University of Nottingham
UK | CHINA | MALAYSIA

Musical Creativity & The Composition Engine: A Portfolio of Songs with Written Commentary

Thesis submitted to the University of Nottingham for the degree of PhD in Music Composition

December 2024

James Gordon

20405287

Supervisors: Dr Elizabeth Kelly & Dr Duncan MacLeod

School of Humanities, Department of Music

University of Nottingham

Abstract

This practice-based PhD project documents the development of a Creativity Support Tool (CST) – The Composition Engine – and its use in the composition and production of two albums of original music in the accompanying portfolio. The Composition Engine synthesises multiple models of creativity from the literature into a map of the creative process and organises them into stages that a composer can move through (or jump around within) while writing or producing music. The model incorporates two principal modes of creativity, "divergent" and "convergent", and includes process guides, prompts-for-action, and sources of raw material to select from. This research is contextualised within the field of Practice-as-Research (PaR), where the creative practice itself is a primary form of research evidence.

Acknowledgements

Without the influence and assistance of many others this work wouldn't have been possible. My thanks go to my supervisors, Dr Elizabeth Kelly and Dr Duncan MacLeod, for their constant guidance and support; they kept me on the path and facing the right direction even as every shiny new discovery threatened to derail me. My deepest gratitude to all the talented musicians I have worked with over the years for shaping the player, songwriter, and human being I am, most especially to Karl Baden, whose immense talent I have endeavoured to emulate in my own small way. Thanks also to my colleagues and students at AMS who have had to listen to me ramble about this for the last three years and who have provided a discerning ear and sage advice without ever seeming too bored. Finally, thanks to my parents, who taught me that it was okay to have my head in the clouds as long as I kept my feet on the ground.

Table of Contents

List of Figures

1 Introduction

This practice-based PhD project consists of a multi-mode research enquiry including:

- One hour of original music presented across two thematically linked albums composed, performed, and produced by the author.
- A commentary to contextualise the work, combining:
    - A conceptual framework for the research that locates my practice "in a lineage of influences" (Nelson 2022, p.40).
    - A documented account of process.

This written commentary is a companion to the submitted portfolio of compositions, offering insight into the creative processes used in their generation. The first section provides a theoretical framework that contextualises my compositional practice, covering concepts from the fields of creativity research and music composition. Here, I outline an original contribution in the form of a Creativity Support Tool (CST) (section 2.1) and model of the creative process (2.3). The second section consists of a discussion and analysis of the music in the portfolio, responding to the issues discussed in the theoretical framework and explaining the use of the CST in writing and producing this material.

1.1 Motivation for Research

> "I do beat my head against the wall, but it's the *wall* that gets the hole in it" – Gustav Mahler (Bauer-Lechner 1980, p.115)

As a practitioner and performer, I have established roots in both the music industry and academia. I am a guitarist and singer who has been fortunate enough to earn a living through music for over twenty years. I've toured the UK and Europe with various acts, from heavy metal tribute bands to acoustic artists. As a guitar teacher, I've taught thousands of students privately and at a music school. I'm an accredited lecturer for Bachelor of Arts and Master of Music students at The Academy of Music and Sound and I have written course materials for their modules and been an internal marking moderator. Writing, recording, and releasing music has been an ongoing activity throughout these roles and has enriched each of them.

Historically, my creative process has been more fragile than I would like, relying too heavily on instinct and easily derailed by self-doubt and external pressures. Compositions would often require

large amounts of effort and will to complete and leave me reluctant to contemplate returning to the songwriting "coalface" until sufficiently recovered. Worse, the weight of the challenge meant that there was usually a reliance on initial ideas and instinctive choices, an unquestioning acceptance of the conventions of my *habitus* (Bourdieu 1977) – tacit domain knowledge – resulting in occasional dissatisfaction as the work felt too safe or familiar. While I am incredibly proud of many of the pieces I have written, the creative act felt like a black box with inspiration going in one end and music coming out of the other. I felt that I lacked the tools to manipulate or understand the inner workings of my own creative process. I was searching for a way to externalise aspects of my tacit knowledge, interrupt my usual patterns, and explore new areas of my practice.

Seeking ways to overcome these challenges became the basis for my research during this PhD and I found two useful concepts that led to an unexpected synergy: Creativity Support Tools (CST) and Practice-as-Research (PaR).[1]

CSTs provide a structured approach to the creative process and prompts to help stimulate idea generation, explore new concepts, or think about problems in a different way (Minas & Dennis 2019, p.230). CSTs can also enhance creativity by helping the user document the creative process (Wang & Nickerson 2017, p.1). Meanwhile, PaR requires us to "attend differently" to our practice in order for it to be considered research (Nelson 2022, p.24). This can be achieved by taking a self-reflective approach during the "process of making the object, the keeping of field notes in the form of a journal, and an examination of the artefact itself" (McIntyre 2006, p.4). All of which provide a useful "insider's perspective" to our praxis.[2] PaR encourages us to view our practice as "both object and method of research" (Arlander et al. 2018, p.43).

In my early experiments with existing musical CSTs (see section 2.1.3), I found that they were useful for generating a host of initial ideas but often had little to offer beyond this nascent stage. *The Book of Chances* (Huang, n.d.), for example, consists of cards that show a rhythmic figure, note value, scale degree, text and image prompts, etc. Drawing a card suggests multiple starting points but offers no real instruction for developing any ideas generated. During the first year of my research, I wrote an enormous amount of etudes and sketches using adapted versions of various CSTs, from musical dice games – dice rolls representing scale degrees, harmonic ideas, or rhythmic fragments – to random number generators – used to select from a book of musical themes or ragas – to coin flips for every

[1] "Research undertaken primarily through a *being-doing-thinking* practice and in which primary findings are presented by means other than writing" (Nelson 2022, p.4).
[2] Praxis: The "imbrication of theory within practice" (ibid., p.19).

musical decision. This glut of raw materials left me overwhelmed, unsure of how to move on. As John Cage (1961, p.99) puts it: too many ideas can lead "to inactivity".

Figure 1 - A selection of CSTs

My goal, then, became to create a CST that not only allowed me to interrogate, interrupt, document, and explore my creative practice but also to act as a process guide beyond the initial generation of ideas.

1.2 Research Questions

- *Can I construct a Creativity Support Tool (CST) that outlines a model of the various stages of creativity used in music composition?*
- *What practical strategies, process guides, and stimuli can the CST provide to support, interrupt, and expand the creative outcomes of my songwriting and composition?*

Multiple models have been proposed to represent the creative process, including some specifically related to music composition (see fig.3, section 2.2). I synthesised these models into a CST (section 2.3) that provides a map of the creative process and encourages exploration by serving as both process guide and stimuli provider. The CST includes divergent and convergent modes, practical prompts for action when composing, and is intended to work at the local "note" level as well as the global "song" level.

This project touches upon concepts related to process music, algorithmic composition, and game elements used by experimental music composers like John Cage, John Zorn, David Cope, etc.[3] While ideas from these domains do form part of the prompts and stimuli incorporated in the tool, CSTs are focused more on metacognitive aspects, attempting to interrupt, challenge, or alter the *composer* and their creative patterns, thought processes, and choices.[4] This aligns more closely with Brian Eno's (1975) *Oblique Strategies* cards than the indeterminate processes used in a piece like Cage's 'Variations I' (1958).

2 Theoretical Framework

2.1 Creativity Support Tools

2.1.1 What are CSTs?

Creativity Support Tools (CSTs) are used to extend and amplify human creativity. As telescopes and microscopes enhance our ability to see, so CSTs enhance our ability to create and discover (Shneiderman 2007, p.22). They are intended to help people become *more* creative *more* frequently, allowing them to handle a wider variety of challenges and broaden the possibility space of the artefacts they create (Shneiderman 2002, p.116). CSTs can include tools that facilitate the act of creation (DAWs and notation software, for example), *process guides* that offer "a structured process that guides the user to think about the task in different ways" (Minas & Dennis 2019, p.3), such as IDEO Method cards (Kelley 2001) or Songpad (2023), and *stimuli providers* that offer suggestions and prompts, like Eno's (1975) *Oblique Strategies* or *The Book of Chances* (Huang, n.d.). Compositional tool kits, such as Messiaen's (1956) *The Technique of My Musical Language*, *Stockhausen on Music* (1989), or Henry Mancini's (1973) *Sounds and Scores* could also be considered a type of CST as they offer guides and raw materials for making music based on the practices of those composers.

CSTs are traditionally rooted in digital domains of research (Frich et al. 2019, p.1). However, the concepts that underlie CSTs can be applied with or without the use of software and analogue systems, such as card decks and game boards, are often included in studies alongside their digital counterparts (ibid., p.6).

[3] Process music is the use of experimental processes or devices to investigate musical possibilities. Such processes may consist of "basic material and a number of rules or goals" (Christensen 2004, p.97).
[4] Metacognition is the awareness of our mental processes and patterns, second-order thoughts *about* thoughts (Matuschak 2021).

The digital aspect of CST research touches upon areas of computational creativity (Nierhaus 2018), such as programs that produce creative artefacts – EMMY by David Cope (2015) and generative AI like Udio (Dash & Agres 2024). However, my research focus is on amplifying, expanding, and supporting the composer's creative process rather than on having the software or tool generate ideas from whole cloth.

Other related terms that overlap with CSTs include: "supportive technologies" (Schneiderman 2002), "imaginative aids" (Boden 2004), and "metacreation systems" (Agres et al. 2015).

2.1.2 What Can CSTs Do?

Creativity Support Tools (CSTs) can:

1. Improve an individual's creative abilities.
2. Provide knowledge about a specific domain and encourage skill development.
3. Enable an experience which is not possible without the tool (Nierhaus 2018).

CSTs can be helpful in overcoming creative blocks and can be used to support each stage of a creative activity, such as songwriting. Effective support systems can also shine a light upon weak or neglected areas (Wang & Nickerson 2017, p.26). For example, as a composer, if I rely on my tacit domain knowledge of rock music, then I am perhaps less likely to engage with musical forms from outside of the stylistic conventions of my field, such as through-composition or period form. A CST could guide me to this "neglected area" of my practice. Mazzola et al. (2011), for example, offer a useful process guide as part of their model (section 2.2) that can help composers "soften the walls" of these tacit assumptions.

To encourage skill development, flexibility, and control, "the practitioner needs to have a full grasp of the materials and tools" being used (Candy 2020, p.207). By stimulating exploration of less-trodden aspects of the tools used to compose – from instruments to software – a CST can act as a set of dumbbells to strengthen those creative muscles.

CSTs can also provide a structure and impetus for documenting the creative process (Wang & Nickerson 2017, p.1). In doing so, a comprehensive CST serves as a support system not only for the creation of new musical artefacts, but also as a useful tool for engaging in Practice-as-Research (PaR). This type of research is "a self-reflective examination of the practitioner's own activity through a process of participation in that activity" (McIntyre 2006, p.4).

2.1.3 Musical CSTs

Many musical CSTs focus on the *stimuli provider* approach outlined above (section 2.1.1) rather than offer a *process guide*. As such, they are useful during the early stages of the creative process (section 2.3.2 and 2.3.3) and for sparking new ideas but can be less useful when it comes to iterating upon those ideas or developing them into something more polished and complete. A creative process like songwriting "is commonly iterative, with a lot of trials and errors … Therefore, a system should not only enable users to plan the process in advance, but also show progress along the way and allow reflection, iteration and selection of steps" (Wang & Nickerson, 2017, p.20). Some examples of musical CSTs are listed below:

- *The Book of Chances* – Card deck with prompts that include chord types, rhythmic figures, notes, abstract directions, and images (Huang, n.d.).
- *Kaleidacousticon* – A deck of playing cards marketed in Boston circa 1822 that could be used create 214 million possible waltzes (Roads 1996).
- *Quadrille Melodist* – A card-based system for writing Quadrilles (a dance fashionable in 18th and 19th Century Europe) created by John Clinton (Bruce 2020).
- *Musical Dice Games* – Often (mis-)attributed to Mozart, dice are used to generate new compositions from precomposed options. Nierhuas (2009, p.36) gives the earliest example as Johann Kirnberger's (1757) 'The Ever-Ready Minuet and Polonaise Composer'.
- *Oblique Strategies* – Brian Eno & Peter Schmidt's (1975) card deck offers often abstract advice that the composer or producer can translate and apply as appropriate.

Process Guides are less common in musical CSTs, largely due to the diverse approaches, styles, and tools that composers use, though many of the models of creativity I cover later (section 2.2) can be coopted and reverse-engineered to work in such a way. An example that was explicitly written as a process guide would be the Musical Creativity model (Mazzola et al. 2011), which contains steps to select a problem or area to work in, identify the walls or limitations, then seek to soften and extend those walls. There are also the compositional "tool kits" mentioned above that often outline a composer's approach to their own creative process.

2.1.4 CSTs & PaR Synergies

There are deeper theoretical synergies between CSTs and PaR beyond the practical alignments discussed above. One of the core principles of CSTs is that they are "where theories of creativity

become manifest" (Wang & Nickerson 2017, p.2). CSTs allow us to instantiate and make practical underlying theories relevant to our creative work. I have taken various stage-based theories of creativity present in the literature and synthesised them into my own model (section 2.2) of the creative process. This model then formed the basis of the CST I used to compose the music for this PhD.

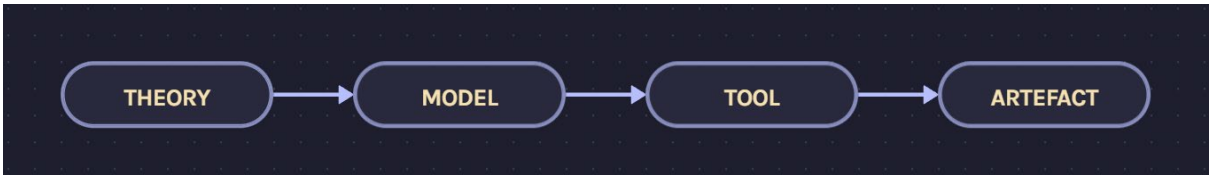


Figure 2 - Facets of a practice-based research inquiry

This provides a clear and practical example of Practice-as-Research in action. Each aspect of the flow of ideas shown above represents a facet of the same research inquiry, a different lens through which to view and understand the ideas that form the core of the research. The musical artefact is the result of using the tool; the tool is built around the model; the model is the result of research into the underlying theories.[5]

2.1.5 Exploring Creative Possibilities with CSTs

Our creative processes are often limited by our *habitus*.[6] The Composition Engine CST (section 2.3) is intended to help overcome some of these limitations, to "provoke the muse" (Barrett & Gromko 2007), to encourage exploration of new areas of conceptual space, all while offering the safe harbour of a process guide and map of the creative process to return to when lost or next steps needs to be taken.

2.1.5.1 Conceptual Space & Domain Acquisition

When engaged in a creative task like music composition, the spectrum of possible outcomes – the myriad directions a thought may diverge; all the songs you *might* compose – can be described as *conceptual space* (also known as "possibility space" or "cognitive hyperspace") (Runco & Acar 2019). Styles of music have their own conceptual space (Boden 2004) that overlap with our own. The rules

[5] Artefacts are materials generated by the creative process, such as song recordings or scores. "The production of music as a recorded artefact involves a broad range of technical, social and musical skills spanning different modes of musical activity" (MacCallum 2019, p.19).
[6] The unspoken or tacit rules of our domain knowledge, a feel for the game or "practical sense" (Bourdieu 1977).

and conventions implicit in the genre shape the possibilities and probabilities of material written in that style, some ideas being more readily available or nearer and others being more remote. Distorted guitars and power chords in heavy metal, four chord loops in pop music, and the ii V I in Jazz are examples of stylistic attributes that are nearer in conceptual space.

Our familiarity with the underlying structures and rules of a possibility space like a musical style comes largely from domain knowledge. This type of tacit knowledge is difficult to put into words or explain logically (Sennett 2008, p.51); it is "a way of doing things that we cannot really express in clear and direct language" (Taleb 2012, p.234). This is the type of knowledge that Practice-as-Research can help elucidate.

A working knowledge of a domain is acquired via formal and informal enculturation. "For songwriters in the contemporary western popular music tradition, the ability to make choices and therefore be creative is both circumscribed and facilitated by their knowledge of the domain of contemporary western popular music" (McIntyre 2008, p.6). This encultured knowledge goes beyond conscious obedience to the rules and becomes what sociologist Pierre Bourdieu calls the *habitus*: "a set of dispositions which generates practices and perceptions. The *habitus* is the result of a long process of inculcation … which becomes a 'second sense' or a second nature" (Johnson in Bourdieu 1993, p.5). Our domain knowledge is often acquired from both formal musical training and on a more ad-hoc basis through the oral transmission that comes from living and working in a musical domain (McIntyre 2008, p.5). Such tacit knowledge is a vital part of a composer's voice and allows the navigation of the near-infinite number of aesthetic and process decisions – *this* note not *that*; *this* chord not *that*; verse *then* chorus, etc. – required moment-by-moment in the act of music composition.

Understanding the rules of a domain is a vital part of being creative within it because "without rules there cannot be exceptions, and without tradition there cannot be novelty" (Csikszentmihalyi 1999, p.315). CSTs can help us discover gaps in conceptual space by guiding us to unexplored areas and by making us aware of the rules of the domain through reflecting upon our own practice.

One of the downsides of this reliance on domain knowledge and intuition, however, is that it can lead to stagnancy, to a convergence upon the familiar. This can cause us to not strive for higher-quality work (Sennett 2008, p.51). Composer Dimitri Papageorgiou suggests that:

> Although intuition is a key element in holistic problem solving, an uncritical reliance on gut-level impressions alone is highly problematic … though I do not disregard the innate sense of what feels right, *I am not willing to take it up without protest*, without first considering other, opposing ideas [emphasis mine] (Papageorgiou et al. 2015, p.115).

To engage in Papageorgiou's "protest" and consider exploring more distant areas of conceptual space, it can be useful to recognise when and how we are relying upon intuition. Active engagement with a CST can help stimulate this type of metacognitive thinking.

In PaR terms, one of the core reasons I began to work on my own CST was to defamiliarise myself from my usual process of composing, to allow new and alternative perspectives to permeate my work. Robin Nelson defines defamiliarisation as "a tactic of *attending differently*" that can be built into the research process:

> A good reason for creative practitioners to engage with the broader academy is the richness of intellectual environment and defamiliarization it affords … creativity often arises in the frisson of encounter between different approaches to research or knowledge paradigms (Nelson 2022, p.41).

2.1.5.2 Rules, Tactics, Strategies

> "Works of art make rules but rules do not make works of art" – Claude Debussy (Howell et al. 1992, p.590).

When engaged in the act of music composition, the possibility space we are exploring can feel near infinite. The sheer number of choices can seem overwhelming, leaving us adrift on a sea of options. Yet, despite this sense of terrible freedom, we are often limited by the tacit rules of our domain, the affordances of our instruments and tools, and myriad other invisible constraints. We might view these unconscious pathways as the tides and currents of the ocean of possibility, and our *habitus* as the shipping lanes that we frequently traverse. To reach more distant areas of conceptual space – "uncharted waters" in this metaphor – and to come up with more creative ideas, we might try navigating with the aid of various *rules*, *tactics*, and *strategies* (RTS). These, according to composer David Cope "represent some of the most important basic processes used by composers when they compose music" (Collins 2012, p.xxiii). To continue our sea-faring analogy, these RTS might represent the rudder on our metaphorical ship or the compass that guides our way.

- *Rules* constrain the number and type of choices available.
- *Tactics* solve immediate problems created by the rules (and provide control over the local compositional environment).
- *Strategies* involve more global goals and indicate how a composer can achieve them (Cope 2012, p.257).

RTS are how composers engage with the act of composition (a type of self-invented CST) and are what composer Roger Reynolds (2012, p.319) describes as "a path from initial impulse to final product". Cope (2015, p.405) asserts that all composers use algorithms, whether vague or highly specific, while composing: "an algorithm is a recipe, a series of instructions on how to solve a problem. In our case, this problem means composing a work of music".

Mazzola & Park (2011, p.3) suggest that extensions of our musical limits can be achieved by "following a general process scheme of creative exploration" and composition can be "a process of discovery and invention that begins with an open question and continues with a … sequence of well-defined operational steps" (ibid., p.17). Such descriptions align with the *process guide* and *stimuli provider* aspects of CSTs previously discussed.

When faced with the challenge of making music, we can use RTS to "focus on the here and now, the smaller number of immediate choices and possibly a few moves ahead (rules and tactics) and use more general principles (strategies)" to focus on completing our compositions (Cope 2012, p.259). This movement between local level problems – which melody note works best over this chord? How should I transition to the bridge? – and global level problems – what is the song about? What is the structure of the piece? – forms part of my approach to The Composition Engine (section 2.3). Each stage is intended to be recursive and fractal, providing stimuli and heuristics at whichever level of abstraction the user is working.

2.1.6 Underlying Theories

2.1.6.1 The Creative Process

To reiterate, CSTs work best when they instantiate underlying theories. To provide a map of the creative process that would form the foundations of my own CST, I synthesised and organised various models of creativity from the literature (see fig.3).

Wallas' (1926) *stage theory* is one of the earliest pieces of research into the creative act and forms the basis for many recent models. Sawyer (2012, p.88) provides an excellent overview of these stage-based creativity models.

Generally, the stages of creativity are given as:

1. *Preparation* – conscious, active work, familiarising oneself with the problem or task, acquiring domain knowledge.
2. *Incubation* – time away from the task, unconscious processing of the problem.
3. *Illumination* – the solution becomes conscious.
4. *Evaluation* – conscious work, instantiating the solution and checking its viability.
5. *Elaboration* – refinements to the solution (Nash & Blackwell 2014, p.2).

In a creative activity like music composition, where each of the stages can be reached multiple times, often in different orders and at different levels of abstraction, researchers needed to move beyond the stage-based linearity inherent in many of these models (Kozbelt et al. 2010). Music composition is a "wicked problem" – ongoing, ill-defined, with no correct solution or definitive end condition (Rittel & Webber 1973) – that does not always fit neatly into a linear model. Amabile's *Componential Theory of Creativity* (1983) is an early example that reflects this messier, more iterative version of the creative process.

Webster's (2002) model attempts to provide a comprehensive map of "creative thinking in music" and it also accounts for the more erratic, jumping between stages process that is common to many compositional practices. Graf (1947), who examined the practices of eminent composers (from Beethoven to Shostakovich), describes the stages of their creative process as *moods*, or *modes of work* – ranging from artistic fantasy to musical conception – and also mentions the iterative nature of their work (highlighting the use of multiple musical sketches, for example).

One of the problems I found in trying to use these models as part of my own practice was that they often lacked practicality and instead felt passive and reified, post-hoc rationalisations that failed to capture the reality of composing music. Author and statistician, Nassim Nicholas Taleb (2007, p.xxv) describes this as "Platonicity", a "tendency to mistake the map for the territory, to focus on pure and well-defined 'forms' … over other less elegant objects, those with messier and less tractable structures". These Platonic models aren't necessarily always wrong, but they can run into problems

where they encounter messy reality (ibid., p.xxv). Author and composer Robert Fritz (1991, p.4) suggests that this might be because "many of these people have never created anything other than theories about creativity".

I found this distinction of particular interest as it relates directly to PaR. For a model to be of use in the creation of music (and for it to work as part of a research inquiry) it must offer practical ways to engage with underlying theories in the act of making music.

2.1.6.2 Divergent & Convergent Modes

Perhaps the simplest model of the creative process consists of "an expanding stage of *divergent thinking* where many possibilities are generated, followed by *convergent thinking* as you converge on the one best idea" (Rittel & Webber 1973, p.88).

These modes appear in many fields, including creativity research, neuroscience, and psychology:

- *Generative*/*Evaluative* (Vartanian 2019)
- *Default Mode Network*/*Executive Mode Network* (Benedek & Jauk 2019)
- *System 1*/*System 2* (Kahneman 2011)
- *Open*/*Closed* (Cleese 2017)

Alternating between divergent and convergent modes – called *adaptive switching* (Benedek & Jauk 2019, p.214) – is one of the driving forces behind the creative process. Webster's (2002) conceptual model of musical creativity suggests that we alternate between the two states as we move through the various stages of creativity. This idea is fundamental to The Composition Engine as each stage has a divergent and convergent mode (see section 2.3).

2.1.6.3 Fractal, Recursive, Messy

Creative tasks like music composition are rarely linear or sequential, they "consist of different stages and subtasks" (Benedek & Jauk 2019, p.212) that require different levels of cognitive control. These smaller stages could be seen as fractal versions of the larger, like Russian nesting dolls, interdependent creative problems which require "many recurrent stages of generative and evaluative processes" (ibid., p.212). Burnard & Younker (2002) observed both linear and recursive approaches in the compositional activities of the music students they studied.

Lubart (2001, p.305) argues that "theories of the creative process need to specify in much greater detail how the subprocesses can be sequenced to yield creative productions". The inclusion of *phases* of work in The Composition Engine for each step of the creative process (see section 2.3) attempts provide this type of sequential process guide.

Conversely, it also important to be able to move through these phases in any order depending on the challenge or task being undertaken. Composer Iannis Xenakis, for example, emphasises the interchangeable order of his compositional practice (Holzer 2018, p.121). Webster's (2002) model "also accounts for the tendency to jump between stages, observable in many composers' less formally structured, sometimes erratic, working practices" (Nash & Blackwell 2014, p.3).

Not all process guides or sub-stages can be followed in every instance of the creative act. Hunches, curiosity, and instinct can guide us to try out the interesting ones (Boden 2004, p.224). The addition of randomness and serendipity (see section 2.4) can also be used to nudge us to new areas of conceptual space.

2.2 Table of Models

Fig.3 shows multiple models of creativity from the last century and beyondw. Due to the recursive and often non-linear nature of musical creativity, I have taken the liberty of rearranging their stages where necessary to better fit my own model.

Musical models, marked in blue:

- Graf (1947) examines luminary composers, from Beethoven to Wagner to Shostakovich.
- Xenakis (1963) describes his own working processes.
- Sloboda (1985) looks at the cognitive and psychological basis of creativity and refers to manuscript evidence such as sketches by Beethoven, Stravinsky, and Mozart, as well as verbal evidence from composers Rosemary Brown and John Sessions.
- Webster (2002) and Burnard & Younker (2002) examine music students.
- Collins (2005) analyses the work of a single composer through MIDI, save-as files, audio artefacts, think-aloud protocols, and interviews.
- Mazzola et al. (2011) use Joomi Park's compositions and case studies of Pierre Boulez and Beethoven.

	Preparation		Generation		Iteration		Evaluation	
	Gather	Specify	Ideate	Implement	Develop	Refine	Play	Verify
Helmholtz (1896)	Saturation		Illumination				Incubation	
Poincaré (1908)	Conscious Thought		Illumination	Conscious Work			Unconscious Thought	
Wallas (1926)	Preparation		Illumination				Incubation (incl. Intimation)	Verification
Rossman (1931)	Survey Available Info	Observe Need (incl. Analyse)	Formulate Solutions		Emergence of the New Idea		Experimentation	Analysis of Solutions
Polya (1945)	Understanding the Problem	Devising a Plan	Carrying Out the Plan					Examine the Solution
***Graf (1947)**	Experience		Productive Mood	Musical Conception	Composing Process		Artistic Fantasy	
Osborn 7-Step Model (1953)	Preparation (incl. Orientation)	Analysis	Ideation	Synthesis			Incubation	Evaluation
Synectics (Gordon, 1961)	Groundwork (incl. Immersion)		Divergent Exploration	Selection	Articulate Solution, Develope, Transform			
***Xenakis (1963)**	Initial Conceptions (Intuitions & Data)	Macrocomposition (Definitions)	Sequential Programming	Microcompositions	Modifications			Sonic Realisation (incl. Symbolic Result)
Universal Traveller Model (Koberg & Bagnail, 1974)	Analyse (incl. Accept the Situation)	Define	Ideate	Implement (incl. Select)				Evaluate
Amabile (1983)	Presentation	Preparation (re-activation)	Response Generation				Re-activation	Outcome
IDEAL Cycle (Bransford & Stein, 1984)	Identify Problems (incl. Learn & Look)	Define Goals	Act	Ancticipate Outcomes			Explore Possible Strategies	
***Sloboda (1985)**	Idea		Theme		Intermediate Form			Final Form
Creative Strategic Planning (Brandowski, 1985)	Analysis		Creativity		Action			Judgement (incl. Planning)
Fritz (1991)	Conception	Vision (incl. Current Reality & Plan)	Take Action		Adjust, Learn, Evaluate, Adjust		Living with Your Creation (time away)	
Osborn-Parnes CPS (1992)	Objective-Finding (incl. Fact-Finding)	Problem-Finding	Idea-Finding	Action-Finding (Acceptance-Finding)				Solution-Finding
Csikszentmihalyi (1996)	Presentation		Illumination		Elaboration		Incubation	Evaluation
Creative Problem Solving (Isaksen et al, 2000)	Exploring Data	Framing Problems	Developing Solutions		Building Acceptance		Constructing Opportunities	
PDSA Cycle (Deming, 2000)	Plan		Do		Act			Study
IDEO (Kelley, 2001)	Observation		Brainstorming	Rapid Prototyping	Refining			
***Webster (2002)**	Preparation		Working Through				Time Away	Verification
***Burnard & Younker (2002)**	Preparation		Illumination				Incubation	Verification
Sawyer (2003)	Acquire Knowledge (incl. Gather Info.)	Find the Problem	Generate Ideas	Combine Ideas	Externalise Ideas			Select Ideas
Mumford's Group (Scott et al., 2004)	Information Gathering	Problem Finding	Idea Generation	Implement (incl. Plan & Monitor)	Conceptual Combination		Concept Search	Idea Evaluation
UK QCA (QCA, 2005)	Questioning & Challenging	Envisioning What Might Be	Exploring Ideas		Making Connections & Seeing Relationships		Keeping Option Open	Reflecting Critically on Ideas
***Collins (2005)**	Postulating Broad Aims		Motifs & Ideas	Editing (General & Specific)	Restructuring			See the Broader Picture
Knörig (2006)	Preparation		Idea Generation		Elaboration			Evaluation
Sternberg (2006)	Know the Domain	Redefine Problems	Generate Ideas		Cross-fertalise Ideas		Take Time Off	Judge Ideas (incl. Sell, Perservere)
Possibility Thinking (Burnard et al, 2006)	Immersion	Posing Questions	Being Imaginative				Play	Self-Determination
Stages of Problem Solving (Cotton, 2016)		Problem Framing	Divergence (incl. Emergence)	Implementation				Convergence (Incl. Testing)
***Musical Creativity (Mazzola et al, 2016)**	What is the Open Question?	Describe Context (incl. Critical Concept)	Soften & Extend Walls	Test Your Extensions			Inspect the Concept's Walls	
Wang & Nickerson (2017)	Problem Finding	Information Finding	Idea Finding	Solution Finding				

Figure 3 - Models of Creativity

2.3 The Composition Engine

My CST, referred to in this commentary as The Composition Engine (fig.4), makes use of four overarching *stages* to map the creative process of music composition, each with a divergent and convergent *mode* of its own. Each of these *modes* has four *phases* that can guide the composer to a process or method of working. Selection of a *phase* can be done linearly, using chance and game-like approaches, or intuitively based on a composer's curiosity or frustration. Details of all the prompts and heuristics contained in The Composition Engine are beyond the scope of this commentary, but a full version is included as a PDF along with my portfolio. It can also be explored online at: https://jamesgordonmusic.com/the-composition-engine.

2.3.1 How is it Used?

The Composition Engine is a large, interconnected map containing digital cards that can be traversed using chance, intuition, or moved through step-by-step like a flow chart. It can be used as a process guide to help overcome challenges during the act of composition or it can provide stimuli for the generation of new musical ideas (or the mutation and variation of existing ones) while encouraging associative activation in the imagination.[7]

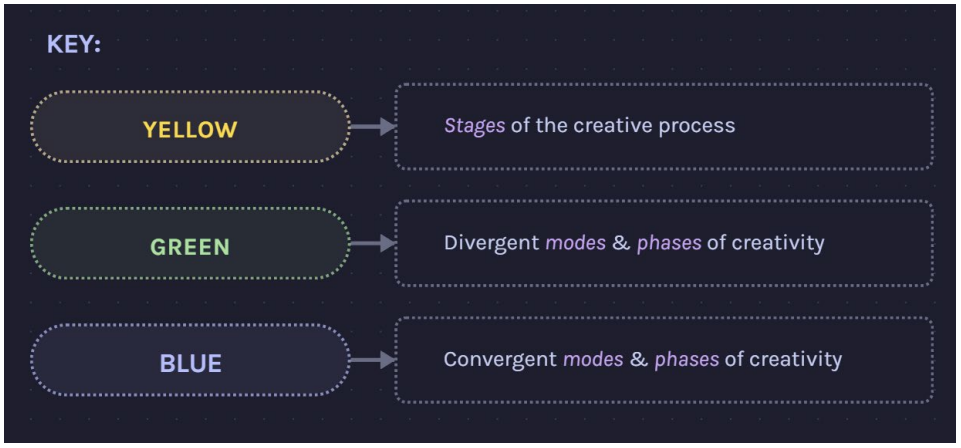
Users begin by selecting the *stage* of the creative process they are currently in (or desire to be in) from the inner circle of yellow cards (fig.4). They then choose which *mode*, divergent (green) or convergent (blue), in which to work. Each of these *modes* has four *phases* that can be selected. These are tasks that can be undertaken at any level of the compositional process, from micro to macro (from constructing a melody to combining or rejecting genre conventions that guide the style of a piece). *Phases* often overlap and interconnect and compositional tasks can fit into multiple phases. The goal here is not to be proscriptive, but to encourage users to try out the tactics and ideas in their own work, to offer practical ways to engage with their creative activities, and to nudge them to new areas of conceptual space. Each *phase* has notes and examples on adjacent cards to illustrate the types of work users might engage in. For example, the selection of Preparation (*stage*) | Specify (*mode*)| Decide & Distil (*phase*) could lead to the activity of sorting through and ranking the musical fragments the composer has previously generated using a creativity index.[8]

[7] Associative activation happens when an idea triggers a cascade of connected thoughts and ideas in our brains, like ripples in a pond (Kahneman 2011, p.53).
[8] Ideas are scored using pre-defined metrics, such as "originality" or "usefulness" (Runco & Acar 2019).

Around the outer perimeter of the canvas are further process guides, heuristics, stimuli, and prompts. Should a composer be seeking raw materials to work with or areas to explore, then selecting from the bottom (light blue) "Musical Ingredients" section could be useful. To the left are process guides taken from various models of creativity, concrete steps the composer can take to break through a creative block. Below that are cards containing interrupters, prompts, heuristics. These are taken from the literature on creativity and problem solving, but also contain my own original contributions in the form of Janusian Cards – prompts that encourage users to think about the opposite of each idea, such as "surround it / let it breathe" – and Antagonist Cards that suggest users take on different perspectives and even seek ways to sabotage their own work (all in an effort to break out of ruts and fixedness). There are further process guides for exploring conceptual space and modifying existing problems or ideas on the right side. At the top, in red, are ideas for alternate ways of engaging with the Engine. These include game-like approaches and concepts such as "fate questions", where users ask a question about what happens next in their composition and let the dice decide the outcome (see section 2.4.1). These fate questions can be tempered by expectations – "I think a chorus would normally happen here, does it?" – or kept entirely random.

Each of the *stages*, *modes*, and *phases* in The Composition Engine are explained below. They can be skipped or made use of as needed and work at both large and small scales, from the crafting of a single melody to organising the running order of an album (both of which are examples from my own use of the tool, see section 3).

Fig.4 Key:



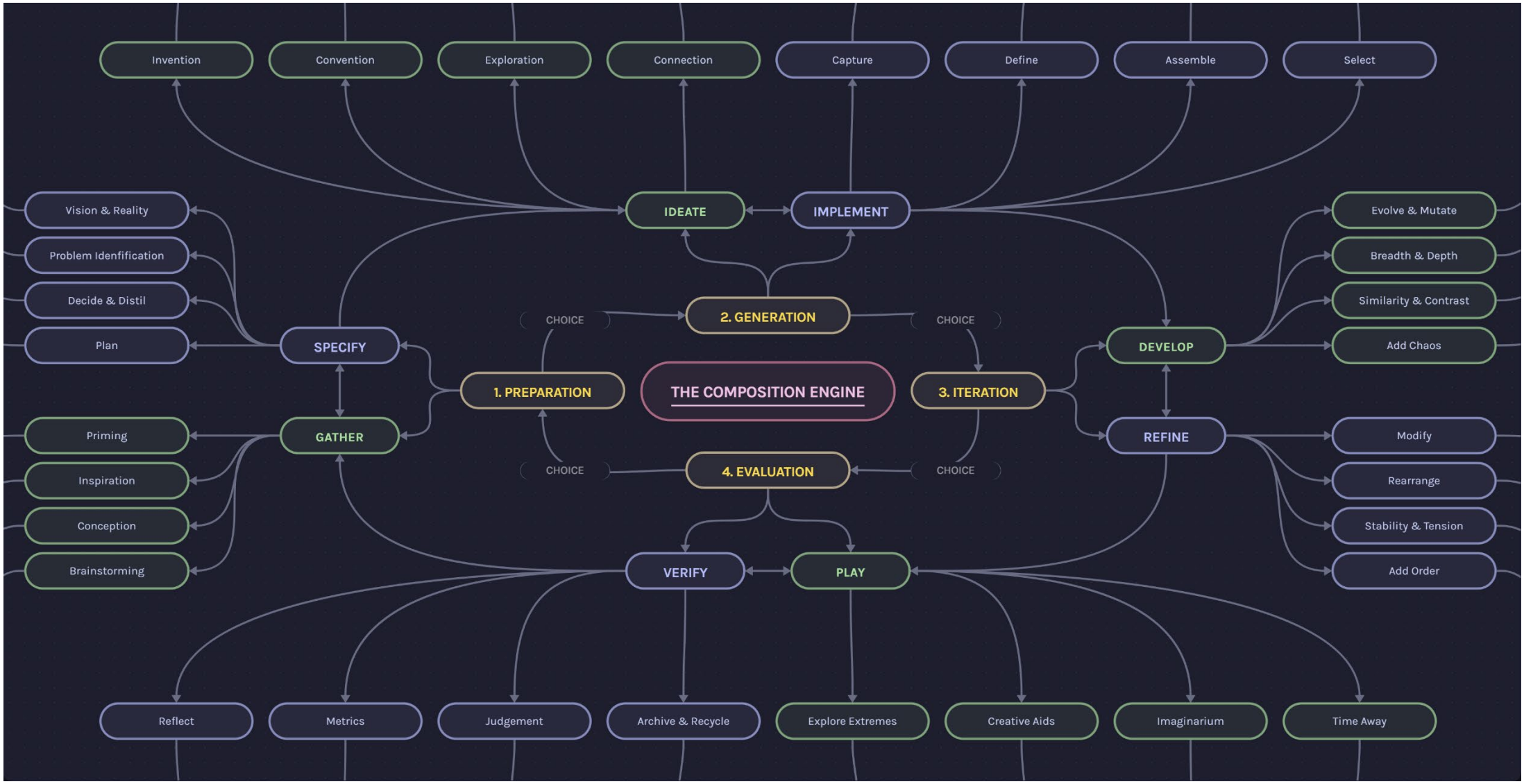


Figure 4 - The Composition Engine

2.3.2 Preparation

This is the *stage* where the gathering of tools, inspiration, and raw materials takes place. Motivation and intentions are primed, problems are discovered and defined, and plans are drawn up. The goal is to "encourage the development of preliminary expectations for a piece" (Young & Roens 2022, p.90). Limitations and restrictions can also be conceived here, as Stravinsky (1942) puts it: "my freedom will be so much the greater and more meaningful the more narrowly I limit my field of action and the more I surround myself with obstacles". In PaR terms, users undertake *Reflection-for-Action* and consider the shape of the project (Candy 2002, p.53).

2.3.2.1 Gather

This is the divergent *mode* of the Preparation *stage*. Here users collect inspirational material and gather ideas about the task at hand, such as songs, images, poetry, journal entries, etc. There are four *phases* of work that can be undertaken:

1. **Priming**: Use stimuli to cue motivation and more creative responses, includes images of achievement or novel examples of others' work (Haase & Hanel 2022).

2. **Inspiration**: Collect material to serve as inspiration or reference for the creative artefact (i.e. the music you are writing). "Prospecting" (Osborn 1963), "scratching" (Tharp 2003).

3. **Conception**: Think about the desired result, the form it will take, the "class" of the artefact, or its default generic shape (Fritz 1991). This might include "superordinate constraints" (Sloboda 1985, p.118), such as musical form.

4. **Brainstorm**: Conjure as many ideas as possible, discover near and far analogies, draft limitations, and broaden the possibility space (Osborn 1963). Not generating specific instances of an idea at this point but exploring the possibilities.

2.3.2.2 Specify

The convergent *mode* of the Preparation *stage*. Here users make decisions, distilling the ideas gathered, choosing the most interesting or appropriate to work on. The *phases* are:

1. **Vision & Reality**: Move to a specific idea of what the artefact should be, an 'instance' rather than a "class". Identify the current reality of how things stand and compare to your vision. This is the

motivic force that drives the creative process, the "structural tension" between what *is* and what *could be* (Fritz 1991).

2. **Problem Identification**: Identify, define, or construct the current problem you are trying to solve. This stage can lead to creative insights even before solutions are sought (Runco & Sakamoto, p.84). Limitations and restrictions can be conceived here, too, as they drive creative cognition and define our individual style (Kozbelt 2019, p.122).

3. **Decide & Distil**: Select elements, concepts, raw materials, limitations, processes, and strategies that are interesting or useful. "Pre-inventive forms" (Finke 1990) like a rough graphical score or seeded exemplars that violate constraints, break rules, or are conceptually distant can be worthwhile.[9]

4. **Plan:** Define some of the metacognitive aspects of the project, the second-order decisions about how you intend to proceed. Cope's (2012) Rules, Strategies, Tactics are an example. Plans lead to actions that produce direct experience of the plan (Fritz 1991). This resonates with praxis and PaR, in which *being-doing-thinking* are intertwined (Nelson, 2022).

2.3.3 Generation

The *stage* where ideas are generated. In the divergent *mode* of this *stage*, more is often better (Plucker et al. 2019, p.45) because "quality turns out to be (with surprisingly accurate predictive ability) a probabilistic consequence of quantity" (Baer & Kaufman 2005, p.3); *superfluity* (Simonton 2011). Moving beyond first notions is also important because "early ideas are not usually true ideas" (Spencer in Osborn 1963, p.131) and "distant associations and ideas found only after some time has passed tend to be, on average, the most original" (Runco & Acar, p.235). The convergent *mode* is focused on capturing and defining generated ideas.

2.3.3.1 Ideate

The divergent *mode* of the Generation *stage* of the creative process. Here, users come up with new material, generate new ideas, inventing and combining, exploring different areas of conceptual space. The *phases* are:

[9] Seeded exemplars are core examples that serve as a jumping off point or guide for the creative task (Ward & Kolomyts 2019).

1. **Invention**: Develop an original path between current reality and your vision (Fritz 1991, p.31). Generate ideas using elements from the earlier stages or through improvisation and imagination.

2. **Convention**: Adopt a path, system, or process that another composer or creator has already used to generate ideas (Fritz 1991, p.31). Borrow concepts and elements from artists who inspired you (seeded exemplars) and integrate them into your idea generation. Build upon and innovate from existing knowledge.

3. **Exploration**: Explore your field or instrument or concept. Let each idea suggest where you go next (Boden 2004). Like using a map to drive to unexplored regions, explorational creativity is about finding possibilities, "coulds" and "cans".

4. **Connection**: Bring two ideas together and compare, contrast, or combine them to see what results. You can include words, images, and sounds, or more abstract constructs like emotions, musical styles, etc. Combinations often synergise, "yielding *emergent features* that might be absent entirely or at least recessive in the original ideas" (Ward & Kolomyts, p.186). Cage (1961, p.28) refers to this as "splicing". Other terms include: "Bisociation" (Koestler 1964, p.3), "Conceptual Blending" (Fauconnier & Turner 2008), and "Combinatorial Creativity" (Boden 2004).

2.3.3.2 Implement

The convergent *mode* of the Generation *stage*. Here, users bring into being the ideas they have generated. They notate the fragment they have written, or record the vocal idea, or begin to cut-and-paste the parts to see how they fit together. The *phases* are:

1. **Capture**: Record or notate your nascent ideas, "catching each gleam and caging it as it comes" (Osborn 1963, p.324). Unwrap and unfold the compositional result of your ideation and capture it. "All of the content we are thinking about when composing should … be materialized as a concrete musical substance" (Mazzola et al. 2011, p.101).

2. **Define**: Express the "current reality" (Fritz 1991). What have you got so far? List the attributes of the idea to locate gaps and identify where further exploration may be fruitful or think about what the idea might be used for (a verse or chorus, for example). Examine the idea's walls, the "properties, characteristics, and specificities" of its current form (Mazzola et al. 2011, p.18).

3. **Assemble**: Begin to piece together component parts, placing ideas roughly into a structure (add to a DAW/project file, place it before or after another part or idea). Even if the placement makes no logical sense, the cognitive dissonance can spark further ideas: "creative individuals are able to tolerate opposites, paradoxes, and contradictions of ideas, stereotypes, structures, etc. in their thinking" (Runco & Acar 2019, p.231).

4. **Select**: Choose among the options and select what to work on based on instinct, what catches your interest, or using a metric from the Verify (2.3.5.2) phase. Using "selective retention" (Simonton 2011), ideas can be "insightfully selected" for their aesthetic (or other) qualities (Boden 2004, p.34).

2.3.4 Iteration

The act of evolving, mutating, refining, and developing ideas. Beethoven's sketching process, for example, was strikingly iterative, he "sketches the same passages again and again … as if the very act of writing prompted mutations that sometimes enabled Beethoven to see where he wanted to go – and sometimes not, resulting in a change of tack" (Cook 2021, p.50).

2.3.4.1 Develop

The divergent *mode* of the Iteration *stage*. Users explore variations and developments of the idea, fragment, or song. This can involve creating new versions, expanding current material, or introducing randomness. The *phases* are:

1. **Evolve & Mutate**: Elaborate, develop, and iterate upon your ideas (Guilford 1967). Try new versions and variations of your melodies or adjust the harmony and rhythm. Composers iterate through ideas and alter their process (and therefore their output) as they are creating (Laughran & O'Neill 2016, p.6).

2. **Breadth & Depth**: Expand out horizontally from the initial idea with repetition or variation. Or add depth and detail in the vertical dimension (more voices, more parts, more complexity). Composition involves "placing different musical entities in relation to one another on a vertical and/or horizontal level" (Sköld et al., p.214). An example of this is "deriving the harmony from stacking or verticalizing the horizontal phrase" (Melford 2000, p.123). Horizontal can also mean different elements that are related by their set or category (all the possible variations of a melody or prime versions of a repeated section), while verticality can mean the hierarchical relationship between categories (musical form is the superordinate structure within which

Sonata or Fugue are categories, while verse, chorus, bridge would be specific subordinate variations) (Deliège 2006, pp.71-72).

3. **Similarity & Contrast**: Develop the idea through analogy or associative activation. Seek related ideas or their opposites. Look for gaps, symmetry, and patterns (Boden 2004, p.114), perhaps by exploring cognitive hyperspace categories such as *Natural/Unnatural* or *Close/Remote*.[10] Musical Axes are a similar idea (Collier, n.d.): arriving/departing, dense/sparse, etc. "Dissonances are only remote consonances" (Schoenberg 1950, p.104).

4. **Randomness & Serendipity**: Introduce the unknown (Cage 1961, p.16), perhaps by folding in accidents created by other sounds that occur as you compose. Cage would often listen to the radio as he wrote (ibid., p.30) and incorporate the sounds he heard into his work (Tom Waits (2002) also used this approach). One of the dangers of iterating out from initial ideas is it is possible to get stuck in an area of conceptual space that is unproductive due to the fixedness of that initial concept or idea (Benedek & Jauk 2019, p.210). The addition of random noise can help break this fixity. Taleb (2012, p.134) refers to this as *stochastic resonance* (see section 2.4).

2.3.4.2 Refine

The convergent *mode* of the Iteration *stage* involves editing and organising the fragments and ideas generated thus far. This can involve trimming or manipulating a melody, rearranging a song's structure, or adjusting the details of a lyric. The *phases* are:

1. **Modify**: Adjust, reshape, and redefine the materials you currently have. Altering the underlying chords can modify the meaning of the melody, for example. Bernstein (1976, p.162) likens this to an adjective modifying the meaning of the noun: "a slight elaboration, or an added voice, or a structural ambiguity, or a change in the dynamics of loud and soft".

2. **Rearrange**: Try the component parts in new configurations and seek patterns. Interchange elements, look for other shapes, layouts, or sequences (Osborn 1963, p.287). It helps to have an "explicit representation of blocks of material at multiple temporal levels … to enable the quick rearrangement and editing of material" and support experimentation in the studio (Duignan & Biddle 2010, p.26). Beethoven would often turn his concept sketches into continuity drafts to test how things would fit together (Cooper 1990, p.113).

[10] Cognitive Hyperspace describes all the possible directions a thought may diverge, drawing upon a large number of conceptual categories (Runco & Acar 2019, pp.231-232)

3. **Stability & Tension**: Look for moments where stability or tension can be added or highlighted. These define the dynamic motion of a piece. Tools like melodic contour, harmonic rhythm, lyric-setting, etc. can help craft stable/unstable ideas at every level, from micro to macro (Pattison, n.d.). Repetition can represent stability here, while variation adds tension.

4. **Add Order**: Organise, structure, or make sense of the disparate elements. This could involve a *deductive* – "devise a plan for the global structure and let the details follow" (Höller 1984, pp.67-68) – or *inductive* approach, where you build up from the smaller cells or fragments into a larger structure, branching out like a snowflake. Composer Sebastian Currier suggests that working top-down or bottom-up are both viable options: "the problems … are complementary. In each case the difficulty is to reconcile the large-scale structure with the smaller-scale details" (McCutchan 1999, p.231).

2.3.5 Evaluation

This *stage* involves examining ideas, playing with them, testing, verifying, and judging. You might "develop a different relationship with your creation than you had while you were working on it" (Fritz 1991, p.38). Users alter their perspective to become the audience for their creation, enabling them to evaluate it and relate to it "by virtue of its own merits" (ibid., p.38). This *stage* is vital to PaR because "reflective and conceptual activities [are] inseparable from physical activities" (Zembylas & Niederauer 2018, p.60) and their monitoring is "part of, and not somehow outside, the enactments of practice" (Shove et al. 2012, p.100).

2.3.5.1 Play

The divergent *mode* of the Evaluation *stage* involves exploring and tinkering with the ideas generated. By engaging in different types of play (such as using creative aids or engaging in mimicry) users can loosen the extrinsic expectations and limitations of their work and perhaps find new and more original variations or, at the least, understand it better. This is "a time for exploring possibilities, constructing strategies, taking time off from the problem, play, and concept searching" (Harrison 2016, p.74). The *phases* are:

1. **Explore Extremes**: Push the idea to breaking point or take it apart and see what makes it tick. Remove aspects to see if it still works (or works better). Break, delete, magnify/minify, etc (Osborn 1963, p.286). Schoenberg (in Cage 1961, p.24) suggests that the eraser end of the pencil is just as important as the writing end. At the final stage of composition Cope (2012, pp.275-276) feels free to "change pitches, rewrite entire sections, and/or eliminate material as I see fit".

2. **Creative Aids**: The use of tools and toys can help visualise an idea or part of the creative process and interrupt its fixedness. For examples, see Eno's (1975) *Oblique Strategies* cards and Roger von Oech's (2011, p.40) *Ball of Whacks*.[11] Games and play can be an important part of this process as they can be leveraged to encourage exploration of new areas of conceptual space and to "subvert musical expectations" (Weiss 2017, p.5).

3. **Imaginarium**: Free the mind to play with the idea in new ways. These flights of fancy – artistic fantasy (Graf 1947) or guided fantasy (Garfield et al. 2001) – can suggest "different vantage points from which to consider the problem" and "encourages individuals to think of a fantasy world distant from the task and use elements of it in generating ideas" (ibid., p.234). DeBono's (1999) "Thinking Hats" are another approach.[12]

4. **Time Away**: Allow the idea time to incubate by temporarily withdrawing from the task or problem (Wallas 1926). This can loosen the fixation on an idea and encourage novel solutions and connections to occur (Ward & Kolomyts 2019, pp.185-186). Allowing room for the mind to wander when not engaged in creative tasks can lead to spontaneous solutions and eureka moments (Benedek & Jauk 2019, p.205). As important as incubation can be, it is vital to remember that "this unconscious work is not possible, or in any case not fruitful, unless it is first preceded and then followed by a period of conscious work" (Poincaré 1914, p.56).

2.3.5.2 Verify

The convergent *mode* of the Evaluation *stage*. Users take time to reflect, measure, or make editorial judgements about the work they have done. Archiving and recycling material for future use is a useful part of this process (a melody that is not be suitable for *this* piece might prove ideal for another). The *phases* are:

1. **Reflect**: Consider and reflect upon the results of your work. This is vital for continued professional development as a composer and is foundational for PaR. By understanding the nature of our practice we are better able to make explicit the tacit parts of our craft. "Self-assessment is a crucial part of art-making" (Young & Roens 2022, p.35). Schön's (1983) *reflection-in-action* and *reflection-on-action* are relevant here as, during this phase, "one is learning and

[11] A series of magnetic rhomboid pieces that can be rearranged into various structures other than the initial "ball" state, used to encourage creative thinking through metaphor and analogy as well as visualisation and physical manipulation.
[12] DeBono suggested that "we can arrive at more creative and better solutions to problems by donning six different thinking hats" (Sternberg 2019, p.90), ranging from objective and unbiased to emotional and value-laden.

adapting their own understanding … and that new information is 'talking back' or 'feeding back' into the process" (Seevinck 2022, p.442).

2. **Metrics**: Score the idea or piece using metrics like originality, aesthetic quality, usability, etc. Wiggins et al. (2015) suggest four parameters for evaluation: Artefact, Creator, Audience, Context. A creativity rating can be "correlated with originality and appropriateness" and can be compared "in relation to an individual's entire output", described as a *creativity index* (Runco & Acar 2019, p.234).[13]

3. **Judgement**: Evaluate the success of the idea/piece. "Some judgement is involved in all creative problem-solving. It is good to have original ideas but it is also vital to know which ideas are the most original [and useful]" (Runco & Acar 2019, p.242). Self-evaluation is dependent on domain-specific expertise, social context, experience, and the intentions of the individual (Agres et al. 2015, p.2). Bad ideas as well as good are useful in PaR as "the nature of artistic enquiry is necessarily disordered, and … 'failed experiments' are both valid research products and an important part of a rigorous research process" (Leedham & Scheuregger, p.81). Effort is not necessarily a good indicator of success, so conducting a post-mortem like this is important: "It's just as hard to write a bad verse as a good verse … The cutting of the gem has to be finished before you can see whether it shines" (Cohen 2003, p.337).

4. **Archive & Recycle**: Sort through and save generated material. This is useful for *backtracking*, where the creator "returns to an idea that had been previously rejected because nothing better was found" (Simonton 2011). Also, producers often "treat their entire archive of past musical projects as a giant library of material to fuel current and future projects" (Duignan et al. 2010, p.30). Author and productivity guru Tiago Forte (2022) refers to these as "intermediary packets".

2.4 Stochastic Resonance

One of the main approaches facilitated by the Composition Engine – and CSTs in general (Minas & Dennis 2019) – is to encourage *stochastic resonance* or the adding noise and randomness to a system to benefit from serendipitous collisions and juxtapositions (Taleb 2012, p.134). Injecting randomness can light up the large-scale neural networks that deal with associative activation and combinatorial creativity in our brains and can have a *priming* effect.[14] Associative activation is the linking of one concept to another in our neural network via associations like *contiguity* (a baby's shoe suggests the child), *similarity* (a lion

[13] See section 3.2 for my own approach to this.
[14] The presentation of "a stimulus designed to subconsciously implant a concept in working memory that alters subsequent behavior" (Dennis et al., p.195).

suggests your cat), or *contrast* (a small person suggests a giant) (Osborn 1963). These associations can also prime other connections, so a single idea can cascade outwards like ripples on a pond (Kahneman 2011, p.53).

2.4.1 Drawing the Sortes

Throughout history many societies have developed a means of utilising randomness in their decision-making, through the drawing of lots or throwing of dice.[15] Often linked with fortune-telling or divination, these tools were "really meant to pick a random exit without having to make a decision, so one would not have to live with the burden of the consequences later" (Taleb 2012, pp.136-137). Examples include the *Sortes Biblicae*, where the reader would use random passages selected from the bible for guidance; *Sortes Sanctorum*, which made use of dice to select from a text that contained 216 "answers" (Luijendijk & Klingshirn 2019); and the *I Ching*, an ancient Chinese text often used as a decision-making tool (Wilhelm 2003). Composers and other creatives have used these tools as part of their creative processes. John Cage (1957), for example, used the *I Ching* in his compositional practice. The Composition Engine encourages this approach, acting as a type of *Sortes Musica*. Fig.5 is an example of some the prompts that users can draw from to encourage stochastic resonance.

[15] "[A] number of divinatory texts survive from the third through seventh centuries in Greek, Latin, Coptic, and Syriac" (Klingshirn 2015, p.99)

Figure 5 - Example prompts

3 Discussion & Analysis

3.1 Musical Context

The music in this portfolio is centred around acoustic rock and folk, with elements borrowed from film composition, art music, sound design, musique concrète, and experimental composers (like John Cage, Edgard Varèse, Luciano Berio). There are similarities in my work to progressive rock music (Tool, Frank Zappa, Opeth), such as complex metre changes and rhythmic elements, non-standard tunings, and extended techniques for the guitar. My approach differs from certain stylistic conventions of heavy progressive music, like the distorted guitars and aggressive vocal styles, focusing more on acoustic instruments and folk elements. Artists like Steeleye Span, Tickawinda, Show of Hands, Le Mystere Des Voix Bulgares, and more modern acts like The Civil Wars and Gazelle Twin serve as inspiration. Tigran Hamasyan and Sufjan Stevens also provided formative examples, the former for his use of progressive metal elements in more acoustic styles, especially on *Mockroot* (2015) and the latter's blend of acoustic and electric rock melded with orchestra, brass, and choir as on *Illinois* (2005) (Taffel 2021).

Many of the pieces in the portfolio developed out of experiments and prompts that involved manipulating samples, found sounds, and noise and these were influenced by a range of artists, such as Autechre, Karlheinz Stockhausen and Pierre Schaeffer. Alongside these influences are elements from classical music (Béla Bartók, Olivier Messiaen, Igor Stravinsky), as well as film composition and cinematic sound design (Hans Zimmer, Ludwig Göransson). These aspects can be heard most clearly in the introductions to the various pieces in the portfolio as they were often the thematic seeds from which the rest of the song was developed.

3.2 Previous Work vs Current Portfolio

To gauge the benefits of the Composition Engine as a Creativity Support Tool, it would be useful to understand the state of my practice prior to engaging in this research. If we discount collaborative efforts and band-based songwriting and focus instead on my work as a solo artist, there are three main releases that can be used for comparison:

- *Circus* (Gordon 2015)
- *Monsters* (Gordon 2018)
- *Sins* (Gordon 2020; Gordon 2022)

These fifteen songs where I was the sole composer, performer, and producer can help provide a sense of my praxis prior to this PhD:

Song / EP	Metre	Tuning (Guitar)	Instrumentation	Harmony / Key / Notes
Circus (2015)				
I'm Your Monster	6/8 > 4/4	Drop Db**	Drums, Bass, Guitars, Vocals, Piano, Strings, Bell	Db minor
Old Lover's Ghost	4/4	Drop D*	Drums, Bass, Guitars, Vocals	D major
Smile Before You Die	4/4	Drop D	Drums, Bass, Guitars, Vocals	D minor
I Know it Hurts	6/8	E Standard	Drums, Bass, Guitars, Vocals, Piano, Choir, Strings	D major / B minor
For the Love of the Game	6/8	Drop Db	Drums, Bass, Guitars, Vocals, Choir, Strings	Ab minor / Gb major
Monsters (2018)				
From the Deep	6/8	E Standard (Capo 3)	Drums, Bass, Guitars, Vocals, Piano, Strings, Accordion	C harmonic minor; chromatic mediants in the bridge
Blood Drunk	6/8	E Standard	Drums, Bass, Guitars, Vocals, Piano, Strings, Bell	E harmonic minor / A minor
Until Your Body Grows Cold	4/4	E Standard	Drums, Bass, Guitars, Vocals, Choir	A major; pre-chorus has bars of 2/4 and 6/4
I Know My Name	4/4	Drop Db	Drums, Bass, Guitars, Vocals	Db minor / Db phrygian dominant
Haunted By the Sky	4/4 > 6/8	Eb Standard***	Drums, Bass, Guitars, Vocals, Strings	F# minor / C# minor
Sins (2020-24)				
Sin	4/4 swung	Drop Db	Drums, Bass, Guitars, Vocals, Piano, Strings	Db minor
Candlelight	6/8	Eb Modal****	Drums, Bass, Guitars, Vocals, Piano, Strings	Eb major
House of Broken Bones	4/4	Eb Standard	Drums, Bass, Guitars, Vocals, Brass	Ab major
Nailed to My Heart	4/4	Drop Db	Drums, Bass, Guitars, Vocals, Piano, Strings	Db major
First We Burn	4/4	Eb Modal	Guitar, Vocal	Eb major

* ***Drop D*** *(DADGBE): Low E string is tuned down a whole tone to D*
** ***Drop Db*** *(Db Ab Db Gb Bb Eb): Drop D, then all the strings down a semitone*
*** ***Eb Standard*** *(Eb Ab Db Gb Bb Eb): E Standard down a semitone*
**** ***Eb Modal*** *(Eb Ab Db Eb Bb Eb): E Modal Tuning, G-string tuned down to an E, then all string lowered by a semitone*

Figure 6 - Early solo work

The instrumentation hews to the standard rock band set with the addition of strings and occasional new flavour, such as the brass in 'House of Broken Bones' (link, 0:03). My selection of metres was limited to 4/4 and 6/8 with some mixed metre that combined the two, as in 'I'm Your Monster' (link, 0:54). Harmonically, I rarely ventured far from the relative major or minor of the key that I started in. The bridge occasionally provided an opportunity for me to break out of the fixedness of the harmony (i.e. 'From the Deep' link, 3:17), but I largely coloured within the lines of the pop and rock chords I was familiar with. I used a standard set of guitar tunings for the styles I was writing in, Drop D and semitone down being common rock tunings. The Eb Modal tuning of 'Candlelight' (link) is the first indication of exploring beyond the bounds of my usual *habitus* by tweaking the framework and affordances (Gibson 1977) of the instrument.

Following is a breakdown of my most recent work (see portfolio):

Song / EP	Metre	Tuning (Guitar)	Instrumentation	Harmony / Key / Notes
A Mischief of Magpies (2024)				
A Mischief of Magpies	6/8	E Standard	Drums (+ Gamalan), Bass, Guitars (+ Theorbo), Vocals, Piano (+ Cimbalom), Strings, Skull Whistle, Bowed Metal, Foley (magpies, bonfire)	Modulates by a b5 from F Harmonic Minor verse to Bm chorus (via a pre-chorus of Db C7 Eb+ D+)
False Alive, False Dead	Bars of 4/4 + 8/12 (4/4 with a metric modulation 120-80bpm)	B Baritone*	Foley (ticking clock), Guitar (Baritone), Vocals, Nyckelharpa, Hurdy-Gurdy, Strings	B Hungarian Minor; inspired by Bartok's (1915) 'Romanian Folk Dances'
These Silent Bones	4/4 (undulating tempo, accel./rit. between 97-175bpm every 6 bars)	D Hung. Minor**	Perc. (bones, brushes, tambourine), Guitar, Vocals, Tagelharpa, Prepared Piano, Contrabass, Choir	Chord clusters (Am11(b5), Gm11(b5), Bdim, D+); vocal harmony and choir stabs inspired by Bulgarian Folk Choirs such as The Bulgarian State Radio & Television Female Vocal Choir
The Unkindness of Ravens	4/4	B Standard	Drums, Bass, Guitar (Baritone), Vocals, Choir, Cimbalom, Piano, (+Prepared Piano, Bowed Piano), Strings, Brass, Foley (crows)	B Hungarian Minor; verse (Bm, G7, F#sus2, G7, C7), chorus (dissonant clusters: Bm(#11), D(#9) Gb minmaj7(add11), F(b9b5), Esus2 (b9, add11)
The Old Witch Comes	9/4 > 4/4	E Standard	Piano, Vocals, Strings, Recorders	A minor (elements of Hungarian Minor); chorus = dissonant clusters based around C Lydian #2 (Cm maj7, B add11(#5), Am #11, G+, Ddim7)
The Bleeding Tree	4/4	D Hung. Min Quarter***	Perc. (bodhran. bones, stomps, piano sides, shaker), Bass, Guitar (+microtontal fretletes, behind the nut), Tagelharpa, Mandolin, Vocals (+ throat singing), Felt Piano, Strings	Microtonal clusters; A section based around root of G; B section root motion G Ab Bb; C section root motion G F G Bb A; structure is Bridge Form
Sineater	9/8	D Hungarian Minor	Drums, Bass, Guitars (+rubber bridge), Vocals (+ backing vocal b2 harmony), Piano, Music Box, Viola, Violin, Cello (jete), Recorder, Nyckelharpa	Clusters based on G# Persian scale: Intro (Abmaj7 (b9, b5), verse (Dm Ddim, Dsus4),chorus (E/Bb, D#11). Inspired by Berio's (1964) 'Black is the Colour'
Doctor Fell	4/4	D Hung. Minor (Capo 2)	Drums, Perc. (udus, sticks, scrapes), Guitars (+ Passerelle bridge), Vocals, Piano, Viola, Contrabass, Nyckelharpa (+ Hurdy-Gurdy), Foley (bell)	Dissonant clusters (E F G# A#) with some chromaticism; Passerelle section (D G# A, E G# D A)
A City of Rust and Bone (2024)				
A City of Rust and Bone	6/4 > 4/4 > 5/4	Eb Standard	Drums, Perc. (Gamalan, clock), Guitars, Vocals (+ whispers, murmurs, breaths, groans), Choir, Piano (+Prepared Piano), Strings (+ Cello Jete), FX (scraped & bowed metal), Foley (rain, thunder)	A section = C#m to C#maj; B section = G# to Am, F Cm
Clockwork Sky	4/4	D Hungarian Minor	Drums, Perc. (Piano hits, ticking clocks), Bass, Guitar (+Baritone, rubber bridge), Vocals, Vocal FX (breaths, rhythmic chops, ticks, hisses), Piano (+Cimbalom), Strings, FX (backmasking, tape)	Dodecaphonic melody, open G# and A of guitar 'let ring' over each chord to create clusters; verse = Dm#11, Bb7/D, D(#11), Gm6/9, Eb add11/A; chorus = F#m add9, D(#11)/F#, A+/F, B7sus4/E
Once and Future Queen	Bars of 5/8 + 6/8 > 4/4	E Standard	Drums, Perc. (tribal), Bass, Guitars (+ Bowed Guitar, Mandolin, Harp), Vocals, Vocal FX (rhythmic chant), Choir, Piano (+ Cimbalom), Strings, FX (bowed metal)	D minor modulates via chromatic mediant to F# major; verse = Dm Bb7(b5)/D, Asus4(b9), A; chorus = F#, Dsus4, Amadd9, Csus2, E+
Orphan's Curse	6/8	D Hungarian Minor	Perc. (bell, piano hits), Guitars, Vocals, Piano, Accordion, Foley (sea)	Clusters: Dm, Dm7, Gsus2(b9), Gbm(b13), F6(#9), Ebsus4
Lords of the Lamp	4/4	Drop D Inverted****	Drums, Perc. (piano hits), Bass, Guitars (+ fretless), Vocals, Choir, Piano, Strings, Winds, Foley & Sound Design (rain, waves, bell, foghorn)	Verse = G minor; Chorus = Fm7, Bm(b13), F(#11), Dbsus2, Bbsus2(add11), Gbsus4
Roll the Bones	4/4	D Hungarian Minor	Drums, Perc. (bones, booms), Bass, Guitars (+ passerelle, lyre, baritone), Vocals, Vocal FX (filtered harmony), Choir, Piano, Recorders, Strings, Brass	D minor > G minor; intro / bridge use of recorders inspired by 'Fire Leap' from *The Wicker Man* (1973)
Shadows Waiting	4/4 (rubato tempo 115-130bpm)	E Standard	Vocals, Choir, Piano, Sound Design (foghorn drone, grain swell), Foley (pump)	E minor; inspired by sprechstimme

* ***B Baritone*** *(BEADF#E): Baritone guitars are commonly tuned a perfect 4th down from standard guitar tuning*

** ***D Hungarian Minor*** *(DADG#AD): Tuning of my own invention, variation on DADGAD, altered to include the #4 of Hungarian Minor Scale*

*** ***D Hungarian Minor Quarter Tone*** *(D A (quarter flat) D G (quarter sharp) G# D); variation on previous tuning using microtonal tuning*

**** ***Drop D Inverted*** *(EADGBD): rather than drop the low E string to D, the high E string is tuned down to D instead*

Figure 7 - Work produced with The Composition Engine

3.2.1 Comparison

Use of The Composition Engine expanded my horizons, encouraging a willingness to experiment with various elements of songwriting and composition, such as metre. Aside from introducing more complex and odd time signatures, I explored interleaving bars of different feels and time with mixed metre, as in 'Once and Future Queen' (1:04). While this is common in many styles of music, it is less so in the classic rock and pop music of my songwriting *habitus*. Experimentation with irrational time signatures – where the denominator is something other than a standard note division, inspired by Ferneyhough (2008), who described them as a distant analogy of metric modulation – led to the following example from the portfolio, which I've notated using both bars of irrational time and metric modulation for clarity.

'False Alive, False Dead' (0:12):

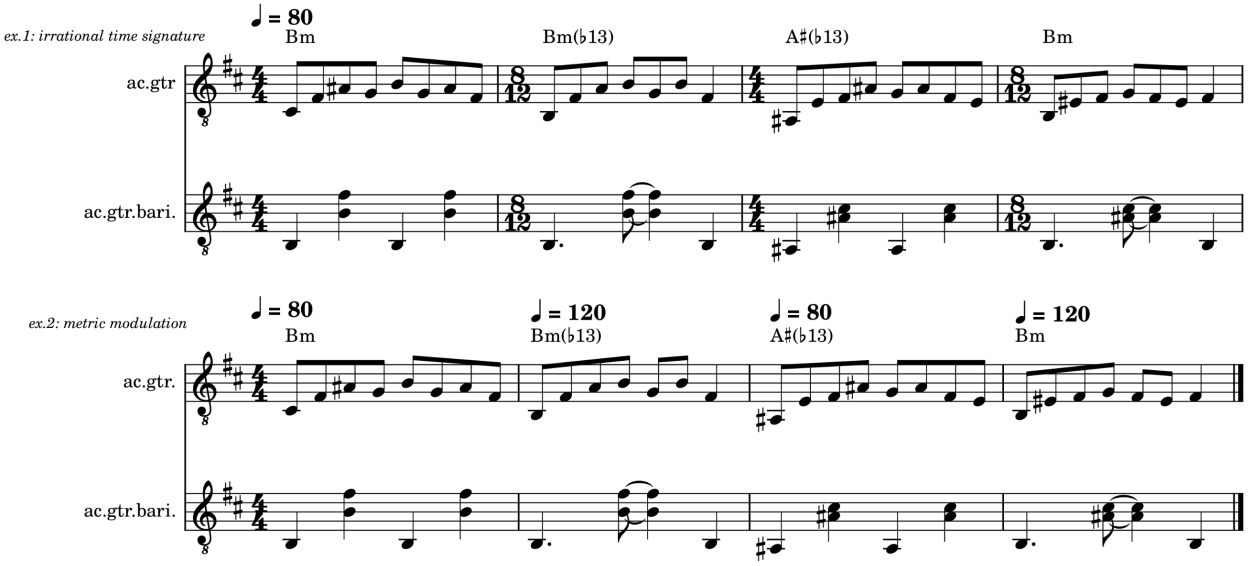


Figure 8 - Irrational time signature example

The "12" in the denominator of the time signature identifies that the bar is a triplet feel while the numerator "8" indicates that there are two full beats followed a third partial beat. Those irrational bars were conceived as a triplet pattern but with the last note cut off to evoke a sense of acceleration (counted 1 + a 2 + a 3 +).

Altered guitar tunings became a vital source of musical ideas in the portfolio. As the guitar is my main compositional instrument, its affordances steer the choices I make as a songwriter, limiting the areas of conceptual space available to explore. By manipulating the standard framework and adjusting the tuning, new options became available. A Composition Engine prompt – *Modify* | "Change the Playing Field" – led to the D Hungarian Minor tuning that formed the basis for seven of the songs (see fig.7). Dealing with the dissonance of having G# and A on adjacent strings led to new ways of fingering chords

that proved to be hugely inspiring. This also led to more clusters and complexity in the harmony of many of the pieces as I used the open strings of the guitar to add upper extensions to the chords being played (see fig.12). This tuning encouraged exploration of unfamiliar scales and chords, which hugely impacted my approach to writing vocal melodies (described in my composition journal as "painting myself into a corner then trying to puzzle my way out").

My use of The Composition Engine led to the exploration of extended articulations for the guitar in ways I had not previously considered. I made and converted my own instruments (fig.9) – fretless guitar, microtonal guitar with additional "fretlets" (Çoğulu 2023), Koto-style instrument using the Passerelle bridge (King 2018) – which were vital in my exploration of new sounds. The creation and use of these unfamiliar (to me) instruments all came from suggestions or connections generated with The Composition Engine as it guided me to "soften the walls" of the tools I used to compose, pushing me out of my comfort zone. This experimentation continued with sound design and the creation of my own samples, like jeté on a violin that I pitched down to the cello's range ('The Unkindness of Ravens', 1:30) and behind-the-nut picking on the guitar ('The Bleeding Tree', 2:42).[16] I also explored new instruments and sample libraries, including bones for percussion, cimbalom, recorder, Nyckel– and Tagelharpa, etc.

Figure 9 - Modified Guitars

[16] The short section of strings that run from the nut to the tuners of the guitar is strummed, creating an atonal cluster.

One of the largest areas of expansion for my creativity came in the use of non-musical elements and musique concrète-type materials I captured, such as the squealing roar of a refuse lorry or the chattering of magpies in my back garden. Many of the songs in the portfolio grew out of these experiments in sound design and my attempts at composing with these materials can be heard in the introductory sections in many of the tracks, including 'A Mischief of Magpies' (0:01).

Another area of growth came from exploring extended vocal techniques. Prompts and associative activations in the *Preparation* phase led me to Luciano Berio's (1967) 'Visage', Harrison Birtwistle's (1996) *Gawain*, and Trevor Wishart's (1990) 'Vox 1'. Hearing their use of vocalisations encouraged my own use of breaths and syllabic utterances in pieces like 'Clockwork Sky' (0:49) and 'A City of Rust and Bone' (0:02). Applying these more experimental ideas in a popular music context led to endless creative possibilities. Other vocal expansions included the use of the operatic technique of *sprechstimme* as a starting point for 'Shadows Waiting' (0:15) – though the result is more of a narrative reading – and learning the basics of Tuvan throat singing and sub-harmonic growls to add a sense of threat and menace to 'The Bleeding Tree' (0:34).

The use of the Composition Engine represents a sea-change in terms of the types of material and ideas I was able and willing to work with when composing. Limitations and restrictions, of which I had been unaware, shaped my compositional choices, from the norms of my songwriting *habitus* to the affordances of the software and instruments I was using. Being able to explicitly question these assumptions and "soften the walls" using The Composition Engine has been one of the biggest benefits to my practice.

3.3 Music Created in Various Stages of the Model

The following examples from my work are based on prompts and ideas generated using The Composition Engine during the writing, recording, and production process. I have divided them up into case studies based on which part of the model I was working with when they arose. Tracking an idea from its initial conception and locating it in the final piece can be challenging as fragments are developed, iterated upon, and integrated into the piece over the course of weeks or months. What started as clear evidence of the prompt or heuristic often became obscured as the recording and mixing continued and the idea evolved and merged with the gestalt. I've tried to be as clear as possible when following the thread of a prompt to an idea and then to its final instantiation in the portfolio, but it's easy to forget how messy the actual journey was when examining it after the fact.

3.3.1 Preparation

3.3.1.1 A Mischief of Magpies

One of the earliest uses of the Composition Engine in my work came from trying to write a prototypical exemplar, a piece that defined the direction I wanted to go with the portfolio. At this stage, I had no clue, musically or thematically, what I wanted to write and the extrinsic pressures of deadlines and external academic judgement caused a severe case of writer's block. Actively engaging with the *Preparation* stage, allowing for remote connections and associative activations, helped kickstart the writing process. The first "lightbulb" moment occurred as I explored an early prompt – from the *Gather* | *Brainstorm* phase – to create a word cloud that evoked lyrical, musical, and thematic ideas:

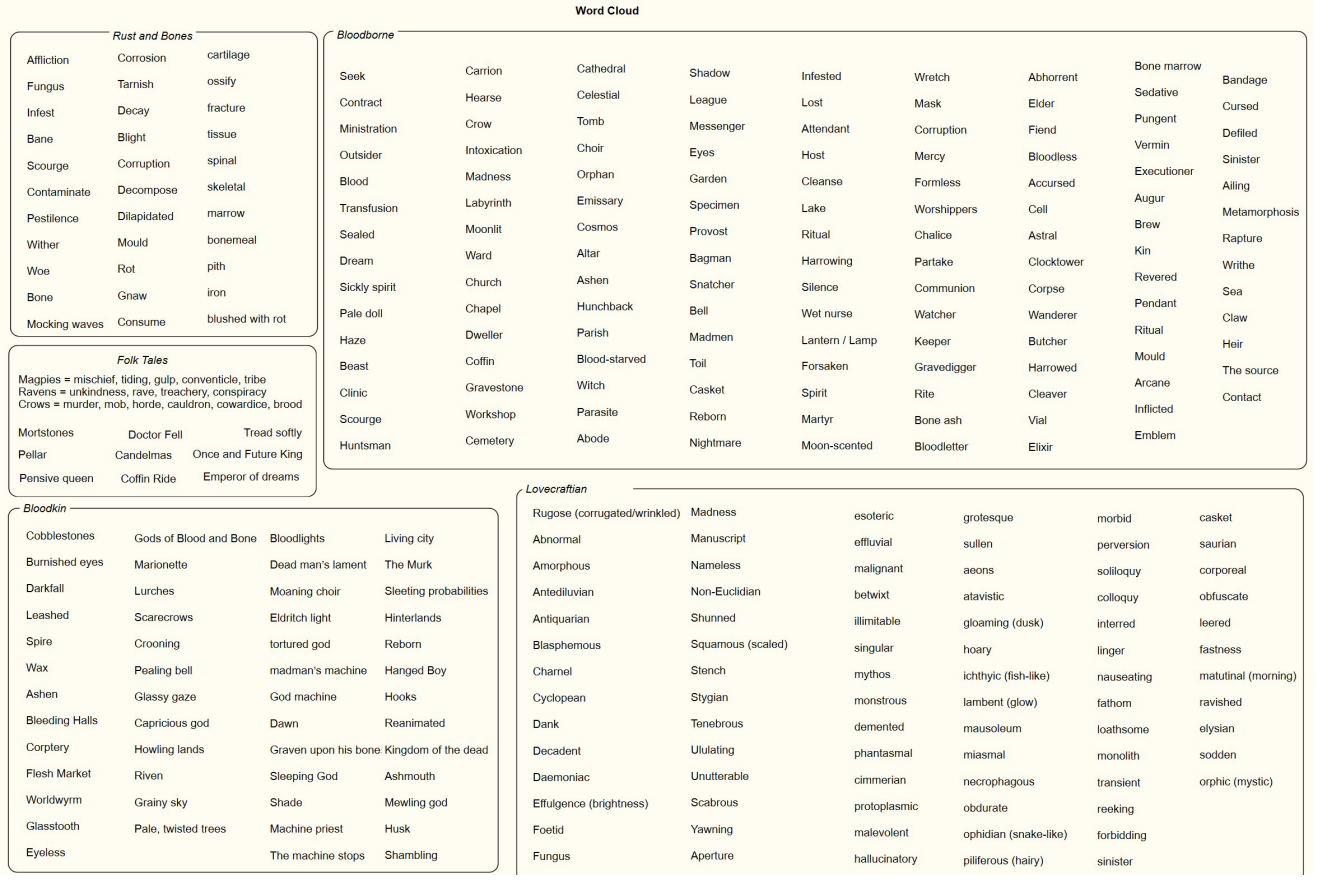


Figure 10 - Word cloud example

Many of the lyrical themes that appear in the final pieces are present in this very early exercise in associative activation ("bone", "lamp", "ravens", "mocking waves", etc.), but the one that resonated early on was "magpie". This led to a series of unfolding mental connections and associative activations that started in folk tales and ultimately resulted in the title track of one of the albums in the portfolio and defined the direction of the whole project.

Folk storytelling is often centred around visceral and liminal rituals (Sims & Stephens 2011, p.109), the births, deaths, and marriage-rites of the community, passages from one world to the next.[17] This concept led to the idea of magpies and crows as psychopomps, mythical entities that escort the newly deceased to the afterlife. Another connection leads to magpie rhymes – "one for sorrow, two for joy" – and I was enamoured with the idea of writing one of my own (see 'A Mischief of Magpies', 0:36). The rhyme has its origins in "ornithomancy superstitions", where the magpie is considered a bird of ill omen in many cultures (Opie & Tatem 1989, pp.235-236). Collective nouns used for a group of magpies led to the serendipitous discovery of "mischief", which was pleasingly alliterative and led to the title of the song. The collective nouns for other Corvidae birds, such as crows, also appear here and, subsequently, in the lyrics of 'The Unkindness of Ravens'.

"Folk tales" inevitably led to "folk music" and I discovered that, rather than being a set style with defined genre conventions and strict limitations of form, folk music is instead "more of a working practice", where people take "available musical resources and develop strategies to make good use of them" (Slobin 2011, p.3). This openness to incorporating new ideas into the folk framework aligned with my desire to fold ideas from musical styles that differed from my *habitus* – such as experimental and orchestral music – into my writing.

Once I had the lyrical seed of this prototype piece, the *Specify* | *Decide & Distil* (2.3.2.2) phase helped me create pre-inventive forms and identify the seeded exemplars that would provide the main sources of inspiration for the song both lyrically and musically. This included evocative lines from old English folktales – such as "buried under marble stones" and "curse the fiends, their children too, and their children forever true" (Philip 2022) – and the unsettling cosmic horror of Robert Chambers' (1895) *The King in Yellow,* alongside poets like William Blake (1793).[18]

The physical nearness (a cognitive hyperspace attribute, see section 2.3.4.1) of inspiration sourced from Blake and Chambers (bold in fig.11) plus the associative connection of "royalty" led to me combining Blake's "pensive queen" with Chambers' "King in Yellow" to create my own character. The Yellow Queen became a common thread connecting the lyrics on both portfolio albums.

[17] 'Keening', an Irish folk lament, for example (Slobin, 2011, pp.37-38).
[18] Cosmic horror: "A certain atmosphere of breathless and unexplainable dread of outer, unknown forces … a malign and particular suspension or defeat of those fixed laws of Nature which are our only safeguard against the assaults of chaos" (Lovecraft 1934).

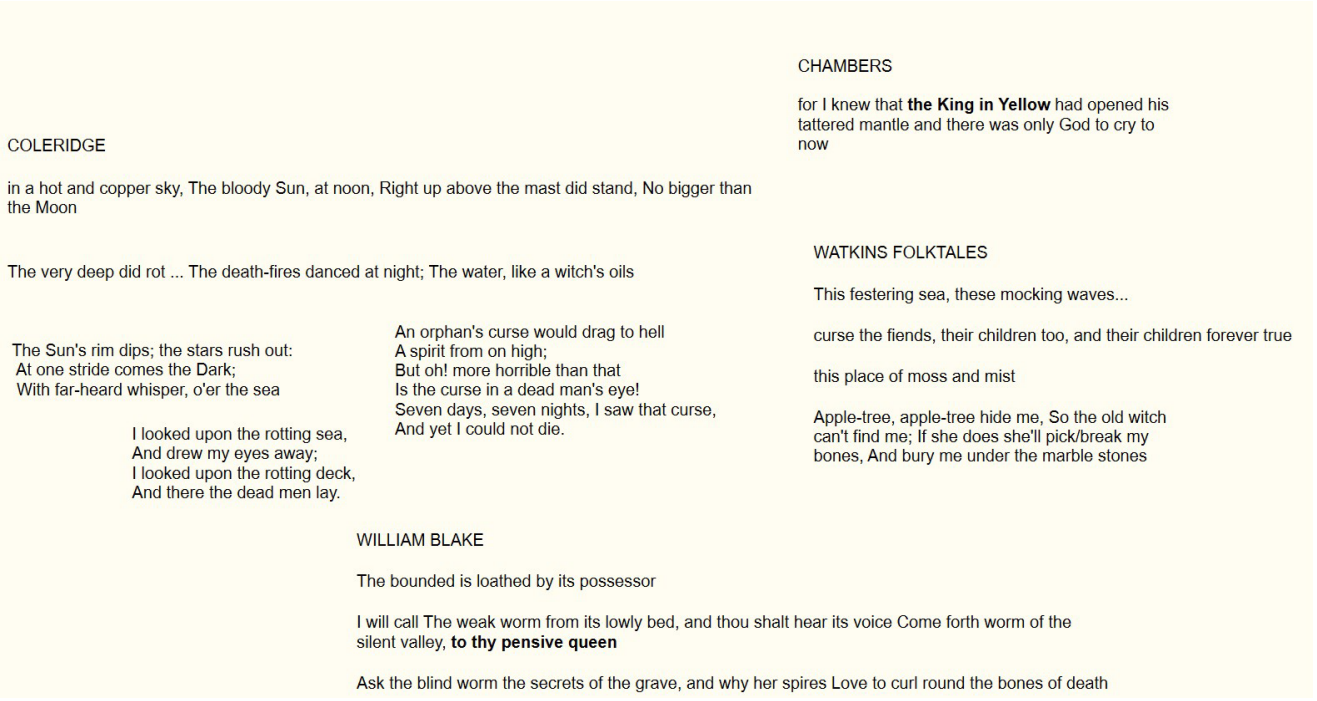


Figure 11 - Examples of lyrical inspiration

The "folk" connection led me to discover Béla Bartók's (1915) *Romanian Folk Dances* during my inspiration gathering in this stage, which would later influence the harmony of multiple tracks in the portfolio as I explored the Hungarian Minor & Gypsy scales. Harrison Birtwistle's use of English folk tales in his work – such as *Punch and Judy* (1980) and *Yan Tan Tethera* (1986) – and Benjamin Britten's arrangements of folk songs like *The Ash Grove* (1954) became touchstones for my approach during this phase. I was also inspired by Berio's (1964) *Folk Songs* cycle, specifically how he made use of traditional folk ballads like 'Black Is the Color (of My True Love's Hair)'. 'Sineater' (0:01) from my own portfolio is a relevant example here.

While lyrical content is "considered by some to be an insignificant part of the songwriter's creative process" (Bennett 2012, p.141), these extramusical elements became a vital part of my work as they were transformational for writing the music as well as the lyrics for each piece.[19] In 'A Mischief of Magpies', for example, I sought to incorporate the folk horror elements of the lyrics into the music production choices. The bowed metal screeches (0:02), skull whistles (0:13), and low string swells (0:22) heard in the opening section are examples.

The song 'Clockwork Sky' offers another example in the form of the dodecaphonic motif (from a prompt that led to "serialism") that can be heard throughout the piece. My goal was to represent the twelve

[19] Extramusical elements: Literary work, poem, myth, etc. Franz Liszt (1893, p.87) refers to this as "alien content", the core aspect of which is the "poetic idea" – the composer endeavours to "grasp the key concept … of the text and submits to its guidance in the act of composition" (Floros 2016, pp.199-200).

hours of a clock jumbled and out of sequence musically (mirrored by some of the backmasking and time-based production effects used throughout the track, 0:01).

'Clockwork Sky' (2:18):

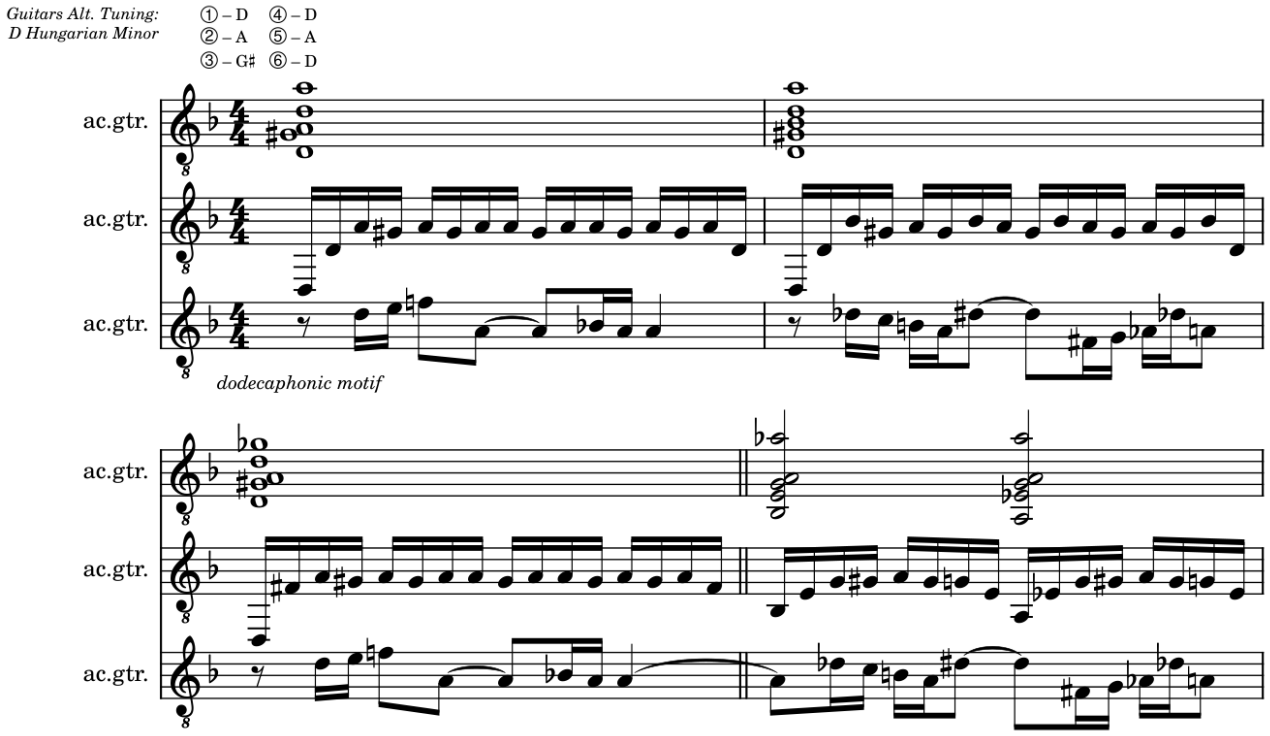


Figure 12 - Motif inspired by dodecaphony

Musically, 'A Mischief of Magpies' draws influences from the unsettling folk songs witnessed by Edward Woodward's character in *The Wicker Man* (1973) and the disturbing sound design of a film like *Midsommer* (2019). I endeavoured to blend the catchy hooks of many simple folk melodies with the uncanny horror elements of this extramusical material.

The piece combines elements of electronic music artist Gazelle Twin's (2018) *Pastoral* – the interweaving of rural life, folk horror themes, and more modern production elements – as well as 'Bridgemore Lullaby' (Licht 2020) from the soundtrack of the video game *Dishonoured 2*. The latter's use of sea-shanties, a sense of narrative in the lyric, and unsettling production choices were instrumental in my approach (the "fluty" register used in the backing vocals at 2:48, for example).

The sound design and production elements that open this track are intended to craft an atmospheric sound world. In the opening thirty seconds, I make use of bowed metal to evoke disquieting laughter and wails, chattering magpie recordings, a low, brooding contrabass drone that ebbs and flows while my magpie rhyme is spoken over the top. The main melody (0:59) is reminiscent of a nursery rhyme in its

simplicity but with an unsettling edge created by the production and compositional choices, which suggest a sense of corrupted innocence also present in the lyrical themes (this is reenforced in the outro with the motif played on a distorted music box, 5:27). This motif formed the basis of the vocal melody in the chorus in both phrasing and contour, though the setting of the lyric necessitated some small changes.

'A Mischief of Magpies' (0:59):

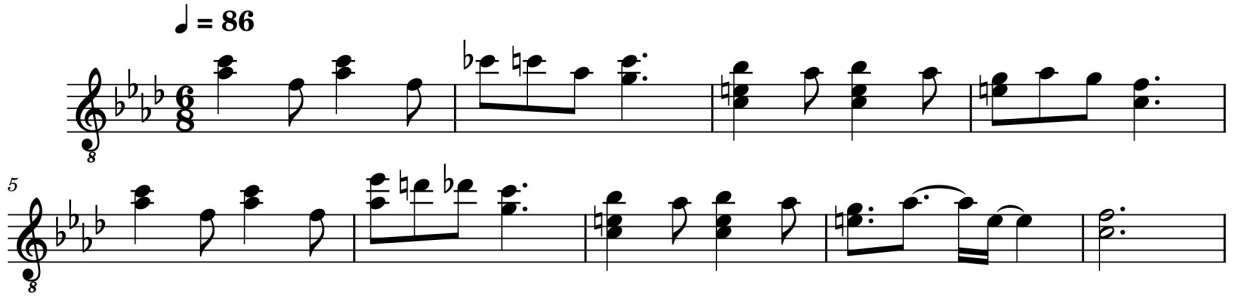


Figure 13 - "Nursery rhyme" melody

The guitar part that accompanies the verse alternates between accenting the leading tone of the Fm chord and the flat five. To help draw the listener's ear, I used behind-the-nut atonal strums that accent various moments (most audible at 2:03). The shanty feel of the verses is intended to evoke the swaying dance of the islanders at the end of *The Wicker Man* (1975).

'A Mischief of Magpies' (1:28):

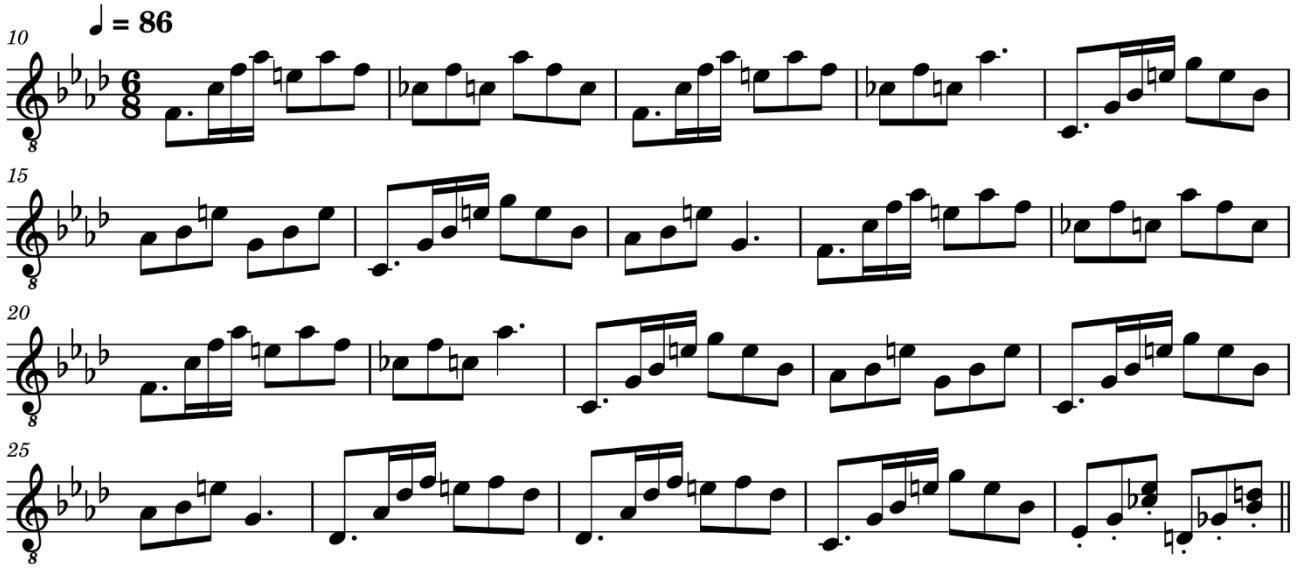


Figure 14 - Guitar accompaniment

The imagery of birds and folk rituals – "lord of misrule", "bone-fire", "scattering salt", etc. – are mirrored in the underlying arrangement and production choices. A playful skull whistle (1:39) to represent "mischief-maker" in the lyric, for example, or a fluttering felt piano motif (1:41).

The chorus moves to a more driving rhythm with the addition of string ostinatos (fig.15), which matches the switch in lyrical focus to a type of chant or invocation (based on a "Persona or POV" prompt drawn during the "Similarity & Contrast" (2.3.4.1) *phase*). Alongside my own twist on the magpie rhyme in the lyrics, I wanted the chorus to feel like an appeal to a dark and ancient deity.

'A Mischief of Magpies' (2:10):

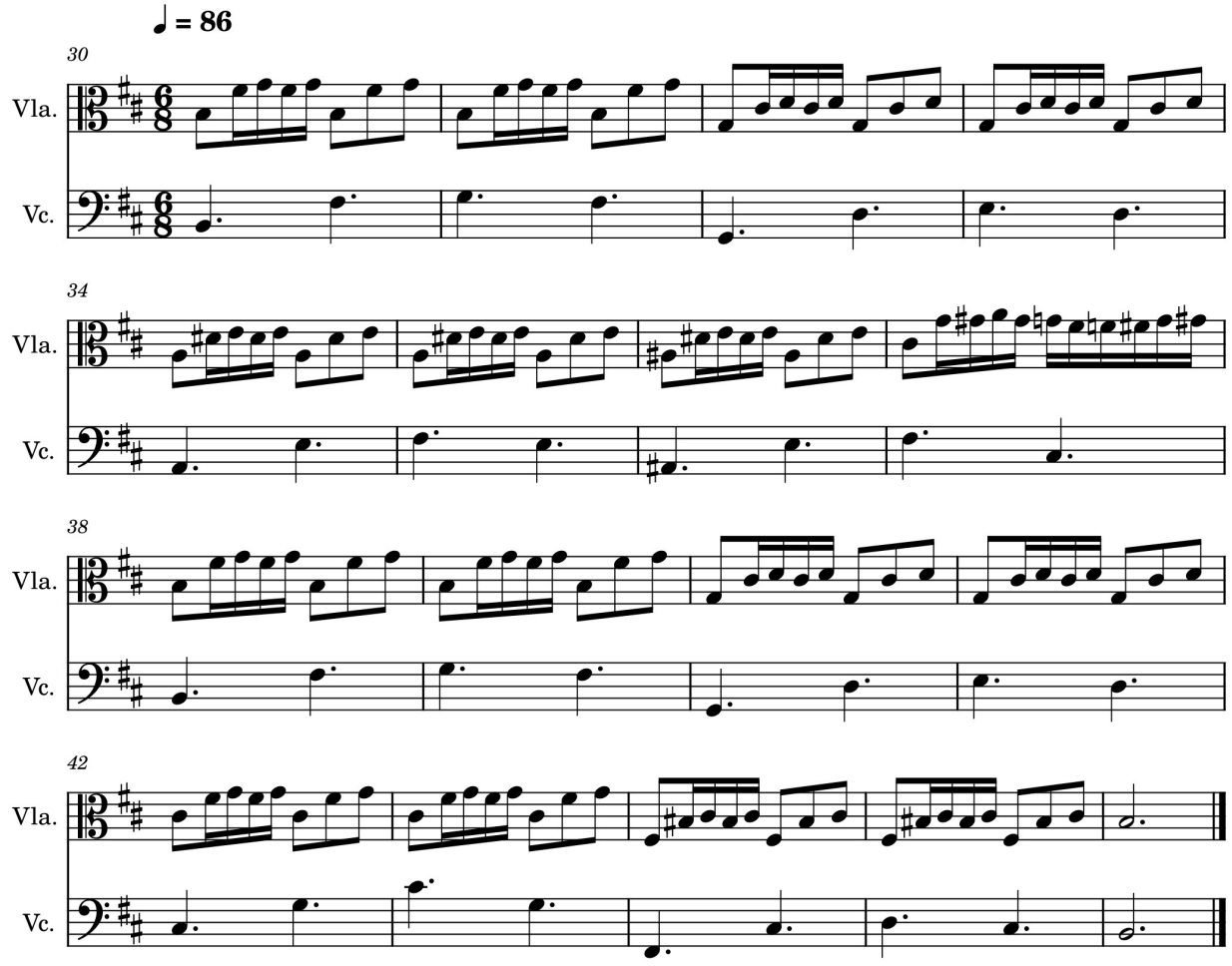


Figure 15 – Chorus string ostinato

3.3.2 Generation

3.3.2.1 The Unkindness of Ravens

This piece represents my first use of an external process to generate ideas for the music, based on a prompt from the *Generate* | *Convention* phase (2.3.3.1) of the system. I was seeking ways to add deeper meaning to my work, to reflect the lyrical and thematic material in the musical elements, pursuing

prosody.[20] This led to an exploration of other approaches to composition and the idea of using "cryptograms" to generate musical material.[21] Composer David Bruce (2020) describes these as *translational* algorithms, taking something and translating it into musical data. More precisely, they are *nondeterministic methodologies*, which use subjective choice, as opposed to a true algorithm that would lead to the same result each time if the input was the same (Loy 2006, p.289).

I made use of a French Musical Cryptogram (fig.17) similar to Guido d'Arezzo's *Micrologus* (Loy 2006, pp.286-287), which mapped notes of the scale to the vowels in a Latin text. I took this idea and created a code snippet (link) that converted words to scale degrees that I could then apply to whatever harmonic structure I was working with. Around this time, my obsession with Bartók and the Hungarian Minor scale was in full force, so many of my ideas used this as a basis. I began mapping words from Poe's (1845) poem, *The Raven* (inspired by material generated in section 3.3.1) onto this scale. For example, "the raven" becomes "615 41157". The motif created from translating this to B Hungarian Minor can be seen in fig.16.

'The Unkindness of Ravens' (0:02):

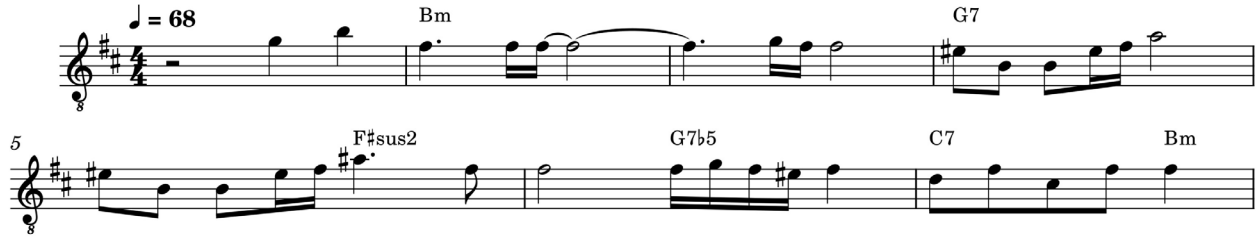


Figure 16 - Melody based on "the raven" cryptogram

1	2	3	4	5	6	7
A	B	C	D	E	F	G
H	I	J	K	L	M	N
O	P	Q	R	S	T	U
V	W	X	Y	Z	'	-

Figure 17 - French Musical Cryptogram

[20] The relationship of words to music in a way that "highlights the meaning of the lyric" (Perricone 2018).
[21] Musical cryptograms map notes to letters of the alphabet, allowing for the translation of words into melodic fragments.

Robert Schumann also "semanticizes his music by means of anagrams and cryptograms, quotations from his own and others' music and diverse allusions" (Floros 2016, p.273). The engaging part of this process for me was finding ways to incorporate the raw materials generated by the process into the structures and norms of my popular music *habitus*.

I took the idea of encoding aspects of Poe's poem further than just the title, by translating "nevermore" and "Lenore" into melodic fragments that inspired the vocal and guitar melodies in the song. The chord sequence (fig.16), for example, is based on an anagram of "raven". This is where I began to iterate out from the initial raw materials generated by the processes and began to apply my own aesthetic choices and tastes. Shaping the work in this way aligns with Berio's (2006, pp.84-85) thoughts on composers who entrust chance with "some sort of aesthetic dimension" and who've often used chance and other numerical and systematic processes as an alibi for "less-than-stellar" results.

Another example of this translational process came from using morse code of the word "raven" as a rhythmic motif (fig.18), inspired by Rush's (1981) 'YYZ', where those letters are translated into a repeating rhythmic figure (Raggo & Hosmer 2012).

'The Unkindness of Ravens' (4:02):

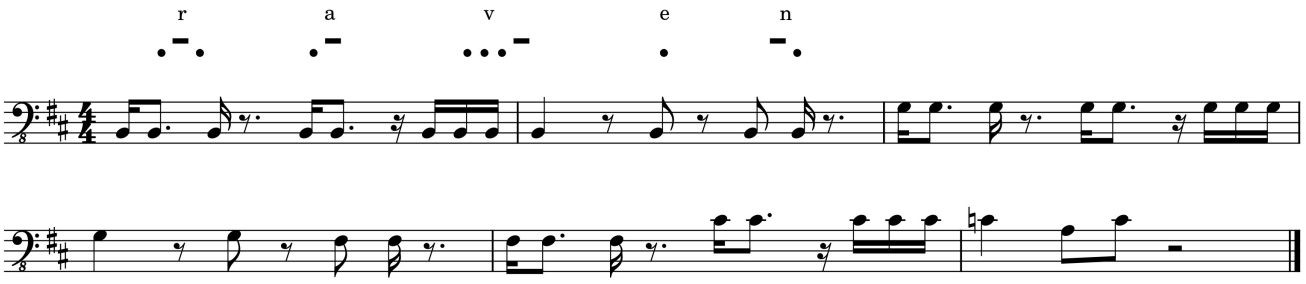


Figure 18 - Morse code guitar rhythm

In the chorus of the piece, the backing vocals sing "witness me" in counterpoint to the main vocal (5:09), inspired by Poe's (1845) watchful raven. This jury of witnesses is important as throughout the song we discover that the protagonist/unreliable narrator is guilty of murder. The backing vocals start in a narrow cluster and expand outwards, creating an unstable foundation against which the lead vocal's melody tries to find resolution.

'The Unkindness of Ravens' (2:50):

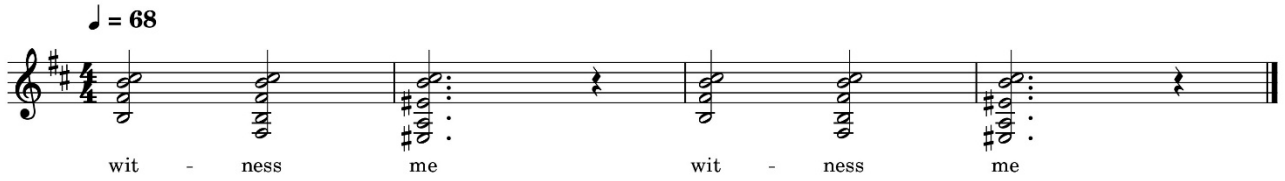


Figure 19 - Vocal harmony

Lyrically, this piece stems from the associative brainstorming mentioned in the last phase, this time rippling out from Poe's poem to Norse mythology and nursery rhymes, such as 'Monday's Child' (Roud Folk Song Index (n.d.) 19526).[22] It also makes use of the poetic techniques of *enjambment* and broken rhyme ("dying sun/Sunday's child").[23] The playful nature of broken rhyme – "much more common in comic than in serious poetry" (Walker 2018) – reflects the ambiguities of "playful" versus "threatening" tone inherent in the lyric.

'The Unkindness of Ravens' (0:56):

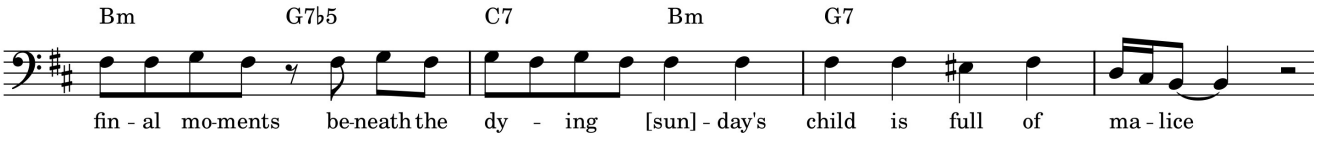


Figure 20 - Lyrical enjambment

The use of an unreliable narrator who turns out to be a murderer is inspired by my research into folk tales and murder ballads, which are a subgenre of the traditional folk ballad – "there is no shortage of murders in the corpus of ballads" (Atkinson 2011, p.185) – and make up a notable portion of traditional ballads originating in England, Scotland, and Scandinavia (Child 1906). In this form, the lyrics describe the events of a murder, often including the lead-up and/or aftermath. I was particularly inspired by Nick Cave's (1996) album *Murder Ballads* and this connection impacted my vocal performance as I aimed for a baritone yet emotive and characterful delivery that slowly unravels and becomes more unhinged as the piece goes on. Compare the melancholic vocal performance in the first verse (0:42) to the aggressive and ghoulish lilt in the final pre-chorus (5:00). Other vocal stylisations to evoke character include the accent

[22] Norse mythology: Huginn and Muninn were Odin's ravens, which translate as "mind" and "memory" and appear in the lyric as such (1:18).
[23] Enjambment is ambiguity over the end/start of the line. Broken rhyme is the splitting of a word at the end/start of a line.

and delivery of parts of the bridge ("she holds court as my memory bleeds", 3:37); the broken edge to "murderer" (4:34) in the final verse; and the emotionless "steal the light from her eyes" (3:58).

3.3.3 Iteration

3.3.3.1 A City of Rust and Bone

This song was one of the earliest etudes I wrote – a simple minor to major modulation with some stock prepared piano/horror film sounds – and because it sat for so long in this state, it began to suffer from "demoitis", what Runco & Sakamoto (1999, p.67) refer to as "fixity".[24] One of the biggest benefits of The Composition Engine was in overcoming such fixedness.

The prompt that allowed me to re-engage with the song was from the *Develop* | *Add Chaos* phase (2.3.4.1) and involved playing music on the radio while composing. This was an idea used by both John Cage (1961, p.30) and Tom Waits (2011). The broadening of focus and the willingness to listen for serendipitous connection encouraged by this method proved to be a huge boon as I set my music player to shuffle and began tinkering with the song, both on the guitar and in the DAW. Out of this process, a whole new section (starting at 2:22) emerged, creating a contrasting structure that elevated the piece.

Two more prompts – from *Develop* | *Breadth & Depth* (2.3.4.1): "collage" and "carve away" – impacted the direction of the piece. By layering in new elements, combining different styles, quotations, references, and ideas to make something new (inspired by Carl Stalling's *Looney Tunes* compositions (Bruce 2018) and György Ligeti's (1999) opera, *Le Grande Macabre*), I took my simple prepared piano opening and created a textural collage (0:02). I added vocal utterances and whispers, chanting, bowed metal, stomps, thunder, and various sung melodies, to create a sound bed that evoked an otherworldly locale. This pool of raw material quickly became a cacophonous mess, which led to me working in a subtractive manner, muting and cutting, thinking more like a sculptor as I followed the "carve away" prompt.

I took a similar approach to composing the lyrics for 'Once and Future Queen', also based on a prompt from this phase – *Refine* | *Rearrange* – utilising David Bowie's (n.d.) "cut-up" technique. This involved shuffling pieces of paper containing lyric fragments together and rearranging them to look for serendipitous collisions (fig.21).

[24] Demoitis: The demo of a track, having been listened to over-and-over, becomes reified and any attempts to recreate it in the expensive studio you've hired are doomed to fail as they never live up to the original version.

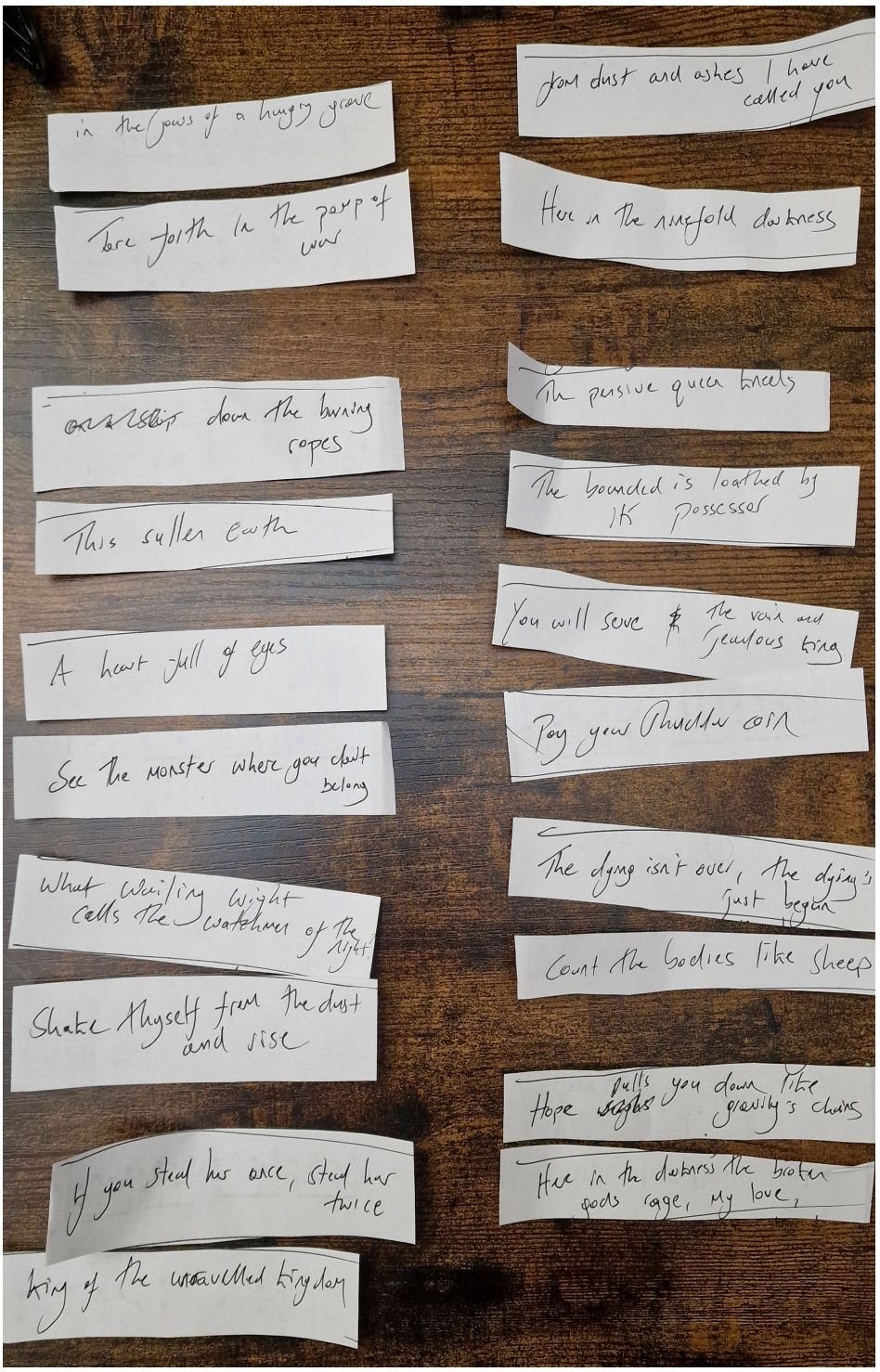


Figure 21 - Lyric collage

The vocal utterances that open 'A City of Rust and Bone' were inspired by Berio's (1967) 'Visage'. The sense that the performer is struggling to speak, the breaths and vocal creaks that are clearly human in origin but that are nonetheless alien and primal, suggested themes of horror evoked by the lyrical and musical elements. Set against the tremulous strings and punctuated with minimalistic piano, these whispers and mumbles are eventually swallowed by a collage of sound design, disparate instruments, and other acousmatic elements that build to a crescendo (1:10).

The shifting metres are all felt in four, but I alter their length to slightly unsettle the listener, moving from 6/4 to 4/4 to 5/4 throughout the A section (1:11). The harmony of the B section (2:02) develops the simple minor-to-major ambiguity of the verse as the root chords now shift from G# to A and F to C. This ambiguity is intended to evoke the otherworldly nature of the locale described in the lyrics. The stop-start guitar arpeggio that plays in the left speaker, waxing and waning, is contrasting by the more delicate ostinato of the second guitar.

'A City of Rust and Bone' (2:02):

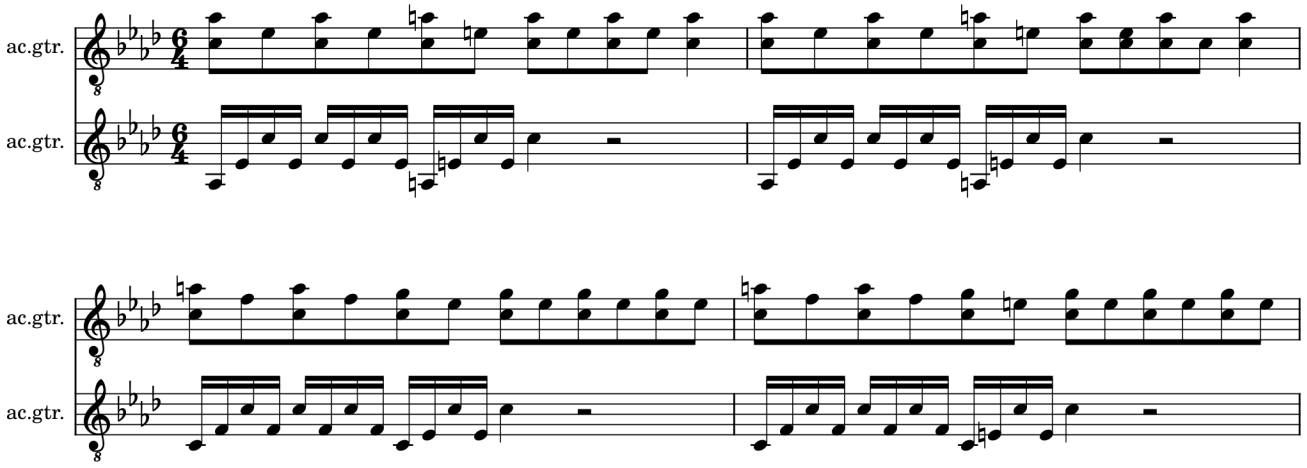


Figure 22 - Guitar ostinato

The "singing flame" in the lyric is a reference to a story by Clark Ashton Smith (1931) – in which the narrator travels to a strange world where they hear the siren's call of the strange flame – while the 'City of Rust and Bone' is my own creation. The mumbling, sleepy delivery of the outro (3:38) is intended to hint at the dream-like nature of the piece, inspired by H. P. Lovecraft's work in which the transportation to other worlds via dreams is sometimes pivotal.[25]

Another piece that was developed significantly during the Iteration stage (2.3.4) was 'These Silent Bones'. My intention was to write something made use of vocal harmony, inspired by Bulgarian folk choirs like Le Mystere des Voix Bulgares (1986). The results were interesting but overall felt a bit static. Based on a prompt ("Mutate"), I began manipulating the tempo of the piece to add movement. Another prompt led to incorporating undulations into the tempo map (based on an early pre-inventive form that I drew – a simple wavy line – to act as a rough graphical score). This resulted in the push-pull of the pulse coming from the cycle of tempi rather the metre. The tempo fluctuates between 97 and 175 bpm in a repeating cycle over the course of six bars. What I found interesting was how subtle the effect was in the

[25] 'The Dream-Quest of Unknown Kadath' (1927), for example.

acapella-style introduction, sounding like a natural rubato, but how impactful it was once the instrumentation enters (0:45):

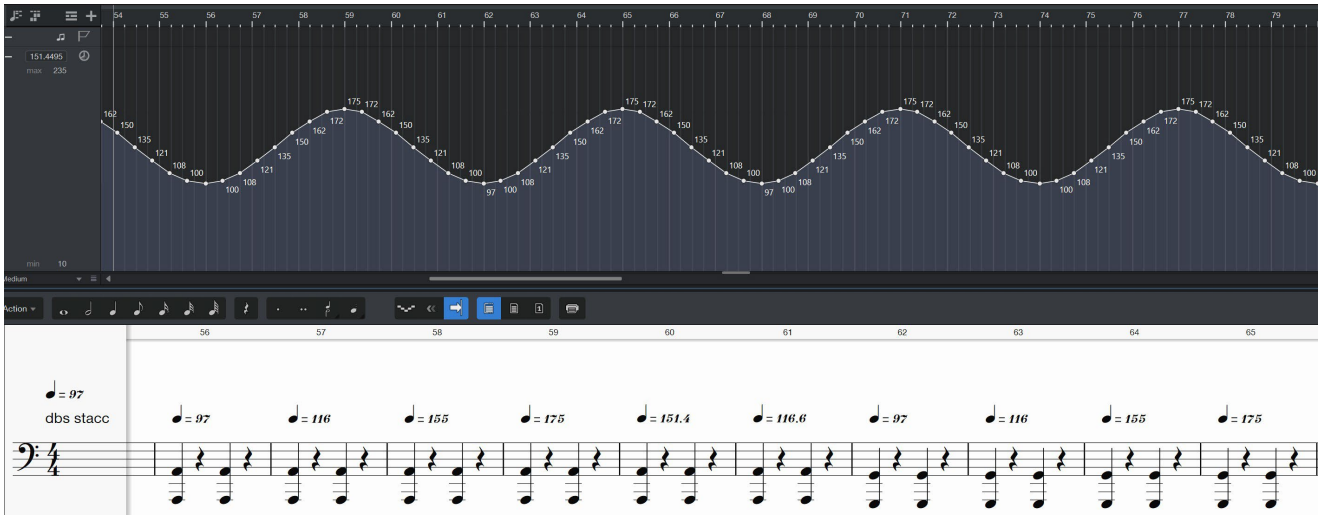


Figure 23 - Undulating tempo map

3.3.3.2 Performer, Composer, Producer

The iterative aspects of using The Composition Engine became an important process for all the pieces in the portfolio as the lines between composition, performance, and production became blurred. Moving between these various layers as a solo practitioner provided many opportunities to use the Engine to affect parts of the process that I might otherwise have left untouched in a more collaborative environment. In 'A City of Rust and Bone', for example, the ability to move quickly between conceiving an idea as a composer (the reprise of the B section vocal melody as a choral harmony (0:50) in the intro collage) to executing it as a performer (singing the stacks of vocal harmonies) to manipulating it as a producer (filtering the various tracks and arranging them so they better fit the intro section's phrasing and rhythm) formed a vital creative loop that enabled me to work at the micro note-level of the piece as well as the macro mix-and-arrangement-level. This idea touches upon Burns' (1987, p.2) *textual* and *non-textual* elements – the parts of the song that can be written down, the song-as-idea, versus the parts that are inherent in the production and performance, the song-as-artefact – which often create a "somewhat artificial division of labour" (ibid., p.2) between the songwriter, performer and producer that was not present in my practice.

3.3.3.3 Album Running Order

Worth briefly mentioning here, is the final use to which I put The Composition Engine in the creation of this portfolio. Originally, my intention was to submit everything as one hour-long album of music. However, determining the order of the tracks proved to be a challenge. Following a suggestion from my supervisors to use The Composition Engine to help solve the problem, I drew a prompt from *Refine* |

Rearrange (2.3.4.2) to "seek patterns". This led to the realisation that the pieces could be grouped neatly into folk horror and cosmic horror themes. I had been unaware of this distinction as I was "in the weeds" of working on the music. Spreading the songs across two thematically-linked albums was the ideal solution (and gave me the opportunity to design two distinct pieces of artwork for the album covers).

Figure 24 - Album covers

3.3.4 Evaluation

3.3.4.1 The Bleeding Tree

This piece represents the most unusual track in the portfolio and the fact that it was completed at all is in thanks to two prompts from the *Evaluation* phase (2.3.5).

First, *Play | Explore Extremes* offered a "thinking tool" (DeBono 2015) prompt – "Disproving: Take something obvious and prove it wrong" – which led to me engaging with a core concept or "wall" of my creative practice, playing in tune. The importance of being in tune was part of the DNA of the musicians I had spent my life working with and finding ways to break a "rule" so foundational to my *habitus* was a challenge. I settled on altering the framework and affordances (Gibson 1977) of my main compositional instrument, the guitar. I had already begun to soften this "wall" with my exploration of altered tunings, so this approach was a next (though previously inconceivable) step. I manipulated the D Hungarian Minor tuning I had created and adjusted two of the strings to a quarter tone, resulting in: D A (quarter flat) D G (quarter sharp) G# D. This retuning of the guitar led me to seeking inspiration in other uses of *scordatura*, such as Brian Ferneyhough's (1996) 'Kurze Schatten II' for guitar.

The strings being detuned led to any melodies played on them also being microtonal. The following guitar melody is an example of this (fig.24, notated in two styles for comparison).

'The Bleeding Tree' (0:34):

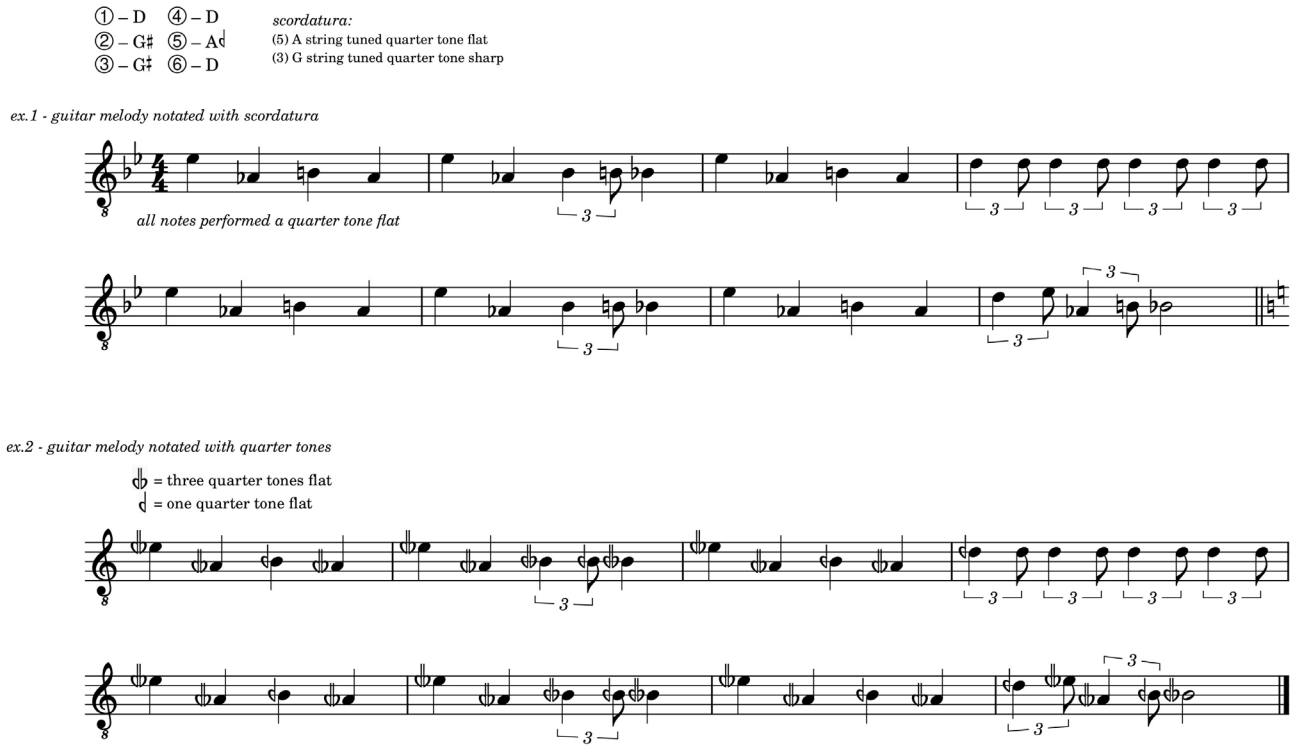


Figure 25 - Microtonal guitar melody

This tuning was the basis for all the live instrumentation (mandolin, guitars, vocals, etc.). The virtual instruments (theorbo, nyckelharpa, etc.) also made use of a microtonal pitch map to allow them to match the tuning of the recorded instruments.

Other areas the Engine prompted me towards included "exploring the extremes" (2.3.5.1) of my voice. 'The Bleeding Tree' incorporates a vocal technique used by some metal vocalists, throat singers, and bass singers in acapella groups. By engaging a growl and vibrating aspects of the vocal apparatus such as the false-folds, a pitch – sometimes referred to as a subharmonic (Švec et al. 1996) – can be generated that is lower than a singer can normally achieve. I use this technique to hold a quarter-tone note in the A section (0:33), but also as a low growl under the vocals of the B section, "throat and eye and knucklebone" (1:28).

String clusters are used as rhythmic stabs throughout the B section (beginning at 1:20), which were inspired by Bernard Herrmann's (1960) work on *Psycho*. These evoke a sense of horror and threat while also adding a drive and forward momentum, taking over the role served by the percussive bones earlier in the piece (0:22).

This piece made use of a structure that I had never approached before, courtesy of the *Borrow* | "structure/form" prompt. Bridge-form (ABCBA) was selected at random and led to a more interesting mirrored or arching structure.

One of the main benefits of The Composition Engine is exemplified by this piece. The initial ideas and fragments I wrote for 'The Bleeding Tree' were amongst the least appealing when measured by my usual criteria. The likelihood of me pursuing and developing these ideas into a new song was, at that stage, very low. The fragments were atonal, spiky, unpleasant to listen to. My usual metric for deciding on what to work on heavily favoured consonant, hook-based melodies and "beauty" in the harmony. These fragments were the opposite of that. However, one of the phases of the *Evaluation* stage suggests the use of a "creativity index" – *Verify* | *Metrics* (2.3.5.2) – which can include scores for "originality" and "novelty" as well as "appropriateness". In terms of originality these early fragments scored very highly. This led to the realisation that if I wanted to write something more "creative" and more "original" than my usual work, I should start with an idea that scored highly in those areas rather than something that I liked *because* it was familiar. This realisation gave me the impetus to develop the piece further and, ultimately, resulted in what I think is the most creative and musically interesting track in the portfolio.

Part of the musical inspiration for this piece was Danheim & Heldom's (2021) 'Runamal', which makes use of bones as percussion instrument, tagelharpa drones, and chanting style vocal elements to craft a soundworld that evokes Vikings and Norse sagas, similar to film soundtracks such as The Northman (2022). My intent was to borrow some of this mood and aggression and transplant it into an English folk tale, lyrical inspiration for which was drawn from Anne Sexton's (1981) poem, 'The Truth the Dead Know'.

I also used this *stage* of The Composition Engine to return to the chorus section of 'Clockwork Sky' and reflect on my dissatisfaction with it. The whole section felt flat and lifeless where I wanted it to be uplifting and evoke the idea of religious worship present in the lyric. This, allied to an "explore extremes" prompt, led to me writing a wide and difficult to perform arpeggio part for the acoustic guitar that covered an extended range of the instrument but that added a sense of sweeping excitement that the section was lacking.

'Clockwork Sky' (1:53):

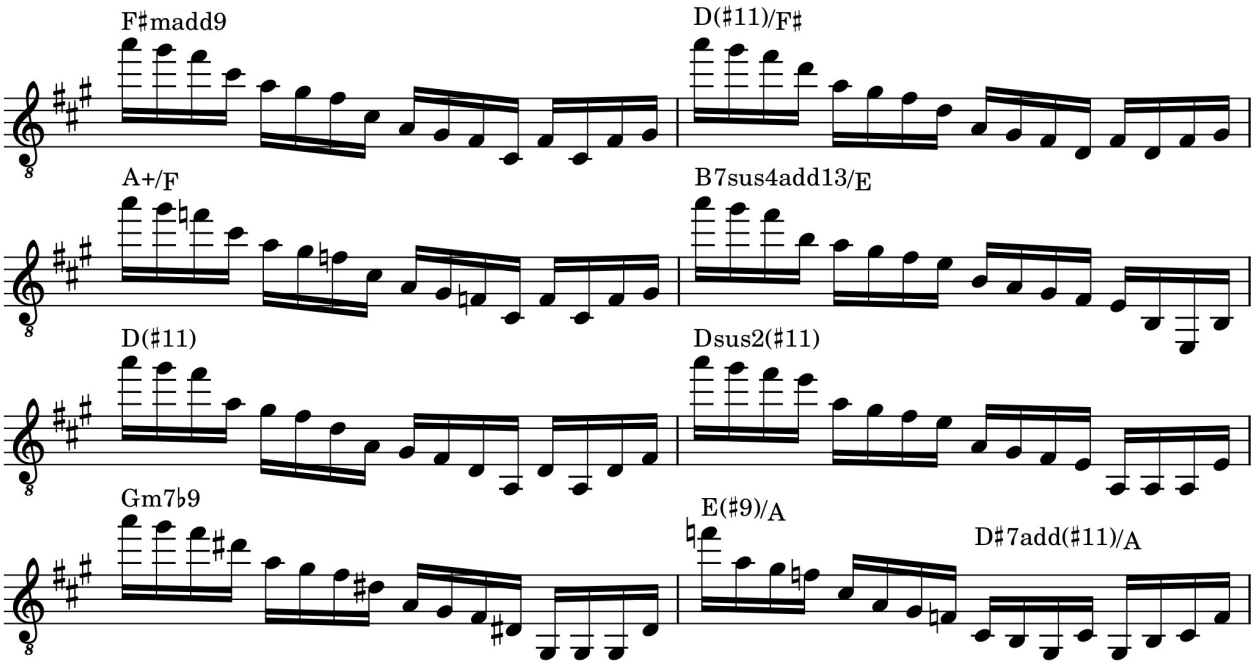


Figure 26 - Wide guitar arpeggios

4 Conclusions

To summarise, in answer to my research questions:

Can I construct a Creativity Support Tool (CST) that outlines a model of the various stages of creativity used in music composition?

I synthesised multiple areas of research on creativity and musical composition into a table of models (2.2) and outlined my own model of the creative process (2.3) that incorporates both divergent and convergent steps at every stage and is useful at the various levels, micro to macro, of songwriting and composition.

What practical strategies, process guides, and stimuli can the CST provide to support, interrupt, and expand the creative outcomes of my songwriting and composition?

My CST (2.1), The Composition Engine (2.3), enables serendipitous discovery and the use of stochastic resonance (2.4) to explore new areas of conceptual space (2.1.5.1) and acts as process guide and stimuli provider for music composition and production. It offers prompts and heuristics that work at various levels of the musical creative process, from composer to performer to producer (3.3.3.2). Evidence of its

ability to broaden the scope of the creative work of a composer is instantiated in the portfolio of songs submitted with this commentary (and discussed throughout section 3).

4.1 Benefits

- Increase in creative fluency
- Expanded conceptual space
- Malleability of previously fixed concepts and elements
- Increased originality and novelty in musical results
- Supports continuing professional development
- Encourages critical engagement with practice

My creative practice – as well as my understanding of how other composers from across a broad spectrum of styles, genres, and eras work – has expanded enormously as has my willingness to engage with ideas and concepts that feel alien to my usual *habitus*. My ability to enter creative flow and overcome creative blocks has also improved and my output has jumped from sporadic and frustrating to fecund and fulfilling. As part of this research practice, I wrote over one hundred etudes and fragments and worked 35 of those into more complete sketches and demos. Of those 35, I recorded, produced, mixed, and mastered 18 tracks totalling around 90 minutes of material. The most pleasing aspect this research and use of The Composition Engine has wrought in my practice is the ability to write more and write more often. This is one of the goals of CSTs mentioned in the opening paragraph of section 2.1. The ongoing professional development and creative growth that comes from exploring these tools are aspects encouraged by the synergy of practice-based research concepts (2.1.4) such as reflection-on-action and the Evaluation (2.3.5) stage of the Engine.

Aside from an increase in fluency, the breadth and depth of conceptual space – the new ideas and stylistic elements discovered, the limitations softened and extended – that I have been able to explore in my work has led to some of the most exciting and compelling music of my career. I often felt a thrill as though I were working with a collaborator, where an alien idea might collide with one of my own to create sparks of a hue and intensity I couldn't have predicted or managed alone. The use of The Composition Engine led to far more creative results than I could have imagined at the outset.

4.2 Issues

- Centipede Syndrome
- Requires metacognition
- Everything takes longer

- Fuzzy aspects of the compositional process make locating yourself within the framework challenging

There were some downsides to using The Composition Engine, such as how thinking about the nuts and bolts of my creative process often disturbed said process. This metacognition – thoughts about thoughts – sometimes felt interminable, slowing down the act of composition as I tried to document, observe, and reflect-in-action (Schön 1991), while also *being* creative. This disturbance in creative activity is what composer Pascal Dusapin (2007, p.27) calls Centipede Syndrome: "As soon as this small crawling creature begins to question the mechanics of its own motion it ceases to move forward". It is likely that further use and familiarity with the CST will ease this somewhat, as not having to document everything for the looming spectre of this PhD will ease some of the extrinsic pressure I felt to capture every nuance of my practice. Future iterations would also benefit from streamlining the use of the Engine and encouraging the fun and playful aspects.

Finally, locating oneself within the framework of the model is not always simple. Musical creativity is a complex and messy process occurring at many levels over an extended length of time and utilising multiple large-scale brain networks. Much of what we do relies on tacit knowledge and instinctive choices. The boundaries between one mode of working and another can sometimes be fuzzy and trying to identify a roadblock or sticking point is not always simple or obvious. Facility with the model and familiarity with navigating through the various stages and phases have made this a less daunting prospect over time. Reflection and engagement with these concepts as they are instantiated in The Composition Engine has ultimately led to a deeper understanding of my own practice.

4.3 Future Research

Moving forward, there is room to explore new ways of interacting the with the system, such as printing physical cards, developing a digital version that allows for quicker engagement with the elements via a program or app, and smoothing out some of the rough edges in the process of engaging with the tool. I would also like to dig deeper into games and ludology to see how emergent creativity based on simple rulesets and more game-like approaches might be leveraged to explore the model.

One useful next step would be to observe how other composers make use of The Composition Engine and see how/if their praxis is altered. A study that observed composers interacting with the tool – identifying which *stage* and *mode* (section 2.3.1) they are working in then drawing prompts and stimuli to interrupt and augment their usual composition methodology, perhaps using self-reflection journals, save-as versioning of their DAW or notation files, and qualitative interviews – would help examine the universality of the system. There is also scope for The Composition Engine to be used as a pedagogical

tool, offering fun and creative ways to introduce and engage with musical concepts and styles with which the student is unfamiliar using random prompts and process guides (section 2.3).

Finally, and perhaps most importantly, the benefit of a CST like this lies in how well it facilitates the creation of new artefacts. Writing more music is what it is for. The music in this portfolio is testament to its success in this regard.

5 References

Agres, K., Forth, J., & Wiggins, G. A. (2015). 'Evaluation of Musical Creativity and Musical Metacreation Systems'. *ACM Computers in Entertainment* 100, 10, Article 1

Amabile, T. (1983). *The Social Psychology of Creativity*. Springer-Verlag, NY

Atkinson, D. (2017). *The English Traditional Ballad: Theory, Method, and Practice*. Routledge, Oxford

Baer, J. & Kaufman, J. C. (2005). 'Bridging Generality and Specificity: The Amusement Park Theoretical (APT) Model of Creativity'. *Roeper Review*, 27:3, pp.158–163

Bandrowski, J. F. (1985). *Creative Planning Throughout the Organization*. American Management Association, NY

Barrett, M. S., & Gromko, J. E. (2007). 'Provoking the Muse: A Case Study of Teaching and Learning in Music Composition'. *Psychology of Music*, 35(2), pp.213-230

Bartók, B. (1915/2013). 'Romanian Folkdances Sz.56'. *A Folk Song Runs Through It* (Rangell, A.). Steinway & Sons, NY

Bauer-Lechner, N. (1980). *Recollections of Gustav Mahler*. Faber & Faber, London

Benedek, M. & Jauk, E. (2019). 'Creativity and Cognitive Control'. In Kaufman, J. C. & Sternberg, R. J. (eds.). *The Cambridge Handbook of Creativity (2nd edition).* Cambridge University Press, Cambridge, pp.200–223

Bennet, J. (2012). 'Constraint, Collaboration and Creativity in Popular Songwriting Teams'. In *The Act of Musical Composition*. Collins, D. (ed.). Ashgate Publishing, Farnham

Berio, L. (1964/1971). *Luciano Berio Conducts His "Epifanie" And "Folk Songs"*. BBC Symphony Orchestra, Juilliard Ensemble, RCA Red Seal LSC 3189, London

Berio, L. (1967). 'Visage'. *Electronic Music*. Turnabout, NY

Berio, L. (2006). *Remembering the Future*. Harvard University Press, MA

Bernstein, L. (1976). *The Unanswered Question: Six Talks at Harvard*. Harvard University Press, MA

Birtwistle, H. (1980). *Punch and Judy*. Decca, NY

Birtwistle, H. (1986). *Yan Tan Tethera: A Mechanical Pastoral* [online]. Available at: https://youtu.be/JvHAMRxg7gc?si=OR4F-4c7w3y_-uuw. [Accessed: 22nd October, 2024]

Birtwistle, H. (1996). *Gawain*. Collins Classics, London

Blake, W. (1793/1988). *The Complete Poetry & Prose of William Blake (Revised Edition)*. Anchor Books, NY

Boden, M. A. (2004). *The Creative Mind: Myths and Mechanisms (2nd Edition)*. Routledge, Oxford

Bourdieu, P. (1977). *Outline of a Theory of Practice*. Cambridge University Press, Cambridge

Bourdieu, P. (1993). *Field of Cultural Production*. Johnson, R. (ed.). Columbia University Press, NY

Bowie, D. (n.d.). 'Cut up Technique - David Bowie' [online]. Available at: https://youtu.be/m1InCrzGIPU?si=OKNrrnUW-61uwunf. [Accessed: 17th June, 2024]

Bransford, J. D. & Stein B. S. (1984/1993). *The IDEAL Problem Solver* (2nd edition). W. H. Freeman & Company, NY

Britannica. (n.d.). 'Classification of Instruments' [online]. Available at: https://www-britannicacom.nottingham.idm.oclc.org/art/musical-instrument/Classification-of-instruments. [Accessed: 15th July, 2023]

Britten, B. (1954). 'The Ash Grove'. *Britten Folksongs*. Decca, NY

Brown, A. R. & Dillon, S. (2012). 'Meaningful Engagement with Music Composition. In *The Act of Musical Composition*. Collins, D. (ed.). Ashgate Publishing, Farnham

Bruce, D. (2018). 'How Looney Tunes influenced a generation of composers' [online]. Available at: https://youtu.be/z1iRsCoP4Nw. [Accessed: 27th April, 2022]

Bruce, D. (2020). 'How to Compose Music with a Recipe (Arvo Pärt, Xenakis and Others)' [online]. Available at: https://youtu.be/X0-zuS_62wc. [Accessed: 19th April, 2022]

Burnard, P. & Younker, B. (2002). 'Mapping Pathways: Fostering Creativity in Composition'. In *Music Education Research*, 4, pp.245–261

Burnard, P. (2007). 'Routes to Understanding Musical Creativity'. In Bresler, L. (ed.). *International Handbook of Research in Arts Education*. Springer, Dordrecht, pp.1199–1214

Burnard, P., Craft, A. & Grainger, T. (2006). 'Possibility Thinking'. *International Journal for Early Years Education*, 14 (3), pp.243–262

Burns, G. (1987). 'A Typology of "Hooks" in Popular Records'. *Popular Music*, 6(1), 1–20

Cage, J. (1957). 'Experimental Music' [online]. Available at: https://www.kim-cohen.com/seth_texts/artmusictheorytexts/Cage%20Experimental%20Music.pdf. [Accessed: 11th November, 2021]

Cage, J. (1958/2003). 'Variations I'. *Variations I-III*. Mode Records, NY

Cage, J. (1961/2013). *Silence (Original Paperback/50th Anniversary Edition)*. Wesleyan University Press, CT

Candy, L. (2020). *The Creative Reflective Practitioner*. Routledge, Oxon

Cave, N. (1996). *Murder Ballads*. Mute, London

Chambers, R. W. (1895/2010). *The King in Yellow*. Chatto & Windus/Wordsworth Editions, London

Child, F. J. (1906/1965). *English and Scottish Popular Ballads*. Dover, NY

Christensen, E. (2004). 'Overt and Hidden Processes in 20th Century Music'. In Seibt, J. (ed.). *Process Theories: Crossdisciplinary Studies in Dynamic Categories*. Kluwer Academic Publishers, London, pp.97–117

Cleese, J. (2017). 'John Cleese on Creativity In Management' [online]. Available at: https://youtu.be/Pb5oIIPO62g. [Accessed: 29th November, 2021]

Çoğulu, T. (2023). *Microtonal Guitar Method Vol. 1*. Italia, T. (trans.). Kitapol Müzik, Ankara

Cohen, L. (2003). 'Leonard Cohen' Interview (1992). In Zollo, P. (ed.). *Songwriters on Songwriting*. Da Capo Press, MA

Collier, J. (n.d.) *Music Fundamentals* [MOOC]. Skillshare. Available at: https://www.skillshare.com/en/classes/Music-Fundamentals-Explore-Create-Your-UniqueSound/1914171600. [Accessed: 8th January, 2023]

Collins, D. (2005). 'A Synthesis Process Model of Creative Thinking in Music Composition'. In *Psychology of Music*, 33(2). SAGE Publications, London, pp.193–216

Collins, D. (ed.). (2012). *The Act of Musical Composition: Studies in the Creative Process*. Ashgate Publishing, Farnham

Cook, N. (2021). *Music: A Very Short Introduction (2nd edition)* [Kindle]. Oxford University Press, Oxford

Cooper, B. (1990). *Beethoven and the Creative Process*. Clarendon Press, Oxford

Cope, D. (2012). 'Rules, Tactics and Strategies for Composing Music'. In Collins, D. (ed.). *The Act of Musical Composition*. Ashgate Publishing, Farnham

Cope, D. (2015). 'Algorithmic Music Composition'. In Nierhaus, G. (ed.). *Patterns of Intuition*. Springer, Dordrecht

Cotton, D. (2016). *The Smart Solution Book*. Pearson Education Limited, Essex

Csikszentmihalyi, M. (1996/2009). *Creativity: Flow and the Psychology of Discovery and Invention*. HarperCollins, NY

Csikszentmihalyi, M. (1999). 'Implications of a Systems Perspective for the Study of Creativity'. In Sternberg, R. (ed.). *Handbook of Creativity*. Cambridge University Press, Cambridge

Danheim & Heldom. (2021). 'Runamal'. *Domadagr* [online] Available at: https://danheim.bandcamp.com/track/runamal-2. [Accessed: 22nd October, 2024]

Dash, A. & Agres, K. (2024). 'AI-Based Affective Music Generation Systems: A Review of Methods and Challenges'. *ACM Computing Surveys*, 56, 11, Article 287, pp.1-34

DeBono E. (2015). *Lateral Thinking: Creativity Step by Step*. Harper Collins, NY

DeBono, E. (1999). *Six Thinking Hats*. Back Bay Books, NY

Deliège, I. (2006). 'Analogy: Creative Support to Elaborate a Model of Music Listening'. In Deliège, I. & Wiggins, G. (eds.). *Musical Creativity: Multidisciplinary Research in Theory and Practice*. Psychology Press, Hove, pp.63–77

Deming, W. E. (2000). *Out of the Crisis*. MIT Press, MA

Dennis, A. R., Minas, R. K., & Bhagwatwar, A. P. (2013). 'Sparking Creativity: Improving Electronic Brainstorming with Individual Cognitive Priming'. *Journal of Management Information Systems* 29, pp.195–216

Duignan, M., Noble, J. & Biddle, R. (2010). 'Abstraction and Activity in Computer-Mediated Music Production'. *Computer Music Journal*, 34:4, pp.22-33

Dusapin, P. (2007). *Composer: Musique, Paradoxe, Flux*. Fayard, Paris

Eberle, B. (1996). *Scamper: Games for Imagination Development*. Prufrock Press Inc, Austin

Ellis, S. & Engelhardt, T. (2010). 'Visualizing a Hit - InfoVis Final Project', *Can Visualizing 50 Years' Worth of Hit U.S. Pop Song Characteristics Help us Discover Trends Worthy of Further Investigation?* [Available at: http://sites.google.com/site/visualizingahit/home]

Eno, B. (1975/2005). 'Oblique Strategies' (1st/5th Edition) [card deck]. Available at: https://www.enoshop.co.uk/product/oblique-strategies?filter=Oblique%20Strategies. [Accessed: 25th July, 2024]

Fauconnier, G., & Turner, M. (2008). *The Way We Think: Conceptual Blending and the Mind's Hidden Complexities*. Basic Books, NY

Ferneyhough, B. (1996). 'Kurze Schatten II'. *Brian Ferneyhough 2.* Montaigne, Paris

Ferneyhough, B. (2001). 'The Ensemble Sospeso: In Conversation with Joshua Cody' [online]. Available at: https://web.archive.org/web/20110721014850/http://www.sospeso.com/contents/articles/ferneyhough_p1.html. [Accessed: 27th June, 2024]

Finke, R. A. (1996). 'Imagery, Creativity, and Emergent Structure.' *Consciousness and Cognition* 5(3). pp.381–393

Floros, C. (2016). *Music as Message*. Bernhardt-Kabisch, E. (trans.). PL Academic Research, Oxford

Forte, T. (2022). *Building a Second Brain*. Profile Books, London

Frich, J., Vermeulen, L. M., Remy, C., Biskjaer, M. M., & Dalsgaard, P. (2019). 'Mapping the Landscape of Creativity Support Tools in HCI' In *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems (CHI '19)*, Paper 389. ACM, NY, pp.1–18

Friedman, B. & Hendry, D. (2012). 'The Envisioning Cards: A Toolkit for Catalyzing Humanistic and Technical Imaginations'. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI '12)*. ACM, NY, pp.1145–1148

Fritz, R. (1991). *Creating*. Fawcett, NY

Garfield, M. J., Taylor, N. J., Dennis, A. R., & Satzinger, J. W. (2001). 'Research Report: Modifying Paradigms Individual Differences, Creativity Techniques, and Exposure to Ideas in Group Idea Generation'. *Information Systems Research*, 12(3), pp.322–333

Gazelle Twin. (2018). *Pastoral*. Anti-Ghost Moon Ray Records, Brighton

Gibson, J. J. (1977). 'The Theory of Affordances'. In R. Shaw & J. Bransford (eds.), *Perceiving, acting, and knowing*. Lawrence Erlbaum, Hillsdale, pp. 67–82

Gordon, J. (2015). *Circus EP*. Available at: https://jamesgordon.bandcamp.com/album/circus. [Accessed: 8th September, 2024]

Gordon, J. (2018). *Monsters EP*. Available at: https://jamesgordon.bandcamp.com/album/monsters. [Accessed: 8th September, 2024]

Gordon, J. (2020). 'First We Burn'. Available at: https://youtu.be/jOH35vcqn6I?si=zDZs7Op9xdiIdsu0. [Accessed: 8th September, 2024]

Gordon, J. (2022). 'Candlelight', 'Sin', 'House of Broken Bones', 'Nailed to My Heart' (singles). Available at: https://jamesgordon.bandcamp.com. [Accessed: 8th September, 2024]

Gordon, W. J. J. (1961). *Synectics: The Development of Creative Capacity*. Collier-MacMillan, London

Graf, M. (1947). *From Beethoven to Shostakovich: The Psychology of the Composing Process*. Philosophical Library, NY

Guilford, J. P. (1967). *The Nature of Human Intelligence.* McGraw-Hill

Haase, J. & Hanel, P. H. P. (2022). 'Priming Creativity: Doing Math Reduces Creativity and Happiness Whereas Playing Short Online Games Enhance Them'. *Frontiers in Education*, 7:976459

Hamasyan, T. (2015). *Mockroot*. Nonesuch Records Inc., NY

Harrison, C. (2016). *A Songwriter's Journey from Little C to Pro C Creativity: An Applied Analytical Autoethnography* (PhD Thesis). University of Newcastle, Callaghan, NSW

Helmholtz, H. v. (1896). *Vorträge und Reden*. Friedrich Vieweg und Sohn. In Wallas, G. (1926). *The Art of Thought*. Watts & Co., London

Herrmann, B. (1960). 'The Murder'. *Psycho*. Unicorn Records, London

Hewitt, I. (2022). 'Harrison Birtwistle: an introduction' [online]. Available at: https://www.classicalmusic.com/features/composers/harrison-birtwistle-an-introduction. [Accessed: 24th June, 2024]

Hofstadter, D. (1999). *Gödel, Escher, Bach: An Eternal Golden Braid (20th Anniversary Edition)*. Basic Books, NY

Höller, Y. (1984). 'Resonance: Composition Today'. *Contemporary Music Review*, 1:1, pp.67-76

Holzer, A. (2018). 'Musicological Perspectives on Composing'. In Zembylas, T. & Niederaurer, M. *Composing Processes and Artistic Agency: Tacit Knowledge in Composing*, Routledge, Oxford

Howell, T., Paynter, J., Orton, R. & Seymour, P. (1992). *Companion to Contemporary Musical Thought*. Routledge, Oxford

Huang, A. (n.d.) *The Book of Chances* [online]. Available at: https://andrewhuang.com/chances. [Accessed: 19th November, 2024]

Isaksen, S. G. , Dorval, K. B. & Treffinger, D. J. (2000). *Creative Approaches to Problem Solving: A Framework for Change* (2nd edition). Creative Problem Solving Group, NY

Johnson, R. (1993). 'Editor's Introduction: Pierre Bourdieu on Art, Literature and Culture'. In Johnson, R. (ed.). *Field of Cultural Production*. Columbia University Press, NY

Kahneman, D. (2011). *Thinking, Fast and Slow*. Penguin Books, London

Kelley, T. (2001). *The Art of Innovation: Lessons in Creativity From IDEO, America's Leading Design Firm*. Doubleday, NY

King, K. (2018). 'Passerelle How To: Tune Up' [online]. Available at: https://youtu.be/2ZEDYETleNw. [Accessed: 10th September, 2024]

Klingshirn, W. E. (2015). 'Christian Divination in Late Roman Gaul: The Sortes Sangallenses'. In *Mantikê*. Brill, Leiden

Knörig, A. (2006). *Free the Body and the Mind Will Follow: : An Investigation Into the Role of the Human Body in Creativity, and Its Application to HCI* (Diplom-Medieninformatiker (FH) Thesis). University of Applied Sciences, Wedel

Koberg, D. and Bagnall, J. (1974). *The Universal Traveller*. W Kaufman, Los Altos, CA, p.7, 16, 2

Koestler, A. (1964). *The Act of Creation*. Hutchinson & Co, London

Kozbelt A., Beghetto, R. A., & Runco, M. A. (2010). 'Theories of Creativity'. In Kaufman, J. C. & Sternberg, R. J. (eds.). *The Cambridge Handbook of Creativity*. Cambridge University Press, NY, pp.20–47

Kozbelt, A. (2019). 'Evolutionary Approaches to Creativity'. In Kaufman, J. C. & Sternberg, R. J. (eds.). *The Cambridge Handbook of Creativity (2nd edition)*. Cambridge University Press, Cambridge, pp.109–131

Laughran, R. & O'Neill, M. (2016). 'Generative Music Evaluation: Why do We Limit to "Human"'? *Conference: Computer Simulation of Musical Creativity (CSMC)*, Huddersfield

Le Mystere Des Voix Bulgares. (1986). *Le Mystère Des Voix Bulgares*. 4AD, London

Leedham, C. & Scheuregger, M. (2020). 'The Purpose of the Written Element in Composition PhDs'. In Wiley, C. & Pace, I. (eds.). *Researching and Writing on Contemporary Art and Artists*. Palgrave Macmillan, Basingstoke, pp.65-90

Licht, D., Colantonio, R. & Brosius, T. (2020). 'Bridgemore Lullaby'. *Dishonoured 2: The Soundtrack Collection*. Laced Records, London

Ligeti, G. (1999). *Le Grande Macabre* (Philharmonia Orchestra, Esa-Pekka Salonen). Sony Classical, Berlin

Liszt, F. (1893). *Franz Liszt's Briefe* IV. Mara, L (ed.). Leipzig

Lovecraft, H. P. (1927/1999). 'The Dream-Quest of Unknown Kadath'. *Omnibus 1: At the Mountains of Madness*. HarperCollins, London

Lovecraft, H. P. (1934/1985). 'Supernatural Horror in Literature'. In *Omnibus 2: Dagon and Other Macabre Tales*. Grafton Books, London

Loy, G. (2006). *Musimathics*. MIT Press, MA

Lubart, T. I. (2001). 'Models of the Creative Process: Past, Present and Future'. *Creativity Research Journal*, 13 (3–4), pp.295–308

Luijendijk, A. & Klingshirn, W. E. (2019). 'The Literature of Lot Divination'. In *Sortilege and Its Practitioners in Late Antiquity: My Lots Are in Thy Hands*, Brill, Leiden, pp. 42–44

MacCallum, S. (2019). *Making Music in the Real World: A Professional Practice Portfolio and Reflective Commentary* [phd thesis]. University of Hull

Mancini, H. (1973). *Sounds and Scores*. Alfred Music Inc., CA

Matuschak, A. (2021). 'Cognitive Scaffolding' [online]. Available at: https://notes.andymatuschak.org/z8ZWYXFwXV38qiCgRx7zf2ySy9WCxWvcizNVr. [Accessed: 29 December 2021]

Mazzola, G., Park, J. & Thalmann, F. (2011). *Musical Creativity: Strategies and Tools in Composition and Improvisation*. Springer, London

McCutchan, A. (1999). *The Muse that Sings: Composers Speak about the Creative Process*. Oxford University Press, NY

McIntyre, P. (2006). 'Creative Practice as Research: Testing Out the Systems Creativity through Practitioner Based Enquiry.' *Speculation and Innovation: Applying Practice Led Research in the Creative Industries*. Queensland University of Technology

McIntyre, P. (2008). 'Creativity and Cultural Production: An Interdisciplinary Approach to Understanding Creativity Through an Ethnographic Study of Songwriting'. *Cultural Science Journal* Vol.1 (2)

Melford, M. (2000). 'Aural Architecture: The Confluence of Freedom'. In Zorn, J. *Arcana: Musicians on Music*. Granary Books, Inc., NY, pp.119-135

Messiaen, O. (1956). *The Technique of My Musical Language*. Satterfield, J. (trans.). Alphonse Leduc, France

Minas, R. K. & Dennis, A. R. (2019). 'Visual Background Music: Creativity Support Systems with Priming'. *Journal of Management Information Systems*, 36:1, pp.230–258

Nash, C. & Blackwell, A. F. (2014). 'Flow of Creative Interaction with Digital Music Notations'. In Collins, K., Kapralos, B. & Tessler, H (eds.). *The Oxford Handbook of Interactive Audio*. Oxford University Press, NY

Nash, C. (2011). *Supporting Virtuosity and Flow in Computer Music*. PhD thesis. University of Cambridge. Available at: http://revisit.info/files/PhD_Thesis.pdf. [Accessed: 29th August, 2022]

Nelson, R. (2022). *Practice as Research in the Arts (and Beyond)*. Palgrave Macmillan, Basingstoke

Nickerson, R. S. (1999). 'Enhancing Creativity'. In Sternberg, R. J. (ed.). *The Handbook of Creativity*. Cambridge University Press, NY, pp.392–430

Nierhaus, G. (2009). *Algorithmic Composition: Paradigms of Automated Music Generation*. Springer, London

Nierhaus, G. (2018). 'On Composers and Computers'. In Donin, N. (ed.). *The Oxford Handbook of the Creative Process in Music* (online edition). Oxford Academic, Oxford. Available at: https://doi.org/10.1093/oxfordhb/9780190636197.013.27 [Accessed: 14th March, 2024]

Opie, I. & Tatem, M. (eds.). (1989). *A Dictionary of Superstitions*. Oxford University Press, Oxford

Osborn, A. (1963). *Applied Imagination: Principles and Procedures of Creative Problem-Solving*. Charles Scribner's Sons, NY

Papageorgiou, D., Mayer, D. & Nierhaus, G. (2015). 'Dimitri Papageorgiou / Interlocking and Scaling'. In *Patterns of Intuition*. Nierhaus, G. (ed.). Springer, Dordrecht

Parnes, S. J. (1992). *Sourcebook for Creative Problem Solving*. Creative Education Foundation Press, NY

Pattison, P. (n.d.). Berklee Songwriting [MOOC]. Coursera. Available at: https://www.coursera.org/learn/songwriting-lyrics?specialization=songwriting. [Accessed: 21st May, 2023]

Perricone, J. (2018). *Great Songwriting Techniques*. Oxford University Press, NY

Philip, N. (ed.). (2022). *The Watkins Book of English Folktales*. Watkins, London

Plsek, P. (1996). *Working Paper: Models for the Creative Process* [online]. Available at: http://www.directedcreativity.com/pages/WPModels.html. [Accessed: 23rd August, 2024]

Plucker, J. A., Makel, M. C., & Qian, M. (2019). 'Assessment of Creativity'. In Kaufman, J. C. & Sternberg, R. J. (eds.). *The Cambridge Handbook of Creativity (2nd edition)*. Cambridge University Press, Cambridge, pp.44–68

Poe, E. (1845/1996). *The Complete Poetry of Edgar Allan Poe*. Signet Classics, NY

Poincaré, H. (1914). *Science and Method*. Maitland, F. (trans.). Thomas Nelson & Sons, London

Pólya, G. (1945/1990). *How to Solve It (1st/2nd edition)*. Penguin Books, London

QCA. (2005). *Creativity: Find It, Promote, Promoting Pupils' Creative Thinking and Behaviour Across the Curriculum at Key Stages 1 and 2, Practical Materials for Schools*. QCA, London

Raggo, M. T. & Hosmer, C. (2012). *Data Hiding: Exposing Concealed Data in Multimedia, Operating Systems, Mobile Devices and Network Protocols*. Rockland, MA

Reynolds, R. (2012). 'Thoughts on Enabling Creative Capacity: Provocation, Invitation, Resistance, and Challenge'. *Contemporary Music Review* 31(4), pp.313–322

Rittel, H. & Webber, M. (1973). 'Dilemmas in a General Theory of Planning'. *Policy Science*, 4, pp.155–169

Roads, C. (1996). *The Computer Music Tutorial*. MIT Press, MA

Rossman, J. (1931). *The Psychology of the Inventor*. Inventors Publishing, Washington DC

Roud Folk Song Index. 'Search Page'. Vaughan Williams Memorial Library [online]. Available at: https://web.archive.org/web/20150315093810/http://vwml.org/search/search-roud-indexes. [Accessed: 11th September, 2024]

Runco, M. A. & Acar, S. (2019). 'Divergent Thinking'. In Kaufman, J. C. & Sternberg, R. J. (eds.). *The Cambridge Handbook of Creativity (2nd edition)*. Cambridge University Press, Cambridge, pp.224–254

Runco, M. A. & Sakamoto, S. O. (1999). 'Experimental Studies of Creativity'. In Sternberg, R. J. (ed) *Handbook of Creativity*. Cambridge University Press, Cambridge, pp.62–92

Rush. (1981). 'YYZ'. *Moving Pictures*. Mercury, IL

Sawyer, R. K. (2012). *Explaining Creativity* (2nd Edition). Oxford University Press, Oxford

Schneiderman, B. (2002). 'Creativity Support Tools'. *Communications of the ACM*. Vol.45, No.10, pp.116–120

Schoenberg, A. (1950). *Style and Idea*. Philosophical Library Inc., NY

Schön, D. A. (1983/1991). *The Reflective Practitioner: How Professionals Think in Action* (1st/2nd Edition). Ashgate Publishing Ltd, Aldershot

Scott, G., Leritz, L. E. & Mumford, M. D. (2004). 'The Effectiveness of Creativity Training: A Quantitative Review'. *Creativity Research Journal*, 16 (4), pp.361–388

Seevinck, J. (2022). 'Making Reflection-in-Action Happen: Methods for Perceptual Emergence'. In Vear, C. (ed.). *The Routledge International Handbook of Practice-Based Research*. Routledge, Oxon, pp.440–457

Sennett, R. (2008). *The Craftsman*. Penguin, London

Sexton, A. (1981). 'The Truth the Dead Know'. *The Complete Poems of Anne Sexton*. Houghton Mifflin, Boston

Shneiderman, B. (2007). 'Creativity Support Tools: Accelerating Discovery and Innovation'. *Communications of the ACM*, Vol. 50, No. 12, pp.20–32

Shove, E., Pantzar, M. & Watson, M. (2012). *The Dynamics of Social Practice: Everyday Life and How it Changes*. Sage, London

Simonton, D. K. (2011). 'Creativity and Discovery as Blind Variation: Campbell's (1960) BVSR Model After the Half-Century Mark'. *Review of General Psychology*, 15(2), pp.158–174

Sims, M. C. & Stephens, M. (2011). *Living Folklore*. Utah University Press, UT

Sköld, M., Holger, R. & Nierhaus, G. (2016). 'Matthias Sköld / A Topography of Personal Preferences' In *Patterns of Intuition*. Nierhaus, G. (ed.). Springer, Dordrecht

Slobin, M. (2011). *Folk Music: A Very Short Introduction*. Oxford University Press, Oxford

Sloboda, J. (1985/1999). *The Musical Mind* (1st/2nd Edition). Oxford Science Publications, Oxford

Slonimsky, N. (2018). *Thesaurus of Scales and Melodic Patterns*. Martino Fine Books, CT

Smith, C. A. (1931/2014). 'The City of the Singing Flame'. *The Dark Eidolon and Other Fantasies*. Penguin Books, NY

SongPad. (2023). SongPad [online]. Available at: https://www.songpad.co/. [Accessed: 25th November, 2024]

Sternberg, R. J. (2006). 'Stalking the Elusive Creativity Quark: Toward a Comprehensive Theory of Creativity'. In Locher, P., Martindale, C. & Dorfman, L. (eds.). *New Directions in Aesthetics, Creativity, and the Arts*. Baywood Publishing Company, NY, pp. 79–104

Sternberg, R. J. (2019). 'Enhancing People's Creativity'. In Kaufman, J. C. & Sternberg, R. J. (eds.). *The Cambridge Handbook of Creativity (2nd edition)*. Cambridge University Press, Cambridge, pp.88–103

Stevens, S. (2005). *Illinois*. Rough Trade Records, London

Stockhausen, K. (1989). *Stockhausen on Music*. Maconie, R. (ed.). Marion Boyars Publishers, London

Stravinsky, I. (1942). *Poetics of Music: In the Form of Six Lessons*. Knodel, A. & Dahl, I. (trans.). Harvard University Press, Cambridge

Švec, J. G., Schutte, H. K., Miller, D. G. (1996). 'A Subharmonic Vibratory Pattern in Normal Vocal Folds'. *Journal of Speech, Language, and Hearing Research*. 39 (1): pp.135–143

Taffel, A. (2021). 'The Three Sides of Sufjan Stevens' [online]. Available at: https://www.theabsolutesound.com/articles/the-three-sides-of-sufjan-stevens/. [Accessed: 26th June, 2024]

Taleb, N. N. (2007). *The Black Swan: The Impact of the Highly Improbable*. Penguin Books, London

Taleb, N. N. (2012). *Antifragile*. Random House, NY

Taylor, S. P. (2017). 'What is Innovation? A Study of the Definitions, Academic Models and Applicability of Innovation to an Example of Social Housing in England'. *Open Journal of Social Sciences*, 5

Tharp, T. (2003). *The Creative Habit* [kindle]. Simon & Schuster, NY

Vartanian, O. (2019). 'Neuroscience of Creativity', in Kaufman, J. C. & Sternberg, R. J. (eds.). *The Cambridge Handbook of Creativity (2nd edition)*. Cambridge University Press, Cambridge, pp.148–172

Von Oech, R. (2011). *Ball of Whacks*. Creative Whack Company, CT

Waits, T. (2002). 'Tom Waits Speaks on Songwriting' NPR Fresh Air Interview [online]. Available at: https://www.npr.org/2004/10/08/4077216/tom-waits-speaks-on-songwriting. [Accessed: 20th August, 2024]

Walker, D. (2018). 'Broken Rhyme' [online]. Available at: https://hull-awe.org.uk/index.php?title=Broken_rhyme&oldid=68891. [Accessed: 11th September, 2024]

Wallas, G. (1926). *The Art of Thought*. Watts & Co., London

Wang, K. & Nickerson, J. (2017). 'A Literature Review on Individual Creativity Support Systems'. *Computers in Human Behavior* 74(7–8), pp.139–151

Ward, T. B. & Kolomyts, Y. (2019). 'Creative Cognition'. In Kaufman, J. C. & Sternberg, R. J. (eds.). *The Cambridge Handbook of Creativity (2nd edition)*. Cambridge University Press, Cambridge, pp.175–199

Webster, P. (2002). 'Creative Thinking in Music: Advancing a Model'. In Sullivan, T. & Willingham, L. (eds.). *Creativity and Music Education*. Canadian Music Educators Association, Edmonton, pp.6–33

Weisberg, R. (1993). *Creativity: Beyond the Myth of Genius*. Freeman, NY

Weiss, P. (2017). 'Game Pieces and Game Elements' (thesis) [online]. Institute of Sonology. Available at: http://sonology.org/wp-content/uploads/2020/04/Thesis-Philipp_Weiss-Final.pdf. [Accessed: 2nd June, 2022]

Wiggins, G. A., Tyack, P., Scharff, C., & Rohrmeier, M. (2015). 'The Evolutionary Roots of Creativity: Mechanisms and Motivations'. *Philosophical Transactions of the Royal Society B*: Biological Sciences Issue on Musicality

Wilhelm, R. (trans.). (2003). *I Ching: Or Book of Changes*. Penguin Books, London

Wishart, T. (1990). 'Vox 1'. *Vox*. Virgin Classics, London

Xenakis, I. (1963/1992). *Formalized Music* (orig./trans.). Pendragon Press, Stuyvesant

Young, G. & Roens, S. (2022). *Insights into Music Composition*. Routledge, Oxford

Zappa, F. (1988). 'Composer to Composer Talks - Carl Stone with Frank Zappa' [online]. Available at: https://youtu.be/VR6CExfYDJs?si=jaIVtdGAKMUxuF5e. [Accessed: 13th June, 2024]

Zembylas, T. & Niederaurer, M. (2018). *Composing Processes and Artistic Agency: Tacit Knowledge in Composing*, Routledge, Oxford