

Chapter 1

Mu-Psi and Music Space: Insights into a 21st Century Music Practice

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In this essay I take as a starting point, a manifesto called MuPsi, published by Carla Scaletti in 2006. I will discuss how the ramifications of such a manifesto, be they new music experiences, methods or creative directions, can be paths for expanding the innate ability we all have to *imagine music* - which applies to composer and listener alike. I explore how an expanded understanding of the activity and variability inherent in music has the potential to inspire in other mediums and to melt away imposed restraints or controlling forces which may be acting on the human imagination at large. I touch on how the contribution of musical imagination has shaped our development as individuals and societies and conclude with examples from my own practice, which involve unconventional computation for defining and quantising musical variability from the realms of Music framed as an *n-dimensional* abstract phase space.

1. MuPsi

In 2006, composer and software developer Carla Scaletti posted a manifesto on her website. The first part of it reads;

Mu-Psi is to music what science fiction is to narrative art. It is sound-art that seeks to transcend the personal and to express universal concepts, patterns, and processes. Just as a science fiction begins with the premise of some possible future universe and proceeds to fill in the details and consequences of that premise, a Mu-Psi sound work begins with a hypothesis, a “*what-if*” premise, and proceeds to explore the ramifications of that premise.¹

This essay takes the Mu-Psi manifesto as a starting point, framing it as

an accessible example of a curious and egalitarian spirit that stems from a truly modernist music practice. An accomplished musician and sound designer, Scaletti is also one of the two computer scientists behind the invention and development of the Kyma sound design language.² Kyma is a 30 year old, specialised software and hardware environment intended for the manifestation of “what-if” sonics. It excels at uninhibited creative exploration in sound with an elegant, flowing feel. For me, the Mu-Psi manifesto which underpins Scaletti’s work is representative of the spirit of modernist musical thinking - beyond genre, beyond aesthetics, beyond any kind of defining technique. It echoes an intellectual attitude of “what-if” which accompanied many of the more radical visions of 20th Century modernism.³ Scaletti’s manifesto avoids some of the biases and pitfalls of the old modernism, by addressing today’s more egalitarian cultural production - the manifesto comes presented with an invitingly imaginative entry point. The invitation to playfully imagine a hypothesis and then seriously undertake the technical exploration of its ramifications in the form of transcendental art, evidences an advanced understanding of the systemic impact of music - in the case of Kyma, in particular real-time performance, synthesis and music computation, such music can be sonified using the most up to date levels of technical precision, thereby making it truly modern. Mu-Psi positions itself as a means to reckon with modernity through a primarily sonic imagination and audible exploration. This is in contrast to scientific, philosophical or literary methodologies - musicians don’t only read words, we also read sound⁴

I shall now briefly outline - including a sprinkling of references for further reading - a glimpse into the high levels of complexity in music, both as an abstract system and as a human cultural activity. The following section fills in some of the background for Mu-Psi and 21st Century musical modernism.

2. Many Rivers to Cross

One cannot step twice into the same river - *Heracitus*

In nature, there is never one identical music experience. Music is affective, situated and embodied; listening to the sound waves of music changes us⁵ - and the setting or the focal quality of our hearing changes music.⁶ There is no “real music” because music as a whole will never be reducible to one set of particular techniques, styles, instruments or sounds. We need to start thinking about music as something much bigger and much more abstract

than recordings or popular songs.

How about a multidimensional space of continuous activity and malleable variability, a musical *ontology*?⁷ We are talking about **Music** with a capital “M” - some kind of vast, abstract, limitless dynamical system of all possible music objects, something along the lines of Borges’ Labyrinths.⁸ In the normal course of life, it is often easier to talk about a piece of music, than to talk about “Music” in all its mind-boggling abstraction. Let it be clear that when we refer to a piece of Music - a recording or a song - we are referring to a music object - a relatively fixed arrangement of specified sounds, mined and polished from the raw flux of a Music ontology. That extraction and mediation is accomplished by musician, composer or active listener. State of the art research suggests we could possibly include algorithms as mediators for music discovery, although arguably software can only *process* music as digital data - this is far from the act of listening. Given the astounding parametric diversity and timescales of Music, it can also be surprisingly egalitarian. For example a composer or designer might equate seemingly unrelated attributes. Some examples; pitch and rhythm,⁹ spectra and tuning,¹⁰ tonality and emotion¹¹ or - as in an example from the field of data sonification - duration and threat detection.¹² It is interesting to note that in the context of Music and auditory design thinking, such experimental couplings are refined through the act of listening - perhaps the results of the research are as narrowly focused as a scientific experiment or as unbridled as a contemporary art form.

The diversity, unity and inclusiveness of the culture of Music manifests most prominently on the level of human engagement and this, for me, is one of the most compelling reasons why music, should not be trapped inside the hustle of an entertainment industry existing solely on the political economy of music objects. I would argue that the experience of Music and musical meaning are by nature, free to all who listen. From a political perspective, it has been argued that Music as an abstract system, *is* capable of defending itself from any form of absolute control¹³ - music activity is difficult to suppress because of the reality that modernity affords; music objects in great abundance, each one imbued with immeasurable levels of nuance and variability in meaning.

Music taps directly into our most profound notions of being, delivering universal information mediated through interwoven scales of vibrational energy. Think of how the tiniest vibrations of a speaker membrane can evoke memories or move bodies in rhythm. A sonic musical experience can unfold with or without audience, with or without the conventions of spoken

language and with or without technology. Music and sound has empathic, cultural, political and ecstatic affects.¹⁴ Sound and music technology have contributed directly to the development of mathematics, computers, medical and scientific thought and vice versa.¹⁵ All of this is Promethean fire for a MuPsi premise.

Being exposed to the musical imagination of individuals and groups is a very common experience - and has accompanied humans for thousands of years. Auditory phenomena can alter the way we situate ourselves in space and in time. Indeed, the physical form of sound waves literally vibrates and alters our neurons and cells, and have done over the entirety of human history. In 2008, the discovery of a vulture bone flute at *Hohle Fels* cave in Germany is dated to 40,000 years, considered the world's earliest recognisable music instrument.¹⁶ In the modern day, when music and sound is proposed in a methodological role beyond conventional ideas of entertainment or aesthetics, it is generally considered unscientific by the mainstream and is often marginalised. This seems at odds with the rich legacy of sonic creativity and life. Some examples might be how the fields of data-sonification or archeo-acoustics remain niche. The latter emphasises how ancient places and artefacts might have *sounded*, rather than how they might have looked. Sounding out the relationships between the location of archeological sites and special acoustic properties of those locations can help us infer just how important sound and music might have been for our ancient ancestors.¹⁷ Another rather niche technical example from my own work is the "WireFrames" library for Kyma which implements real-time sample rate computation using synchronised audio signals acting upon each other. Using only audio signals at high sample rates, it can compute the dynamics of flocking systems, Lorenz systems or Nearest Neighbour algorithms, the results of which can be sonified in realtime as digital oscillators or spectral resynthesis.¹⁸ I believe the applications of high speed computation in the audio signal domain has enormous potential in fields beyond those of sound design yet I struggle to convince non-sonic practitioners.

Let us get back to the Mu-Psi manifesto. I would like now to compose some Mu-Psi premises, and invite the reader to consider the ramifications. Are they purely speculative or musical folly? My premises build on the idea that sound and music formed a big part of the original augmented realities in our previously un-electrified world. Evidence of prehistoric instruments carved from bone or rock, suggest that the ecstatic experience of music (in the original sense of ekstasis — to be outside or beyond one's self) and

its transformative affects, has been with us for millennia. Here are three Mu-Psi premises which explore the ramifications of a human development where music, acoustic and sound phenomena have maintained their sacred status from antiquity.

What if.... music and sonic meaning were not marginalised today as little more than entertainment? We need all the help we can get as we face catastrophic threats to life on Earth. How can Music contribute to improving our relationship with nature?

What if.... Music contains within it all of humanity's prayers, gods, imagining and dreams as a vast mandala, parts of which we can play back as vibrations, perceivable in the air around us?

What if.... sonic communities exist who worship ecstatic sound objects. What if they consider the creation of music as sacred as the invention of prayers, as useful as the most empowering technology?

What if.... an abundance of ecstatic sound objects and reproduction technology rapidly empowers the auditory imagination of individuals and societies triggering an unprecedented feedback of *ekstasis* inspiring new ways of relating to nature and each other?

What kind of crazy music could stem from these premises? To me, and surely others from the music community, such premises do not seem so crazy, fictional or futuristic. They seem like a description of the *sonic-now*. It is already happening, but needs more amplification!

3. The Art of Flux

As we have implied, the Mu-Psi manifesto is both current and futuristic - the contemporary modernity. It is a calling to be radically creational in a medium that does not necessarily rely on any kind of transaction, decoding or interpretation. Music is sensorially immersive, like a flux, like noise - it flows through us and expresses many possible states at once. People tend to take it for granted for example, that music and sound is both in the airwaves around us *and* somehow, inside our bodies at the same time. This ubiquitous freedom grants a significant purpose and responsibility to the creation of music, and it reminds us that the artistry and craft around

music can be a demanding and unconventional pursuit. The second half of the Mu-Psi manifesto contains a mission statement.

Art has a purpose and plays a powerful role in society. The artist's mission is to:

- Stimulate imaginative thinking, discussion, and creation of alternative worlds, solutions, possibilities
- Entertain by stimulating the intellect
- Guide audiences along paths through abstract conceptual spaces
- Invite the audience on an intellectually challenging journey from which they will return refreshed, rejuvenated, and inspired
- Create sonic metaphors for powerful universal concepts
- Create an ecstatic experience for the audience
- Play within a set of constraints; experimentally violate one or more constraints to explore the ramifications.

This mission statement along with the whole Mu-Psi attitude aligns well with another source of encouragement I would like to share here - Adam Harper's *Infinite Music*.¹⁹ Some of the ideas packed into this dense little book significantly widened the scope of my own 21st Century music practice. It is a fast-paced investigation into the structural and philosophical complexity of a MuPsi-like premise - *What if.... the variability of music is infinite?* The book - and its mind-bending footnotes - attempts to explore the ramifications of that idea. An exciting concept that he welcomes us to early on, and one I have also been introducing gently to the reader in this essay, are collected theories about the fabric of an *n-dimensional* "Music Space" where infinite musical variability exists as a quantisable space of possible musical attributes. Against this backdrop, Harper blows the conventional idea of music wide open. For example, he postulates that experienced practitioners working in Music Space easily integrate and specify non-musical forms such as architecture, images, text, bodies or history as musical variables. In fact everything can be material to be appropriated, synthesised, recombined, saturated, repeated or precisely specified in the never-ending pursuit of extending a universal sonic imagination. I would add that when lived, this mind frame is often undirected and unfocussed yet devoted to innovating in sound. Why? As it says in the Mu-Psi manifesto - extending the musical imagination is an ecstatic process of continuous spiritual and embodied transformation for all who engage with the process or the production.

The widening of an imagination to accommodate a new and unusual idea or possibility can be a rewarding experience in itself, but this process is also the engine of our development and betterment as individuals and as societies.
(Harper, 2011, p.9)

4. Music Space

At this point, I would like to go through some examples from my own practice which involve some unconventional ideas and in the praxis, some unconventional music computing. I consider them as works informed by the ramifications of thinking about music as a (near infinite) Music Space. Firstly, I refer the reader to a video piece^a, part of a collaboration with composer SØS Gunver Ryberg^{20,21} and film maker Marta Bala.²²

Poise. Intention. Action. Precision. Here we are on our knees, mining the Sugar Cave. It is our environment of being, it is a beautiful place. It's made of music. It dreams of us and our dreams flow back into it. It's resourceful, sometimes we've even seen it feed upon itself...Inside, Music is everything but sound can be absent. In fact, some of our favourite parts are silent. There's lots of silence in there.²³

The spoken text I wrote for the video piece expresses metaphorically what it feels like to live and work in the flux of *our* Music Space - which we called the "Sugar Cave". As well as being the speakable name of our esoteric moniker SGR^CAV , it stands as a metaphor for the abstract vastness of Music Space with its resonant caves, audible dust, spectral trails and voids. In the video piece, we come across as Kerouac-style adventurers, on our knees, mining Music Space for mythical sonic bounty using special technologies and following secret trails before packing our discoveries down into encapsulated and diffusible forms for public consumption. At least that's the way I read it. The piece is hinting that a Mu-Psi/Music Space life can be directional but also confusing - like a drunken walk. The main example in this piece, is the attempt to describe how it is that composers and sound artists might not always work with sound when they are deriving musical meaning. This notion could be construed as equivalent to thinking about computation without computers, and equally as path widening.

5. Soundless Music

Let us break down that idea a bit more. John Cages's piece of silent music 4'33" is a modernist milestone,²⁴ performed with famously disruptive impact by David Tudor in 1952. Seventy years later - demonstrative of the power of true modernism - to think about the paradox of equating silence with music, still serves as a thought exercise. Consider the following

^aViewing link: <https://vimeo.com/126520100>

example. Have you ever observed a fellow passenger at rush hour, reading a musical manuscript in preparation for a meeting perhaps? Have you ever wondered if that person is hearing sounds in their head? If you dwell on it - how is it even possible to hear imaginary sounds in such a noisy place? *What if... we all have a Mind's Ear?* Of course sound is as important to musicians as words are to a writer yet paradoxically, composers are regularly considering non-sonic parameters in the normal course of music composition.

Turning to post-modern pop, Bernard Sumner of New Order once sang *A sound form in a vacuum may seem a waste of time.*²⁵ Maybe. But then again, maybe the line was hinting that imagining a sound form in a vacuum, isn't a waste of time at all. These words about silence are embedded inside layers of Sequential Circuits synths and Oberheim drum machines.²⁶ Therefore the medium which surrounds the poetic notion of a silent sound in a vacuum, is not a void, but of course music in all its void-filling richness. Music - when it is not sounding - exists as potential sound forms in a vacuum waiting to be released, waiting to be realised in time and space. From a personal perspective, I have witnessed many times how a precisely specified mix, adapted and mutated in a listener's presence. My recording apparently contained layers of unspecified behaviour which only emerged when listening to it with others. This amazes me. To maximise this effect, I try to design it in - sound with combinatorial potential - and that often means imagining and specifying a range of sonic possibilities. This is achieved through applied non-sonic activities, such as tweaking in the code editor or configuring rows of modules or guitar pedals for performative potential. This is modern composing. It is often a virtuoso act of sonic imagination.

6. Crawling around in the mud

Let us now get further into what it is like to compose something like a Mu-Psi premise, and techniques for extracting from the fabric of Music Space. In my studio - sometimes in silence, sometimes out loud - I spend substantial hours designing the tooling and explorative systems that will help in the endless process of innovating sound and music, the process of mapping out Music Space. On a day to day, these systems might form networks of unpredictable signal modulations and algorithms acting on many musical attributes at once. Examples of stochastic algorithms might be the zig-zag of the "Drunken Walk" or the recombinance of the "Markov Chain" -

when applied to notes, frequencies, rhythms and timbres these time based processes always evoke ranges of expressive data, to listen to and consider as musical potential. Shepherding the myriad of possibilities towards a functional goal such as an audio recording, an improvisation or a written score, is an activity that musicians all do, one way or another. I would argue it is at the heart of the practice for many. *Crawling* and *Shepharding* over a long history of iterations.

At some point during a creation, I will begin to structure the sonic and musical architecture through a process of interactive listening. This stage of the process usually unfolds when situated in the studio, but not always. It involves a lot of parameter adjustment whilst listening to results - volume is one of the most important parameters, hence the critical importance of studio acoustics and good isolation. Through interactive listening, the idea is to understand what might be evolving musically and how to sieve that emergence through a universal, predetermined and/or subjective set of decisions. It can be exciting, it can be repetitive, it can be exhausting. Hence the SGR^CAV mantra - "*Poise. Intention. Action. Precision.*" - designed to guide safe critical decision making whilst in the flow.^b

A notion of safety and responsibility in the electronic music studio is important. The studio should be understood as an experimental laboratory containing technologies that have been solely designed for sonic *ekstasis* and the production thereof. A transformative sonic temple if you will, optimised for listening to what Conny Plank described as the "potential of noise".²⁷

The intensity levels in the studio can be, and need to be, overwhelming at times. I encourage getting away from the machines every now and then, going out on sound explorations through the city or going out to performances and music events. In fact, one of the cool things about being immersed into a compositional process, is how the act of listening to everything else is a continuation of the work of composition and decision making on your own project - just a little offset in time. For example, I may be inspired by something I've heard and later sit down to compose a remembered sound in the studio. Starting from remembered sounds is another example of musical imagination taking a role in production. To clarify - I am rarely successful at recreating something exactly from memory - that isn't the point of the exercise. That would be better served by field recording. Instead, this exercise is intended to open paths, when the process might have become blocked or stagnated.

^bPerhaps also somewhat inspired by SØS Gunver Ryberg's former stunt training

7. Play. Create. Guide

To conclude, I would like to return to focus on three points of the Mu-Psi Artists Mission statement.

- (1) Play within a set of constraints; experimentally violate one or more constraints to explore the ramifications
- (2) Create sonic metaphors for powerful universal concepts
- (3) Guide audiences along paths through abstract conceptual spaces

This concluding section will outline examples of these three, applied to my own practice and with suggestions for further reading.

7.1. *Play.*

When discovering a particular terrain of musical imagination, put down some constraints which might help mark it out. In other words, lay down some tracks. In the case of my 2013 album - *Eselsbrücke*²⁸ - I introduced intervallic constraints from the very beginning, before sounding anything. The works on the album were derived from rows of constant integers and an interest in the musical potential of the intervals between the elements. Four row transformations were allowed, as a means of evolving higher order sets. The rows all expressed distinct intervallic patterns, and the algorithms for generating them were straight forward, although it became challenging to find a non-subjective way of making choices about them. The gritty details of how I applied sieve theory²⁹ to create the sets and how I solved the artistic challenge of struggling against intuitive decisions, are beyond the scope of this paper. Nevertheless, I encourage the reader to take a look at the creative and technical essay published by *Fylkingens Journal* online, which goes over the project in detail.³⁰

7.2. *Create.*

This subsection relates to the metaphors part of “Create Metaphors”. After the recording process and concerts were all exhausted for the *Eselsbrücke* album, I still felt compelled to document a little more about the universal concepts - and following the Mu-Psi manifesto - do that as metaphor. As I had already taken all the decisions to compose the sonic metaphors, I moved into the non-sonic music territory. Painting might have been adequate but I am not so good at that. Instead I decided to write short stories. Three short stories emerged whilst thinking about the music and the musical processes

on *Eselsbrücke*. The stories are set in a space that for me at least, seemed to resonate with the synthetic, time computed and intervallic dialectics of the music processes on that record. In the frame of 'Music Space', we could see these stories as music objects specified to be text based, but containing musical meaning. Perhaps they could be interpreted as scores or librettos, for improvising another *Eselsbrücke* music object, perhaps not a solo this time, but instead an opera with a group musicians. Perhaps we could imagine a new literary genre of *MuPsi stories* - creative writing about abstract conceptual spaces that were originally musical narratives. To sum up; with the music and the words, a corner of Music Space was rendered in the form of recorded music and in the form of literary non-literal texts - parallel examples of encapsulated musical meaning.

7.3. *Guide.*

I leave the reader with an extract from one of those Mu-Psi short stories. The whole chapter can be downloaded at <https://github.com/cristianvogel/mupsi-musicspace-writing-music-spectra>. The piece of music it is based on is also available in that repository, alongside full colour spectrograms kindly prepared by Guy Birkin.³¹ A short conclusion to this essay follows the excerpt.

8. Mount The 137 (excerpt)

Every strategy we invent is in the hope that it will unfold unexpectedly. We invent the real in the hope of seeing it unfold as a great ruse. From strategy we expect control, but from seduction we hope for surprise.

When the bridge emerged, the solution crossing solution, it was fast and vivid and its sudden sound woke him instantly. Hope had finally matrixed out all the mapping decisions and executed the patterns. The synthetic nucleotide had alloyed into an instant shimmering vertical stack. The tall structure stretched out across the river. It was constructed from crystal clock state machines, its edges honed by the strong resonances the clocks traced in the fluxscape. Lucky Connor was particularly impressed by the way Hope had used a sieve to make structural decisions about the clocks that made up the bridge. Connor always carried around a light green sieve in his stuff, and that's the one Hope had used. He always kept it, because this particular sieve had a great pattern, one that expressed the space between all prime numbers. He had often wondered what it was really for - it was never much good at draining rice. He could see that Hope had used the sieve to sift out and frame fundamental decisions for the bridge structure - the height at which each clock was suspended, for example, had been chosen through the sieve, as had the speed of each clock being used. The lowest and slowest clock ticked - changed states - just once between one bank and the other. Its on-state cast a wide fresh crystal alloy across the fluxscape, stretching out exactly half way across the river. The highest and fastest clock ticked 137 times to reach the other side, leaving staccato fragments of crystal, high in the fluxlight. When a clock tucked itself into the off-state, it resonated an outline of its previous state. These empty outlines, transparent shadows or memories of stability, filled the gaps between each solid tick. In these intervals, the background of the river scene was pulled taut to become foreground. Unlike the reflective crystal alloy links of the on-states, the off-states of each clock refracted the view of the over bank and magnified Lucky Connor's projections of nextlevel flow - like mirages manifesting out of distant hot air into something so desirable, so close.

9. Conclusion

The prose metaphorises the stacked oscillator and pulse structures from which a spectral "bridge" (fig.1) emerged. The spectral shape was a characteristic of almost all the pieces on the album stemming from the intervallic constraints, particularly relating to the stacking of prime number tempos. Interestingly, even though the music was derived from a relatively

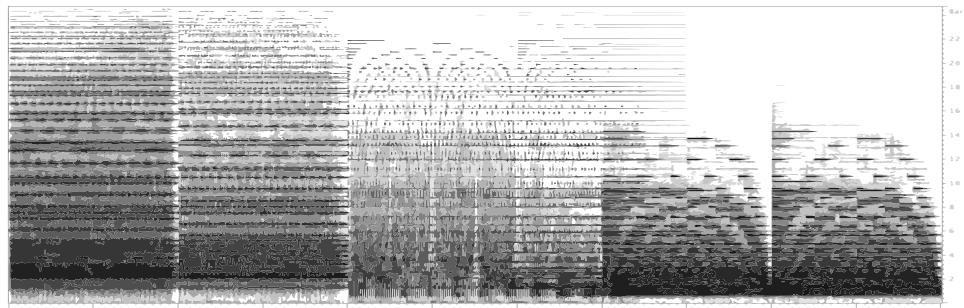


Fig. 1. Approximate spectrogram of Mount The 137 showing the spectral "bridge"

'cold' starting point - applying prime number sieves for constrained decision making - the album ended up having a surprisingly powerful emotional and spectral signature, notably different to my previous work. For me, the structure of the story has a sense of the On Off switches and State Machines, as it splices between my sometimes generative Mu-Psi prose and that of another text, a book by Jean Baudrillard. The spliced passages were appropriated and processed, much as I do with sampled sounds. My original writing and the appropriated texts both have intervallic, ecstatic and emotionally additive qualities, which contrasted well together and structurally with the sound of the music. I feel *Eselsbrücke* adhered to many aspects of the Mu-Psi manifesto, placing it as a concrete example in my catalogue of how Mu-Psi and Music Space directed my musical imagination toward unconventional means and method for the discovery and traversal of Music Space.

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