing the relationships and connections between the individuals in the team and the resulting collaborations. I compared this to Tim Ingold's notions of *correspondence* and *following the cut*, suggesting

that these are concepts which apply to the sculpting of sounds in the studio, but also to the teasing out of musical and artistic ideas from the interactions between members of an artistic team.

I also gave examples of how my practice has evolved over this period – in particular discussing the nature of my creative process and how it now entails a number of stages which each focus on a different aspect of my hybrid skillset. This process is demanding and may require more time in order to be fully realised than for projects which make use of fewer particular skills. Hybrid authorship and distributed creativity can help to mitigate this challenge greatly and still offer opportunities for a dialogue between contrasting skills to take place, generating ideas which would not otherwise have arisen and opening up new directions in which the project can be taken.

In the context of this thesis I would say that a work like *Blodeuwedd* is one of the best examples of a piece which pushed my individual hybrid skillset maximally from both the acoustic and the electronic directions. By this I mean that I took a more formal theoretical approach to composing the chorale than I had previously ever attempted, while I also made heavier use of audio and video processing/production tools, many of which were completely new to me (Big Sleep, sampleRNN). On the other hand I would contrast this with my work with UnHeard, in which I made use of this individual hybrid skillset but at the same time nested it within the context of a larger team of collaborators – which produced works such as *Rain Spectacle* and the live version of *Zygote*. All such collaborative projects made use of a wider team to solve both logistical and creative/compositional problems, and to define the direction of the music as it was ultimately realised.

Many of the pieces discussed in this thesis only received one performance – their premiere was the last time they were presented in public. Others which did receive follow-up performances were heavily altered or rearranged in their subsequent versions (as in the case of *Zygote, UnThing* and *Rain Spectacle*). I note this partly as an example of the issues raised earlier regarding standardisation of hybrid works – many of the pieces I have outlined here have logistical complexities associated with them that make it difficult to see how they could be faithfully recreated in a follow-up performance. Doing so might incur additional expenses at least, or require additional technical support/specialist knowledge, or require creative amendments to be made such that the piece can be adapted for a new setting or instrumentation. As such follow-up performances are less incentivised, and this is a

challenge that many technologically demanding works may encounter. Presenting my works here as part of this thesis is intended as one means of ameliorating this issue, since it is one way to ensure the longevity of these pieces and to give a clear documentation of how they are intended to manifest in performance. This can be referenced if other performers and ensembles wish to take on the challenge of bringing them to the stage without being forced to rely solely on the score.

In chapters 1 and 2 I outlined a number of tensions that have been present ever since the beginnings of the digital age of music production and its slightly earlier technological precursors. We know that to some degree these tensions are still present today. Within the current project I have framed these within the bounds of hybrid groups and hybrid compositions; examining how computers and digital technology are contextualised within the ecosystem of a contemporary classical ensemble. My belief is that the ultimate synthesis of these elements involves the eventual transcendence of the hybridities I have discussed. This would pave the way for the arrival of truly novel, integrated wholes – not things composed of two or more parts 'stitched' together, as they may be in a chimera.

When an electronic musician using a computer performs, there is always at least one additional layer of translation/interpretation between their actions and the resulting sound – a *modelling* of reality, rather than a direct interaction with it. The differences between these were explored in a playful manner in *Study for Laptop, Guitar and Voice*, and discussed in chapter 2 in connection with Bill Thompson's work *dismantle for laptop (solo)* (2010). Conceptually the laptop performer does not have the same level of tactile intimacy and direct physical relationship with the sound source and resulting sonic output as they would with any tangible, sound-producing object. The physical computer itself is not being called upon to assume this role and is instead acting as an interpreter. Since the whole process of digitisation is involved with abstracting information – whether that information be images, sounds, instructions, text or otherwise – it contains a related risk to that discussed above by Goehr, that of promoting a tendency to view the output not as alive and not as particular. No matter how sophisticated or authentic it may appear to our senses, a digital reproduction is still a *re-presentation* generated through manipulation of logic and bits – not a direct presentation of something entirely new, arising from reality itself.

I hope that in a small way the work of this project may move the needle in the direction of a true synthesis between the new era of digital tools and all that preceded them, or

contribute some clarity such that others may trigger that movement. As mentioned in the introduction this thesis is a document of a particular time in the author's creative life, and of how the surrounding circumstances of the technological and musical landscape were experienced as an influence on the composition work I undertook during that time. This is presented here as a case study which could be of use to other composers and other researchers, with this commentary providing the necessary context so that the decisions taken in creating each piece of music can be better understood.

In the final analysis much of the works here shown do not display anything more than a glimmer of that true transcending of the parts between the digital and the acoustic – hence why a discussion of hybridity is far more pertinent to the music I have been making since 2018. The term has become a way to describe my creative aesthetic and a convenient means of encapsulating how I operate within my practice, but I would say that it acts as a pointer towards a potential way of working in the future and is not itself the destination. Many of the pieces and events in this portfolio probably qualify more as chimeras than as true syntheses of distinct elements. I would certainly say that the forms of collaboration I have discussed – whether they be remote or in person, in real or non-real time, with developers of software tools, with scientists, poets, visual artists or sonic artists – offer extremely effective means of managing these hybrid projects, and uncovering ways of bringing the parts together elegantly. This thesis has focused both on the application of a hybrid skillset within an individual (myself) and across multiple individuals, and I would propose that a 'both and…' attitude to these is required in order to best realise artistic works which encompass the hybridities I have described. But now that this project focussed on the notion of hybridity is complete, my new goal would be to move beyond this term and towards a more seamless practice that is characterised less by the noticeable combining of constituent parts and more by the bringing of those contrasting parts into seamless new wholes. This characterisation would transcend the notion of 'hybridity' at the level of the works, the ensembles, and my practice itself.

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Appendix A – Additional *Big Sleep* Examples Produced for *Blodeuwedd* (2021)
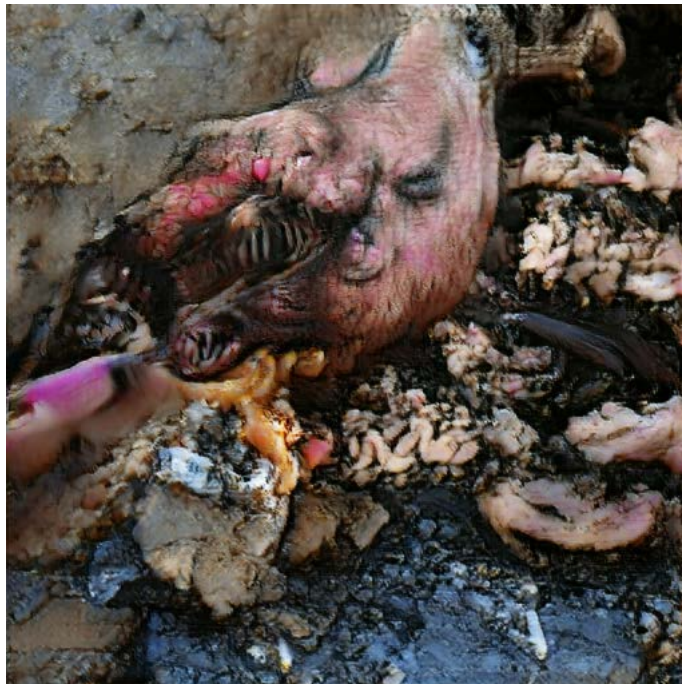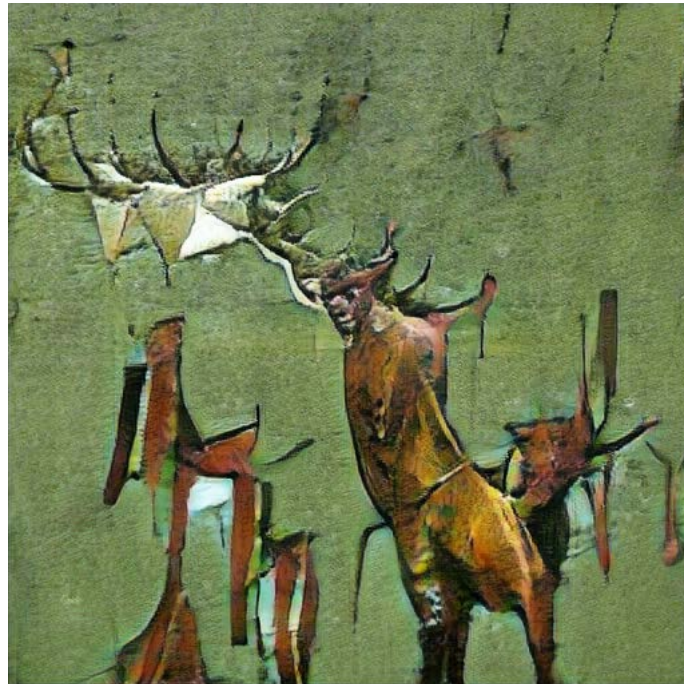

'a pig eating rotting maggots'

'a stag man'

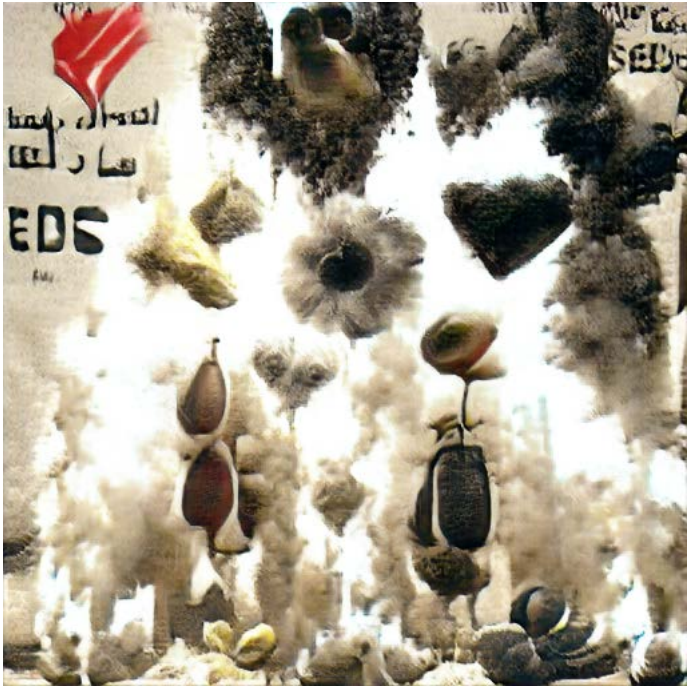'a stag man' (alternative run)

'a ship made of seaweed'

'a woman made of glitches'

'pollen inside eye sockets'

'blood made from tree 'sap'

'seeds made from bombs'

Appendix B – Earlier Uses of Visuals in Performance

The following pieces premiered in 2019 all included some sort of visual element in addition to the music, even if only very minor:

- *Staggering* (2019) (my laptop screen, running Ableton Live and showing my activities in the performance, was projected as is onto the studio's main screen).
- *Study for Laptop, Guitar and Voice* (2019) (again, the laptop screen was projected in order to show my activities, but this time these actions were far more scripted in order to add a theatrical and contextual element to compliment the music played by the guitar and soprano).
- *Streets in the Sky* (2019) (a curated slideshow of photographs of Park Hill Flats in Sheffield were included, in order to bring the subject of the piece more directly into the performance itself. The slideshow was edited into a video format, so that the images could be cut to the meter of the music at different sections).
- *Zygote* (2019) (the remote string quartet were visible on a large monitor screen above the local players).
- *Dying Archon, #rulingwheel$1* (2019) (the visual material in the VR headset was projected onto the main hall projector screen for the audience to witness what the player was seeing).
- *Active Restraint* (2019) (Sonic Pi's basic graphical visualisation of the sound, along with the live code was displayed on large monitors for the audience to see).