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Introduction: All Worlds

‘To the makers of music – all worlds, all times’

– handwritten inscription on the Voyager Golden Record

There’s a legend that sometime in the early nineteen-twenties Arnold Schoenberg, the Austrian composer regarded by many as the defining figure of musical modernism, proudly announced to his pupils Alban Berg and Anton Webern his discovery of a new compositional technique that would ensure the dominance of the German musical tradition for a thousand years. The technique was twelve-tone music, later called ‘serialism’, and it offered a method for the structuring of music to replace traditional tonality’s system of keys – a harmonic convention Schoenberg had lead the way in superseding a decade before, inaugurating ‘atonality’. The twelve-tone technique treated all twelve pitches in the Western octave equally, with each of them allotted an equal presence and significance within the musical work as part of a ‘tone row’ or ‘series’ that incorporated them all. In the subsequent decades the method developed into serialism and the same technique was applied to other musical variables such as duration, volume and timbre, becoming highly popular with composers in Europe and America. Today, serialism has all but died out, faith in musical modernism has subsided, and the legend seems more like a joke. There probably wasn’t much truth in it to begin with, and it was most likely spread and embellished by some of Schoenberg’s many detractors, wishing to draw parallels with the other declarations of lasting national dominance heard during that era.

When another leading modernist composer, Karlheinz Stockhausen, died at the end of 2007 another legend was told, this time among the composers based at the university music

department where I was studying at the time. Apparently in the moments immediately before his death, Stockhausen had announced to onlookers his recent discovery of ‘a new way of breathing’ – after which he promptly collapsed. The joke was mean-spirited, but nonetheless betrayed a certain affection for a composer who’d probably done more to explore radical new musical worlds than any other, yet with little mainstream acceptance. The last movement of Schoenberg’s Second String Quartet is often described as the very first example of atonality, and had featured a soprano ushering in musical modernism by singing the words: ‘I feel air from other planets’.

Both of these stories thrive on the perceived failure of twentieth-century musical modernism. It’s certainly difficult to argue that it came to enjoy as much public success as its protagonists and adherents would have liked it to. Of course, many people do appreciate and value this music, but these days much of this appreciation is found among small, often academic communities who, in spite of the ground-breaking efforts of their forebears, have almost paradoxically come to hold on to some very specific ideas about which particular forms of music and methods of composition are to be preferred, ignoring the growing diversity and complexity of the many other musical styles explored more freely by the wider public. Many focus on the historical facts of musical modernism such as atonality, apparently failing to recognise that music becomes modern relative to the conditions, perceptions and conventions of its time – modernism is not, in itself, a set of conventions. If music becomes conventional, it’s by definition no longer modernist.

This book argues that musical modernism is not a state or a set of particular techniques or characteristics, but a direction. Modernism moves away from the strictures of tradition, progressively tearing them away piece by piece and leaving them behind as it travels towards an ultimately infinite potential for musical variety. In doing so it enhances the ways in which we perceive,

imagine and live in the world. But there isn't just one, general and absolute path towards the infinite point of musical modernity, an assumption that came to stifle modernist music until it became, ironically, a new orthodoxy. Rather, each path is relative to a different starting point, a different context of convention. Modernism is a multi-directional and multi-dimensional process, and there are as many paths toward musical infinity as there are ways of composing and listening.

The musical modernists of the twenty-first century should follow the *spirit* of serialism and not its technique, its path of innovation and not its absolute solution, its difference and not its being repeated. Serialism sought to structure the entirety of music's wider (and ultimately infinite) possibilities with an even hand. This goal remains the same. But the sheer infinity of complex musical variety is too much to be squeezed into the discrete spans imposed on single musical works. Many serialist works aimed to have it all, all the time, an attitude that usually resulted in a structuring of musical variety so diffuse that it was difficult to perceive its workings in detail. Thus musical infinity had relatively little success at the level of the musical work itself. This made little difference, many of its adherents went on to claim, because the music was for experts and not meant for the general (or else somehow coerced) intelligences of the general public. So when interest in serialism subsequently all but died, it was assumed that this was because people – especially the general public – didn't really want music to be new and different, and that in a wider sense, radical attempts at innovation were hopeless, or at the most the exclusive preserve of a special minority cursed with the solitude of aesthetic superiority. What if this was an illusion, an overreaction?

What's more, serialism momentarily became the new orthodoxy because of its restrictions. Despite its noble aim to freely and equally structure the entire scope of musical variety, this variety was often permitted only for the single variable of

pitch, or a limited range of the options expressed by other basic musical variables. Many serialist composers failed to perceive or challenge the even more fundamental conventions of their musical milieu: that the timbres they used were those of the instruments of Western classical music, centuries old, that the pitches and tunings they used were those of Western equal temperament and were even older. More fundamentally still, the music continued to be presented in the manner it had been for centuries: within a formal concert performance. Atonality was only one step on the road to musical modernity, and not its destination. The new musical possibilities that could be uncovered by the removal of still deeper conventions went unnoticed by many of the serialists. Other modernist composers, such as John Cage, Henry Cowell, Harry Partch and La Monte Young did travel beyond these conventions, but they didn't usually incorporate the egalitarianism of serialist techniques.

The greatest problem with serialism, though, was in its boiling down of all the complexity of music to one single, simple and absolute system of variables to be serialised, up to four in number: pitch, timbre, duration and volume. Pitch tended to take precedence, and to this day it's still seen as the most important, even the defining, variable in music. But music was nominally a construction of four variables and thus composition amounted to sculpture in a space of four dimensions. However, just as modernist music doesn't have one single set of characteristic techniques but operates instead relative to convention, so musical invention can't be reduced to four absolute dimensions, each constrained and finite. Technically, musical sound can be reduced even further to merely two dimensions: time and the amplitude of its sound wave. And these dimensions can be built up and combined in a number of ways to form more complex quantities that composers may wish to observe and control, such as timbres, harmonies, rhythms, melodies and any structure there may not yet be a name for. So where do we draw a line around what

musical variables composers should observe and potentially serialise?

We don't. That was the old serialism, the old modernism. There can be no one absolute foundation for music. And there can be no prior assumptions, no prior techniques and conventions – no restrictions whatsoever. We can't even assume any ultimate distinction between musical activity and the wider lives of ourselves and the universe. That's what the meaning of musical infinity is, and it's in that direction that any future modernist endeavour must travel. Infinite music necessitates an *n-dimensional modernism*. Its egalitarian serialisation – in individual musical works or among a group of works – can approach infinity, increasing in scope and richness as it goes, but will never actually reach it, and so modernism can only ever amount to a relative direction rather than a fixed state. Serialism and modernism are dead. Long may they live.

Modernity is the challenge of the infinite within the capacities of the present. Musical modernists seek to maximise the possibilities of composition to the utmost degree, taking in equally both its broad and deep possibilities and those at the finest levels of detail (composers regularly lose themselves between these two extremes, ignoring or unaware of the entire range). This infinity of possible permutations in musical variety has often been a topic of discussion. In 1959 the composer and conductor Leonard Bernstein gave a television lecture entitled 'The Infinite Variety of Music', concerned with, as its title suggests, the richness of musical variation.¹ To illustrate this, Bernstein took a simple sequence of four pitches and gave a number of examples of how that sequence had been varied across different examples of (mainly Western classical) music. In a preamble he noted that the number of other possible combinations of pitches stretched to a number that was over a hundred digits long. With chords (i.e. more than one pitch sounding simultaneously) taken into account, this number increases to over three hundred digits. Of

course, not only did this just describe the numerical potential of one variable – pitch – but it only took into account the twelve pitches of the Western classical system.

With the much finer possibilities and control over musical variables offered by recently developed and increasingly accessible electronic music technology, this number truly explodes. Since the nineteen-fifties (the heyday of Bernstein and musical modernism) countless musical performances have occurred and musical variables invented, used and perceived that cannot be counted within Bernstein's number. Many of these came from an arena of music-making some still call 'popular music' – the term is quaint, in many ways incorrect, in some contexts has an offensive tinge, and will probably lose its currency over the next century. 'Popular music' can either mean 'music that is widely appreciated' or else music *for* 'the people' or *by* 'the people', regardless of how many people actually appreciate it. I'm referring to the third category, but either way the term is generally a catch-all category for music that isn't thought to be Western classical music. Since the Second World War this 'popular music' has been increasing exponentially in diversity and complexity, incorporating new, technological structures and forms and becoming a powerful new site for musical modernism.

It hopefully goes without saying, then, that modernist music isn't limited to one particular musical style or genre, but can and will manifest through hundreds and thousands of different styles. In any case, the main thrust of musical modernism has largely fallen out of the hands of Western classical music over the last fifty years. In its current state, it rarely offers those hungry for the musically new anything more than convention upon convention – a long, deep and undeniably rich tradition that Schoenberg never escaped from. These conventions are sonic, but in the end they are deeper still: the concert, the concert hall, the smartly dressed musicians playing age-old instruments of wire, wood and brass, the silenced audience. Too often, the elitism is

social as well as artistic. Western classical music – we could call it ‘non-popular music’ – has long ceased to assume a place of absolute privilege and priority in musical culture as a whole. It’s given and may well continue to give us some of those works of art our culture has appreciated the most, but today its general tendency towards myopic traditionalism and exclusivity makes it tiny against the enormous backdrop of infinite musical possibility, which is calling more loudly than ever before.

A number of the cultural assumptions we make about music and musical concepts live on, however, inherited from centuries of Western classical music and its aesthetic ideologies. A ‘composer’, for example, is routinely held to be a specially trained person (usually a man) who writes music using Western classical notation, which is then given to an ensemble of specially trained musicians playing Western classical instruments. But technically the word ‘composer’ suggests anyone at all who might create music. In this sense, the term overlaps with the word ‘performer’. Composers may also come in groups that collaborate on the creation of music. In this book I retain the word ‘composer’ because of this fundamental meaning, but in no way should it be assumed that I am talking about classical music, or classical music composers, or composers who write for live or acoustic instruments, or specially trained or professional artists. No, with the word ‘composer’ I’ll be referring to *any source of music at all*, multiple or otherwise, including performers (be they singers or instrumentalists), producers, singer-songwriters, ‘artists’, sound artists, DJs and other selectors, artificial sources and even, in a significant sense, people who play music to themselves alone, with an instrument or the press of a button. We can all be composers, and we are all composers. This must not be forgotten as you read. Nor does the term imply any particular value or privileged position – all these figures are equal. To emphasise all of this, I’ve only used the word in plural form.

Similarly, when I talk of the possibilities of ‘music’, I don’t prioritise or ‘really mean’ classical music, as the term is often used in certain circles. Nor do I ‘really mean’ any sort of popular or Western music. I don’t even ‘really mean’ ‘art’ music, or ‘difficult’ music, or ‘serious’ music – awkward terms that have been used to differentiate, separate and territorialise musical activity in the past. I don’t even mean whatever we consider to be ‘good’ music. I mean music in all its senses, all its past, present and future senses. Music in senses that haven’t even been discovered or practiced yet. Music before categories and without prejudices, to the fullest possible extent of the word’s meanings and consequences.²

How can music be infinite in such a way? Its possibilities can’t literally become actualised as infinite, of course, as long as the various systems that perform music are somehow finite, which will necessarily be the case since the universe itself is physically constrained. For this reason we should consider these possibilities *virtually* infinite. Besides which, an infinite variety of music isn’t necessarily desirable in itself. Even with the best intentions it can’t be denied that we appreciate some permutations of musical possibility more than others, depending on context, and that our capacity to appreciate music has some relation to the prior musical systems we’ve become familiar with. Does musical modernism fail to take this into account? Only partially – if modernism is a directional process, the music it creates is always somewhere *between* the old and familiar and the indiscriminate infinity of different forms, proceeding only *toward* the latter. It’s a relation between old and new, and any given moment of modernist music will present a mixture of what can be appreciable to a given audience to any extent as either old or new. So not only must modernism reject any one absolute system, path or final resting place, but it must also situate itself with respect to the familiar in some way, however small, and this link with or establishment of the familiar is what can facilitate appreciation.

Here, perhaps, is a way to bringing more listeners to modernist music than it won in the twentieth century.

But why all this talk of modernism and infinity? Why does music need to align itself with the maximum compositional possibilities of its time? Aren't things just fine the way they are? Why write this book? The issue is one of *imagination*. Music is one of the activities that can stoke it, and not just in some abstract, exclusively artistic sense. There is no absolute border between the musical imagination and the imagination of anything else in life. 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. Sometimes ideas become difficult to imagine; often we can't tell when our imaginations have become limited and we can no longer detect what might lie beyond their horizons, making us ignorant both of the way things really are and the way things might one day be.

I would argue that music, both in its composition and in its appreciation (not entirely differentiable categories, as we'll see), often faces such a predicament and is actually facing one today. For many people it's difficult to imagine the future of music as being anything very different to what it is at present. This is compounded by the notion that in the last century we've supposedly learned the lesson that radical musical innovation along the lines of serialism will only be unsuccessful. We might even lapse into an attitude of some cruel irony concerning matters of glittering, confident musical futures, an irony by turns tragic or mocking: the jokes – Schoenberg, Stockhausen – receive their punch-lines. Or else we ignore it, or remain ignorant entirely. Either way we've perpetuated the status quo.

Why shouldn't we try to imagine another thousand years of musical history? Why shouldn't we try to feel the air of other planets? Is stagnation and comfortable, unwitting boredom

preferable? Twentieth-century musical modernism may appear to have ended in failure when compared to its loftiest ambitions, but the future of the human musical imagination is about more than the rehabilitation of that same old twentieth-century modernism. This enters a far deeper current of human history. We could say that musical modernism is a process that also occurred at other moments in music history that may not be as well-known today, but had huge repercussions for the increasing richness of music: bass-led harmony and opera (in the seventeenth century), the precise division of musical time (in the fourteenth century), even polyphony and tuning itself are the products of musical innovation – of venturing into a detailed musical infinity – down the ages, and that’s only Western music.

This book proposes a system for the imagining of music. It’s not just a single system as was offered by serialism, but a system of systems, an infinite system allowing for the creation of subordinate musical systems or what will be called ‘musical objects’, describing how they interrelate and how they’re perceived (or not). It sees music as a *complex system of variables relating primarily to the production of sound*, and takes this idea to its infinitely variable conclusions. This system, which is given the name ‘music space’, situates the limitations of any one, particular idea or set of ideas about musical forms against a space of infinite variability expressed in infinite dimensions. It ultimately treats all music as *a process of continuously changing information* and thus at the point of infinity, music, which manifests as an event, is always unrepeatable and different (i.e. changed) unless we restrict the perception of this change in some way. We see every musical structure as one of different relative rates of this change, with some elements changing while others repeat or remain effectively the same. We see how the same structures of musical change apply both within and outside of the borders of musical performances, making music as a whole a single system spanning all lengths of time. We see how composers and listeners perceive

this change in relation to their own capacities and interests and thus come to handle and develop musical information discriminately. Most importantly, by imagining music in terms of paths of possible change running through a space of infinite possibility, we learn how the restrictions of unwitting convention and the apparent finitude of our imaginations can be detected and thus overcome.

This book is for both for composers (meaning anyone who creates music) and listeners. It assumes very little prior familiarity with the various technical terms and concepts in music – instead, it offers a new vocabulary. Examples and analogies are given where possible, but it'll naturally be a challenge to express complex musical structures that haven't yet been invented as musical concepts, so we generally have to make do with the usual typological landscape of musical works, instruments, styles, notes, sounds, melodies and so on. The infinite world beyond them is given its space, but has to remain largely undemonstrated and should always be borne in mind. The system presented here also draws influence from areas of contemporary philosophy, musicology, psychology, statistics, geometry, physics, information theory and speculative astrobiology but again, the concepts involved are for the most part explained and framed afresh rather than reliant on much prior familiarity with, reference to, or quotation and transplanted terminology from these discourses.

Each part of this book expresses broadly the same set of ideas, with each adding its own successive layer of conceptual detail in framing these ideas. Part 1 is an introduction to the concept of musical variables and how they operate and combine to form structures. Along the way we'll define music and its relationship to wider life, and see it as something that changes, most notably at the point of performance. Part 2 is a more technical exploration of the matters arising from Part 1, examining the properties and development of 'musical objects' within music

space and the nature of musical information, how it can increase and decrease. This leads to an understanding of musical experimentation and imagination, and to an ethos of composition. Part 3 deals with the aesthetics or perception of music, noting that listening to music is an active, interested and discriminatory process dependent on our capacities and needs. Listening and aestheticising turns musical objects into 'images of music' whose limitations can hinder more imaginative listening. Part 3 consequently arrives at a definition of musical modernism as pertaining relative to these images, and concludes by positing three successive categories of invention in new music.

Written ten years into a new millennium that has already seen widespread and significant technological change as well as scientific discovery, this book is not primarily a guide to what will happen in the next thousand years of human music-making (if we survive that long), although it does make a few predictions and suggestions, and its system is designed to encompass all possible musical change that may arise in that time. The word 'millennium' doesn't just refer to a period of a thousand years, either, but also suggests a new era, one with generally positive connotations. My hope – barefacedly idealistic enough to rival those of the modernists of precisely a century ago – is that it will see the virtually infinite possibilities of music more easily accessed by humanity as a whole. If nothing else, this is at least a goal for modernist music.

Why *human* music-making? Are there other kinds of music-making? Perhaps – but here, 'human' is intended not so much as a qualification for or an all-too-tragic limitation on musical possibility than as an invitation to it. Humanity doesn't equate to a set of given biological, evolutionary or social constraints, but is constantly adapting and developing from the old, familiar and limited humanity to new forms of humanity, using tools and technology and increasing its capacity for imagination and information as it does so. Music goes along with it, as a part of this

process.

The scope and achievement of human music-making to date regularly goes unappreciated. I'm not only referring to the well-known canonical gravitas of figures like Bach and Beethoven, but to the broader variety of the world's musical culture and its wide array of detailed approaches. Speaking of humanity's capacity to use tools and technology to gather new information and ultimately reach the infinite, a representatively diverse compilation of recorded human music known as the Voyager Golden Record was attached to each of the two Voyager space probes, launched in 1977. Having photographed the planets and moons of the outer solar system, Voyager 1 is now rapidly heading out of our solar system and has by some distance become the farthest human-made object from Earth, roughly ten billion miles away at the current time of writing. Inspiringly Romantic as this is, the Golden Record also reveals just some of the rich possibilities of human music-making that have already been realised. They were selected by a committee chaired by astronomer and cosmologist Carl Sagan and include examples from four centuries of the Western classical concert tradition (Bach and Beethoven make five appearances between them) as well as musical styles from India, Africa, China, South and North America, Southeast Asia, Eastern Europe and Oceania. Complementing the outer areas of musical possibility sketched by the modernist composers of the mid-twentieth century, the record demonstrates the depth of complexity that can come to fill this broad space – then, now and in the future.

The Golden Record is intended as an emissary of the mid-twentieth-century human race, on the off-chance that any extraterrestrial life-forms (or future humans) recover it. Even if it is weighted towards Western music, compiled by Western ears and doesn't take in the experimental and electronic music developed in the second half of the twentieth century (and particularly towards its end, after launch), its complexity and

diversity is still deeply instructive. With music heading all the time into new territories, sometimes rapidly, sometimes more slowly, what would an equivalent of the Voyager Golden Record sound like in a thousand years' time? Would Bach and Beethoven still seem significant enough within the archives of human musical achievement to merit an appearance, or will they, like the monastic chant of the first millennium AD previously that doesn't appear on the Golden Record, be deemed too obscure, not rich enough compared with the more recent millennium's achievements? Voyager 1 is scheduled to pass within 1.6 light years of the star AC+79 3888 in forty thousand years; what will human music be like then? What, if anything, will be the capacity and meaning of the categories 'human' and 'music'? What would any space-faring future humans or extraterrestrial life-forms make of it if it were found? The chances seem remote – the probe, with all its wealth of musical information, is nonetheless a very tiny object set against the enormous backdrop of the space it's travelling through. Or to reverse the scenario, what will Voyager 1, leaving the familiarity of Earth at a speed of roughly seventeen kilometres a second, find if it ever meets something? What would an extraterrestrial equivalent of the Voyager Golden Record sound like? And couldn't the music of future humans have become just as alien during Voyager's journey?

How will we come to compose and recognise this music of the future? By seeing it in terms of its most fundamental condition: change itself.