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Musicking on the Shores of Multiplicity and Complexity

David Borgo

Of all the travels made by man since the voyages of Dante, this new exploration along the shores of Multiplicity and Complexity promised to be the longest [...]

Henry Adams¹

In *The Education of Henry Adams*, privately printed by the author in 1906, Adams self-consciously marks the rupture between the ordered certainties of a Newtonian world and the chaotic multiplicities that he saw as characteristic of the twentieth century. His complex, nonlinear and ultimately unresolved personal journey marks an important entry point into a century perhaps best characterized by the ‘crisis of representation’ that swept across academic disciplines. From the sciences to the arts and humanities, researchers in the twentieth century were led, often reluctantly, to shift their focus from objects to relationships, from products to processes, from content to context, and from ideas of permanence to those of permeability and polysemy. Articulating this pronounced conceptual shift – often from several directions at once – Gilles Deleuze and Félix Guattari write in their influential book *A Thousand Plateaus*: ‘[I]t was a decisive event when the mathematician Riemann uprooted the multiple from its predicate state and made it a noun, “multiplicity”. It marked the end of dialectics and the beginning of a typology and topology of multiplicities.’²

In music studies, similar postmodern and poststructuralist trends de-centered the musical ‘author’ (usually read as ‘composer’) and the musical ‘text’ (usually read as the ‘score’ or the ‘recording’) from their privileged positions. Musicking, a semantic turn-of-phrase first introduced by Christopher Small, has become something of a rallying cry for contemporary music scholars interested in highlighting the dynamic, complex and intrinsically social nature of their subject. To music is to ‘take part, in any capacity in a musical performance, whether by performing, by listening, by rehearsing or practicing, by providing material for performance (what is called composition), or by dancing’.³ Small employs the term musicking to remind us to focus on important issues of performativity and reception and never to forget that ‘music’ is at heart an *activity* through which we bond with one another and by which we explore our environment and our own identities in relation to a group.

In the past few years several seemingly new ways of musicking have crept into, and are already beginning to alter, our social sphere. In the introduction to the edited volume *Cybersounds: Essays on Virtual Music Culture*, Michael D. Ayers writes:

A relationship has slowly developed, albeit a sometimes dysfunctional one, in which social actors and technology, specifically internet technologies, have altered the course of how this one art form, music, is created, produced, consumed, worshipped, and ultimately perceived.⁴

For instance, although portable music listening devices have been common for some time (e.g. transistor radios, Sony's Walkman etc.), the enormous success of the newest generation of digital music players (e.g. Apple's iPod) in combination with appropriate computer software and the various legal and illegal means of internet music distribution appears to mark a contemporary moment in which acquiring, organizing, experiencing and sharing music have become activities increasingly subsumed into the technological sphere. Other computer and internet technologies are providing similarly unprecedented opportunities for 'trained' and 'un-trained' musicians alike to manipulate, combine, transform and generate sonic materials and to interact with machines and with one another in intriguing ways.

Beyond the considerable power computers offer to individuals for ordering and transforming musical sounds, their true promise may lie in the potential they offer for enhancing connections between human participants and for allowing performers and listeners to explore the uncertainties of systems that are too complex for human control. In other words, computers don't simply offer new avenues for sonic exploration; they facilitate new forms of social interaction and they may provide new vistas into emergent and decentralized behaviours that are often extremely difficult for humans to intuit or imagine on their own.⁵

Although it appears that technology has increasingly become part of the musical experience, it is important to acknowledge as well the ways in which musical experiences are increasingly shaping our ways of being in a technologically mediated world.⁶ As we continue to investigate this still under-theorized area, we must be careful not to presume that new technologies operate as independent agents creating new modes of social engagement from whole cloth. Rather, new technologies often serve as loci of social forces, both constituting and mitigating change, and both transforming and maintaining existing/received ways of knowing, specifically with regards to critical aspects of culture, class and race that still often remain concealed in contemporary discourse.

In this essay, I propose to bring Christopher Small's notion of musicking into the twenty-first century. The very notion of what might constitute 'taking part, in any capacity, in a musical performance', appears to have greatly expanded or at least significantly shifted in recent years. Drawing on insight from software design and the culinary arts, I will offer a multidimensional framework for situating and understanding musicking, an approach intended to expand on Small's visionary idea while at the same time giving it a bit more analytical bite. In offering this framework I hope to circumvent the petty battles that frequently arise in and out of the academy over issues of musical style and to provide a more responsive and responsible way of discussing contemporary musical creativity, one that can avoid imposing conventional categories such as 'composer', 'interpreter', 'improviser', 'organizer' or even 'listener' in ways that often hinder how we perform, experience and ultimately understand music.

From Music to Musicking

All sensation takes place in time, but sound has a special relationship to time unlike that of the other fields that register in human sensation. Sound exists only when it is going out of existence. It is not simply perishable but essentially evanescent, and it is sensed as evanescence. When I pronounce the word 'permanence', by the time I get to the '-nence', the 'perma-' is gone, and

has to be gone.
Walter Ong⁷

I begin with a deceptively simple question: what should music scholars study? In other words, if we attend a music performance on what should we focus our attention? Or, more precisely, where should we look for meaning? Perhaps we should focus our inquiry on the 'notes' that were played? If the performance was of pre-composed material, then perhaps notation exists that we could use for analysis. If instead it was improvised, we might decide to create a transcription of the performance to use for analysis. But would either this prescriptive or descriptive notation capture all of the details of the performance?⁸ What of the specific sounds (timbres) of the instruments or voices being heard? Or of the expressive nuances that the performers imparted? As countless musicians will attest, it is not what you play but how you play it that matters most.

Since sounds travel as physical waves through a medium of air, then perhaps music scholars need only capture and analyze those sound waves. Yet humans do not *hear* music as physical waves. When discussing music with one another we do not talk of frequencies and amplitudes, complex waveforms or spectral envelopes. Instead, we perceive musical qualities such as pitch, timbre, intensity, rhythm and form through complex and still-incompletely-understood perceptual faculties and cognitive processes.

Should our analysis attempt to take account of the visual dimension of performance? We might decide ahead of time to make an audio-visual recording of the event, but where in the room should we place our equipment? How many cameras or what type of microphones would we need to capture the event fully? How would the physical layout and the acoustic design of the space or the technological limitations of our equipment affect our final analytical product?

How much attention should we pay to other people at the event? Would their physical or sonic presence be considered a part of the performance? How do they view their role in the event? How do we view our own? Can we articulate the significance or the emotional resonance of the performance? Should any of this even concern us? Even if we accept that everyone in attendance was roughly exposed to the same audio/visual stimulus, did we hear or experience the same thing? In what ways would our personal history and particular mood as well as our encultured sensibilities affect how we hear the music? If, as music scholars, we take a thing called 'music' to be the topic of our research, then where should we locate our object of study?⁹

Ethnomusicologists are often quick to point out that many cultures do not have a word or concept that equates to the Western notion of 'music'.¹⁰ In English we also confusingly use the single word 'music' to describe not only performances but also their

symbolic and sonic reductions as notation and audio recordings respectively (as in, ‘Who has the *music* for tonight’s performance?’ or ‘Come see my *music* collection’).¹¹ Notation has provided an invaluable tool to composers and performers (particularly those in Western art music traditions) and more recently audio recordings have revolutionized how people across the globe create and engage with musical sound. But no static representation of music, no matter its notational detail or sonic fidelity, can purport to capture the whole of the musicking experience, divorced as they are from many embodied and social dimensions of performance. Listeners also bring to bear on their engagement with music a lifetime of personal and cultural experiences and sensibilities, perhaps hearing certain details and not others and, over time and through repeated exposure, constructing complex and manifold meanings.

Academic music studies have tended to argue (at least until recent decades) that music’s significance, as well as its ontological status, resides in its structural features; specifically those structural features that may be represented as a notated score. Meaning, it was assumed, was ‘in the notes’, and performance, for many, became synonymous with an ‘accurate’ realization of a composer’s intentions, a ‘making-audible’ that could even be bypassed by those properly trained in the art of score reading. Following this logic one might even ask, ‘if a score represents the perfect realization of the music then why does it ever need to be performed?’

For music not predicated on the primacy of a notated score or on strong distinctions between composers and performers – in other words, most music on the planet – this often meant the kiss of death, since the music academy has traditionally viewed all modes of musical expression through the formal and architectonic perspective of resultant structure. In ways similar to the procedures and epistemology of Newtonian science, our traditional modes of investigating music have been atomistic, elemental and reductionist: proceeding by breaking systems into component parts, searching for fundamental rules or laws, and seeking absolute and objective descriptions of all resultant phenomena.

In an often-quoted passage, Benoit Mandelbrot, the inventor of fractal geometry, eloquently commented on the impossibility of capturing nature’s complexity within static Euclidian forms: ‘[C]louds are not spheres, mountains are not cones, coastlines are not circles, bark is not smooth, nor does lightning travel in a straight line’.¹² It is equally impossible to capture the richness of musicking by a symbolic and static reduction. Ethnomusicologist Charles Keil once irreverently complained that a notated score is only ‘a petrified skeleton on which to hang the flesh and bones of actual music-making’.¹³ By focusing principally on the structural features of music (and most often those associated with Western art music), previous scholars have often missed or downplayed the complexities of musicking that play with our sense of memory, anticipation, emotion and identity in countless and complex ways.¹⁴

Dimensions of Musicking

As we perceive reality as a network of relationships, our descriptions, too, form an interconnected network of concepts and models in which there are no foundations.

Fritjof Capra¹⁵

Open source software has, in recent years, become the poster child for the power of networked systems. '[I]t is fascinating, and somewhat mysterious', Rishab Aiyer Ghosh writes in his introduction to the edited book *Code: Collaborative Ownership and the Digital Economy*,

[H]ow a 'bunch of hackers' who have never met and are not formally organized have managed to come up with such a powerful system of creating software. Thousands of people organize informally to create single works that can hold their own against the assembly-line software produced by large multinational companies. It seems important to know that this is possible, but it still seems out of the norm, exceptional – as if people would only collaborate in this way for a *reason*, for some *ideology*.¹⁶

Ghosh acknowledges that in certain cases there is an ideology, but he laments 'most of us assume creativity as necessarily individual, private and subject to the creative inputs of others only under commercial conditions'.¹⁷ Musicians tend to know differently. Although the impact of the switch from knowledge and art to 'intellectual property' that Ghosh and his co-authors describe is no less pronounced in the domain of musicking – arguably music file sharing is an equally well-known poster child for the emerging digital economy (a 'Wanted' poster, perhaps?) – musicians, at least when pressed to look beyond the Romantic notion of solitary genius or the more recent notion of a 'bling-bling' lifestyle, will most often acknowledge the importance of collaboration, influence and non-commercial aspects to what they do.

In this section, I take inspiration from software design and the culinary arts to reflect on the nature of complexity as it arises in musicking situations.¹⁸ Small's notion of musicking, while extremely helpful in combating the formalist tendencies of earlier musicological study, remains rather one-dimensional in orientation: it highlights the temporally and geographically immediate activities of music making with often less to say about the further flung networks of musical participation and influence and the ways in which this added complexity may qualitatively shift the types of activities involved. I wish to pursue musicking from a multidimensional vantage point. This approach, I believe, can avoid imposing preconceived notions of musical style or musical behaviour onto the ways in which we investigate musicking. It is intended to provide not simply an alternate vocabulary for discussing music but rather a challenge to conventional notions and discourse. How we choose to discuss and categorize musicking behaviours has ramifications that extend well beyond the immediate realm of musical practice into the institutional and infrastructural systems that support, condemn or simply ignore those activities. The four dimensions of musicking that I articulate here are: *musicking-any-which-way*, *musicking-in-the-small*, *musicking-in-the-large* and *musicking-in-the-world*.

From a certain perspective, each of these dimensions of musicking builds upon aspects of the previous ones while introducing at each step an additional level of organizational complexity (and frequently, though not categorically, one of sonic complexity as well). The ordering of musicking dimensions can also be seen to follow a chronological path, in that each subsequent dimension appears to have assumed a more prominent role in more recent times. But I would caution against adopting these hierarchical and

chronological readings unquestioningly, since there is, and has always been, a role for all of these musicking dimensions, and the ways in which they affect one another are far from simple or linear. It is best to think of these dimensions as operating in simultaneous and overlapping ways. With these caveats in place, however, I will attempt to shed some light on how thinking along these lines can both organize and add subtlety to our contemporary discourse that surrounds music.

Musicking-any-which-way involves the context-specific activity of directly engaging with the materials of sound: from our ancestors earliest endeavours shaping their sonic (and therefore social) environment, to the contemporary moment when any musician produces sound from an instrument (be it in one's bedroom or in Carnegie Hall), or when a listener turns the knobs on their stereo, affects a change in a computer music application, or even turns their head, cups their ears or gyrates to the beat in order to hear/experience something differently. *Musicking-any-which-way* is at heart impromptu, ephemeral and context specific.

To turn to a cooking analogy, the any-which-way dimension includes the impromptu decisions of a chef working directly with their ingredients and tools: a pinch more of this, a quick stir here, less heat for right now, use this whisk or pot instead of that one etc. Software design in the early years (1960s) was also, according to Jose Luiz Fiadeiro,

[A] one-off activity best performed by virtuosi in absolute control of the execution infrastructure and with the final result of the execution as the primary goal of the activity.¹⁹

In other words, programmers worked directly with their machines – and their many limitations in terms of memory and speed – to arrive at an immediate and desired result; programs reflected each machine's architecture very closely and programs were primarily a means to an end.

We may at first wish to map musicking-any-which-way to individual activity – and the cooking and programming analogies just offered seem to reinforce this desire – but this would be misleading. Firstly, an individual's activity is always situated by one's understanding of his or her 'place' in a social process. And secondly, one's activity often knowingly or unknowingly impacts directly on the experiences of others (neighbours complain that a stereo or drum set is played too loudly; a listener suddenly hears/understands a composition differently due to a performer's impromptu embellishment; another person is inspired to dance after witnessing the gyrations of a first etc.).²⁰ For instance, in a group musicking situation the any-which-way behaviour of one performer affects the sonic and social environment being engaged simultaneously by all of the other participants, such that their own any-which-way behaviour will, by necessity, establish a complex feedback cycle. This may be most apparent in the practice of group free improvisation, but all ensemble performances involve the coordination, or more precisely, the *co-constitution* of musical nuance and expression.

Musicking-in-the-small refers to more generalized and abstracted musical activities that involve some sort of symbolic code or 'transportable language'. When employing these

codes, individuals structure the flow of a performance by organizing collective memory and resources in advance to ensure progress towards a desired goal. Western notational practice provides one such approach – and we may be tempted here to think principally of musicking-in-the-small as facilitated by a ‘score’ – but oral/aural symbolic means abound as well for describing musical intentions and prescribing musical behaviors. The elaborate system of vocal syllables (*bols*) used to teach *tabla* drumming in Hindustani music or the categorization of modes and modal melodies found in the Persian *radif* are only two of the numerous non-notated, non-Western examples that could be mentioned.²¹ And when jazz musicians discuss what musical forms or harmonic progressions to adopt prior to improvising, or how to order a sequence of solos or sections within a performance, they are musicking-in-the-small as well.

To turn again to our cooking analogy, if musicking-any-which-way is comparable to a chef working directly with the ingredients and resources at hand, musicking-in-the-small is analogous to following or writing a recipe. Recipes are simply instructions for how to go about preparing a meal; they allow for the transportability of cooking knowledge. They may be communicated through literate or oral means, or by a combination of the two. Interestingly, cookbooks underwent a significant change from their earliest incarnations, which often followed very closely what was going on in the author’s head while cooking a meal (‘two minutes before the chicken is cooked add the tomatoes that are marinating in Aunt Sally’s special mix’), to more contemporary approaches that emphasize less context-dependent instructions (‘mix together in a bowl two spoons of olive oil...’; ‘after 15 minutes check the chicken with a fork’; ‘if the juices run clear add the tomatoes and marinade and cook for another two minutes’).²²

In a similar fashion, the development of machine-independent programming languages allowed programmers to develop more generalized skills and to work at a higher-level of abstraction than that of the underlying code that runs on a given machine. Not only were programming skills now transferable to different machines and to different business contexts, but the programs themselves, instead of the results of their executions, became the goods. In other words, software became a product. As Fiadeiro explains:

[I]nstead of a chess fanatic developing a program for his pocket calculator to compute the next move on a given configuration, we are now talking of a scenario in which a chess-playing program is developed to be sold to clients who will run it themselves on their machines for their own purposes.²³

Western music reached something of a similar landmark when, by combining the abstractions (and the increasing complexity) of notational practice with the historically emergent standardization of instruments, tunings and ensembles, composers were able to produce a compositional ‘product’: something that could be easily transferred to others (aided significantly by innovations in typesetting) and then ‘realized’ in a variety of ways and settings. As it became easier to disseminate music as a product it also became more prevalent to regard the abstraction of a musical ‘composition’ as more real than the reality that it represents. Lydia Goehr, however, has convincingly argued

that the ‘work’ concept as applied to a musical score reflects a nineteenth-century European notion projected both backwards and forwards to encompass the totality of Western art music practice and often projected ‘sideways’ to influence the way we interpret musicking practices around the planet as well.²⁴ As David Roberts wryly comments, ‘[T]he score is no more the music than a recipe book is a meal’.²⁵ That being said, the process of abstracting salient details of music either for pedagogy or performance – in other words musicking-in-the-small – is an important part of seemingly every musical tradition.

Beyond the use of notation and/or oral means for organizing performances, the ability to record music has exponentially expanded music’s ‘transportability’. Prior to Thomas Edison’s invention of the phonograph in 1877, musicking (as either co-performer or as listener) was only possible with other musicians physically present. If notation allowed for musical ‘products’ to be disseminated and realized in disparate ways and locales, audio recording made it possible to capture and disseminate ‘snapshots’ of musicking already completed. Interestingly, when Edison arrived at his invention he envisioned its primary use as a Dictaphone, not a technology that would significantly shape not only where and how we hear music but also the range of possibilities available for creating, manipulating and, ultimately, defining it and our selves in relationship to it.²⁶

It often takes considerable time before the possibilities inherent in a new technology become apparent. Early film, for example, was described as ‘photographed theater’. In their infancy most people envisioned computers as offering little more than number crunching or bookkeeping assistance. Since the earliest models filled entire rooms and were off limits except to a privileged few, also many initially viewed computers as representative of a centralized mindset. Of course computers *do* still function as electronic bookkeepers and they *are* still out of reach of many, but increasingly computational tools and networking technologies are playing a critical role in the spread of decentralized ideas.

The shift from ‘in-the-small’ to ‘in-the-large’ activities hinges on decentralization; it is not simply related to the size of a system but rather to the fact that systems are ever more heterogeneous and distributed. In other words, moving from ‘in-the-small’ to ‘in-the-large’ activities shifts the emphasis from *probability* to *viability*. In our cooking analogy, whereas cooking-in-the-small involved using the abstract language of a recipe to guide the preparation of a single dish, cooking-in-the-large brings this activity into a qualitatively more complex situation, in which the skills, time and resources of a large kitchen with many chefs must be harnessed in order to prepare a multi-course meal for a room full of people all expecting to be served hot and delicious food at contextually appropriate times. In other words, this is not simply a matter of producing more food, or even more varieties of food; rather, it is the distinctly different challenge of managing heterogeneous individuals (with perhaps differing food preparation styles or knowledge), their interpersonal dynamics, the limited resources of the kitchen, the time constraints imposed by the context or event, as well as the differing tastes and expectations of the hungry patrons.

Competition-based television cooking shows are designed to highlight the added complexity and inherent uncertainty of ‘in-the-large’ cooking. For instance, the

Japanese show called *Iron Chef* features two challengers who have one hour to cook and improvise a multi-course meal around a theme ingredient that must be present in every dish. The show highlights each chef's ability to cook-any-which-way (through impromptu decisions), in-the-small (by following memorized and well-practiced recipes), and in-the-large, to the extent that each chef must take into account the limits imposed by the kitchen itself, the time span of the show, the ingredients that were provided to them ahead of time and, ultimately, the personal palate of the judges who will decide the winner. *Hell's Kitchen*, a team-based 'reality' cooking show that airs in both UK and US versions, involves small groups of aspiring chefs cooperating together and competing against one another to serve a room full of celebrity guests and to please the head chef and *maitre d'*. This team-based approach places considerably more emphasis on the interpersonal dimensions of cooking-in-the-large (albeit in a highly exaggerated form generally tilted in the direction of extreme humiliation).

Software design in recent years has also increasingly become an 'in-the-large' activity. As the scope and role of software in business has grown, so has the size of the programs, such that now most current applications are unmanageable by the lone programmer. According to Fiadeiro,

[E]ngineering principles were quickly identified to be required to face the complexity of the product and the term programming 'in-the-large' was coined to reflect the fact that software development needed another activity to be supported: one that could break the task into manageable pieces.²⁷

Beyond simply creating more complicated software applications, programming-in-the-large involves combining and integrating potentially 'incompatible' systems designed by many individuals or teams of individuals and ensuring that each interdependent programming team and software module has the resources and flexibility that it needs. Fiadeiro argues that structuring a large collection of modules to form a 'system' is a distinct and different intellectual activity from that of constructing the individual modules. 'You can't build skyscrapers using carpenters', he explains, referencing a 1994 *Scientific American* article that identified a 'software crisis' which was beginning to hurt the economy.

In this light, what might *musicking-in-the-large* imply? If, following Fiadeiro, we are talking about a 'distinct and different intellectual activity', then one might be tempted to turn to the distinction already commonly made between those who make music and those who work in the music industry (e.g. running record labels, producing and promoting large-scale events, editing trade magazines or websites, heading up companies and community organizations etc.). In this reading, the latter have the engineering skill and vision to build skyscrapers while the former are mere carpenters. In the creative music communities with which I am most familiar this distinction is rather troublesome, as many of the most visionary organizers are themselves compelling artists.²⁸

It is undoubtedly true that additional skills and propensities are required for musicking-in-the-large. Not all musicians, even those who may be in the upper echelons of their chosen musical field, have interest in or the ability to work in these areas. Many of the

finest classical musicians alive, for instance, would be loath to imagine a role for themselves beyond the prescribed one of interpreter of previously composed ‘masterpieces’.²⁹ Composers may also be extremely gifted at envisioning and prescribing musical activities (writing creative and tasty recipes), but may be unwilling or unable to engage in collaborative projects for which the ultimate outcome is less certain or more context-dependent.

Musicking-in-the-large seems to accurately describe an approach that is increasingly common among contemporary creative musicians, many of who cross or dissolve stylistic divides, work in and in-between multiple media, and seamlessly switch ‘roles’ from composer/performer to producer/organizer and back again. If musicking-any-which-way and musicking-in-the-small are envisioned as primarily (though not exclusively) individual-centred activities, musicking-in-the-large takes us firmly into the social realm. Here, the viability of any musicking endeavour hinges on the immediate and far-reaching integration of people with diverse personalities, perspectives and capacities, in tandem with an awareness of those qualities and desires in others who might wish to engage as onlookers or supporters. Community is key, and improvisation, broadly defined, is an important component as well, since issues of viability demand the thorough integration of preparation, awareness and flexibility in order to make successful choices in the moment.

It is interesting to note that two of the hottest current topics for organizational design are the sciences of complexity and jazz music. Both domains emphasize adaptation, perpetual novelty, the value of variety and experimentation, and the potential of decentralized and overlapping authority in ways that are increasingly being viewed as beneficial for economic and political discourse.³⁰ Karl Weick, in a special issue of the journal *Organization Science* devoted to an exploration of ‘the jazz metaphor’, finds that the music’s emphasis on pitting acquired skills and pre-composed materials against unanticipated ideas or unprogrammed opportunities, options or hazards can offset conventional organizational tendencies towards control, formalization and routine.³¹ In a response to the heavy reliance by journal contributors on swing and bebop as the source of their jazz metaphors, Michael Zack outlined ways in which free jazz might propel discourse even further into the realm of emergent, spontaneous and mutually constructed organizational structures.³²

If a move away from individual effort and products towards an awareness of and responsiveness to group activity/need is a key element of musicking-in-the-large, then the *coordination* of innumerable and intricate interactions – often at a geographic remove – defines *musicking-in-the-world*. I am tempted to argue that ‘in-the-world’ in the contemporary era is slowly becoming synonymous with ‘in-the-virtual-world’. In fact, cooking-in-the-world seems to have no easy description, although it undoubtedly would represent the increasingly global flow (and control?) of food sources that may serve as potential ingredients, as well as the shifting palette and expectations of cosmopolitan chefs and their clientele.

Programming-in-the-world reflects the ongoing shift from software as product to software as service. Applications are gradually shifting from large chunks of software that exist on a personal computer to web services that can, according to Fiadeiro, be

‘orchestrated when needed, establishing collaborations between them, at run-time, so that the desired global properties of the application can emerge from their joint behavior, just in time’.³³ Here again the complexity arises not from the size or scope of the material but from the number and intricacy of interactions involved.

Programming-in-the-world requires cultivating a systems perspective that integrates the design of autonomous components with the ability to manage their interconnections within an open-ended structure; new components may be required to join in and others to be removed at any time. Additionally, once a software component has been ‘deployed’ it becomes part of the ‘real world’ in the sense that its very existence may change the problem domain for the user (e.g. perhaps highlighting possibilities or shortcomings that were not originally apparent). If programming-in-the-large represented an overriding interest in issues of *viability*, programming-in-the-world shifts those concerns to the domain of *sustainability*.³⁴ According to Fiadeiro, software systems increasingly must be ‘ubiquitous, resource-aware, self-healing, and built over dynamic interactions between heterogeneous components’.³⁵

While it may be tempting to attribute in-the-world activities to the internet revolution, a more fundamental shift appears to be taking place; a shift from an engineering paradigm to a biological one. Reflecting on the current shift underway, composer Brian Eno remarked:

I think one of the changes of our consciousness of how things come into being, of how things are made and how they work, is the change from an engineering paradigm, which is to say a design paradigm, to a biological paradigm, which is an evolutionary one.³⁶

Eno likens generative music, his term for this emerging approach, to gardening. In gardening, you have some degree of control, but you never know precisely what will emerge, since living things respond to changing conditions during their growth. ‘Generative music’, Eno explains, ‘is like trying to create a seed, as opposed to classical composition which is like trying to engineer a tree’.³⁷

The current state of computer music appears to reflect a co-dominance between engineering and biological paradigms. Computers afford unprecedented possibilities for engineering and transforming acoustic signals. They can model artificial sonic spaces (through reverberation techniques for instance) as well as manipulate and transform sonic details on the smallest possible scales (as granular synthesis and other recent digital sound processing techniques amply demonstrate).³⁸ In a networked environment, however, computers can also facilitate complex interactivity by sharing the outcome of their computations with other machines or by mediating human-to-human interactions. Much of the effort in the last few decades regarding ‘networked music’ has been pragmatic: directed at solving problems of interface and connectivity and overcoming the challenging limitations of technology. But as Margaret Schedel explains in her introduction to a special issue of *Organized Sound* on the topic: ‘[A]s the evolution of networked music continues, the essential question transforms to not how networking and music are combined, but why?’³⁹ Tim Perkins, one of the founding members of the innovative network computer music group The Hub described their approach this way:

I see the aesthetic informing this work as perhaps counter to other trends in computer music: instead of attempting to gain more complete control over every aspect of the music, we seek more surprise through the lively and unpredictable response of these systems, and hope to encourage an active response to surprise in the playing. And instead of trying to eliminate the imperfect human performer, we try to use the electronic tools available to enhance the social aspects of music making.⁴⁰

The computer, in many ways a reductionist tool *par excellence*, also holds out the potential for us to (re)envision musicking as a complex, dynamic and emergent system. Computers and network technologies are allowing contemporary artists to explore sonic and social complexity in ways that, although certainly envisioned earlier, were often impossible, or, at the very least, impractical. In the contemporary era not only is science evolving, as nonlinear, qualitative models and computation intensive analyses overtake older linear models that demand explicit solutions, but also music and the arts are evolving, as representational, individual-centered works are being overtaken by interactive, socially-oriented, nonlinear forms.⁴¹

From Musicking to Metamusicking

This is a time of transition betwixt and between a period that seemed more stable and secure and a time when, many people hope, equilibrium will be restored... Stability, security, and equilibrium, however, can be deceptive, for they are but momentary eddies in an endlessly complex and turbulent flux. In the world that is emerging, the condition of complexity is as irreducible as it is inescapable.

Mark C. Taylor⁴²

The mathematician Stanislaw Ulam famously described the study of nonlinearity as ‘the study of non-elephants’. Most ‘real-world’ phenomena exhibit nonlinear behaviours, from the explosive outcome of earthquakes to the spread of ideas in modern society. But because nonlinear equations can introduce extreme difficulties and uncertainties into the mathematical modelling of systems (and as a result limit our ability to control them), scientists have focused the bulk of their attention, until recently, on the elephants.⁴³

Since considering the multi-dimensionality of musicking behaviour introduces untold complexities and uncertainties into musicological study, music notation, and the ideology that it engenders, continues to be the ‘elephant’ of academic music scholarship and pedagogy.⁴⁴ In fact, the conventional distinction made between those activities deemed ‘composition’, ‘interpretation’ or ‘improvisation’ is based solely on a compliance or non-compliance with a musical score.⁴⁵

These conventional distinctions are not in keeping with contemporary developments. Not only are artists increasingly working in the interstices between these approved musicking roles, but new technologies, by their very nature and design, often blur these lines further. For instance, we traditionally think of musical compositions *for* instruments, but as artist increasingly design interactive and virtual environments for

audiences to engage their work it often makes more sense to describe their compositions *as* instruments.⁴⁶ Electronic composer and performer Joel Ryan explains, 'I've always seen programming work as kin to instrument making rather than crafting language to describe music'.⁴⁷

Although technology appears to be playing a decisive role in this paradigm shift, we must take care not to arbitrarily separate technological developments from related and concurrent cultural shifts.⁴⁸ The twentieth century saw both a reemergence of improvised musical creativity – an essential part of earlier pan-European practice that was virtually abandoned (at least in art music circles) around the time of Beethoven – and a growing awareness of the world's musical diversity, brought about at least in part by the gradual (and still very much ongoing) shift from a colonial to a postcolonial world.⁴⁹ Eurocentrism, a still-too-common residue from our colonial past, imagines there to be one reality, one knowledge, one music. Music theory, effectively read as European music theory, has traditionally assumed our knowledge about music to be without ambiguity; a C major chord is a C major chord after all. We have also tended to believe that we need experts to filter information and that we need established social institutions to certify our experts for us (a situation that is about established authority as much as it is about knowledge).

I would argue, following David Weinberger's book *Everything is Miscellaneous: The Power of the New Digital Disorder*, that we are entering into a third order of order.⁵⁰ In music, sounds themselves are the first order of order. They are the material substance of music, but as such they are subject to certain limitations imposed by our physical reality; sounds can only travel so far before they are no longer heard, and, as Walter Ong suggested, they exist only when they are going out of existence. Notation and recording technologies offer a second order of musical ordering; they help us to organize and preserve first-order musicking. But there are limits inherent in the second order. For example, not all information about first-order objects is recorded and second-order orderings quickly become more cumbersome as they grow in size (e.g. a musical score that detailed every conceivable nuance would be unplayable and an album collection that contained a lifetime of musicking by even a single artist would bury even the most dedicated completist).

The third-order of ordering removes many limitations associated with music's transience and the physicality of its representations. Both second- and third-order orderings are a type of musical metadata (or metamusicking?), but third-order orderings take advantage of the immateriality of bits: digital metadata can easily exceed data.⁵¹ In the digital domain, musicking shifts from a site-specific activity to one in which, to quote Marshall McLuhan, there are 'centres everywhere and boundaries nowhere'.⁵² Sonic and experiential networks become equally or more important than sonic artefacts.

The third-order world is user-generated and user-defined. In the age of iPods, listeners choose what they hear by relying on shared playlists or on computer-generated recommendations. Other "users" create and share original content by remixing or mashing pre-existing musicking moments or by sampling and transforming the sounds around them. Metamusicking creates a dynamic and distributed matrix of possibilities

that controverts the notion of a singular musical experience. There will still be a place for individuals who are extremely gifted at first- and second-order musicking, but the ever expanding third-order may return us to a situation that only a very few cultures might be said to have maintained: one in which every member of society is encouraged, and in fact expected, to be musical.

Theorizing about the contemporary moment is always difficult, but what is certain is that we are only beginning to glimpse the implications that this reconfiguring of musical time and space may have for our collective musicking. In her editorial introduction to a special issue of the journal *Organised Sound* devoted to networked music, Margaret Schedel employs biological language to help her articulate the current moment:

What we have is an ecology still undergoing rapid change, subject to dramatic mutation, recombination, and selective pressures, one of the most exciting and dynamic periods in the maturity of any field. What may be the next step in this process is the recognition of networked music as a true ecosystem, in which each of the projects with a connection to the Internet publishes some meaningful aspect(s) of its identity for access and manipulation by others. For example, a virtual collaborative space that produces a shared sonic outcome could not only publish its music to the participants, but also make the resultant data available in some standard interchange format such that other projects could use that real-time flow of information as an input source. Why not take the tapestry of networked music to this next level, interconnecting not only people and machines, but entire environments?⁵³

Interconnection has always been a fundamental principle of music. Christopher Small's stirring appeal to adopt a verb form of the word, musicking, simply highlighted an orientation towards music *as activity* that was already deeply seated in the human condition. Across evolutionary time and cultural expanse, musicking has promoted 'groupishness' through various means of physical, cognitive and emotional coordination.⁵⁴ In this essay I have outlined a multi-dimensional model of musicking that could be useful in understanding and in generating musical activity. Creativity, portability, viability and sustainability, the four dimensions of this musicking matrix, have been, and undoubtedly will remain, principle strategies and primary challenges as we continue to explore musicking on the shores of multiplicity and complexity.

Notes

¹ Henry Adams, *The Education of Henry Adams* (New York: The Modern Library, 1931), p. 449.

² Gilles Deleuze and Félix Guattari, *A Thousand Plateaus: Capitalism and Schizophrenia* (London: Athlone Press, 1988), pp. 482–83.

³ Christopher Small, *Musicking: The Meanings of Performance and Listening* (Hanover: Wesleyan University Press, 1998), p. 9.

⁴ Michael D. Ayers, ed., *Cybersounds: Essays on Virtual Music Culture* (New York: Peter Lang Publishing, 2006), p. 2.

⁵ See Mitchel Resnick, *Turtles, Termites, and Traffic Jams* (Cambridge, MA: MIT Press, 1994).

⁶ For those who doubt the importance of music in the burgeoning network society one need only think

of the preponderance of sounds that circulate daily over the internet.

⁷ Walter Ong, *Orality and Literacy: The Technologizing of the Word* (London: Routledge, 1988), p. 32.

⁸ For a detailed and insightful discussion of the limitations of transcription, see Peter Winkler, 'Writing Ghost Notes: The Poetics and Politics of Transcription', in *Keeping Score: Music, Disciplinarity, Culture*, ed. David Schwarz, Anahid Kassabian and Lawrence Siegel (Charlottesville, VA: University Press of Virginia, 1997), pp. 169–203.

⁹ For more on this issue see Wim Van Der Meer, 'The Location of Music: Towards a Hybrid Musicology', *Tijdschrift*, 10 (2005), pp. 57–71.

¹⁰ For instance, dance and music in many traditional African societies are not only interrelated, they are inseparable.

¹¹ We also extend the word 'music' metaphorically to signify beauty or pleasure in other domains (as in, 'that's music to my ears'). In the nineteenth century the word 'musical' also carried with it for many the connotation of effeminate or homosexual.

¹² Benoit Mandelbrot, *The Fractal Geometry of Nature* (New York: W.H. Freeman, 1982).

¹³ Charles Keil, 'Participatory Discrepancies and the Power of Music', *Cultural Anthropology*, 2:3 (1987), pp. 275–83 (p. 279).

¹⁴ See David Huron, *Sweet Anticipation: Music and the Psychology of Expectation* (Cambridge, MA: MIT Press, 2006).

¹⁵ Fritjof Capra, *The Web of Life* (New York: Doubleday, 1996), p. 39.

¹⁶ Rishab Aiyer Ghosh, ed., *Code: Collaborative Ownership and the Digital Economy* (Cambridge, MA: MIT Press, 2005), p. 1.

¹⁷ Rishab Aiyer Ghosh, *Code: Collaborative Ownership and the Digital Economy*, p. 1.

¹⁸ The initial impetus for exploring musicking in this multidimensional way came from an unpublished article by José Luiz Fiadeiro sent to me by the author titled 'The Many Faces of Complexity in Software Design'.

¹⁹ José Luiz Fiadeiro, 'The Many Faces of Complexity in Software Design', p. 7.

²⁰ For more on this general orientation see Sasha Barab and Jonathan Plucker, 'Smart People or Smart Contexts? Cognition, Ability, and Talent Development in an Age of Situated Approaches to Knowing and Learning', *Educational Psychologist*, 37 (2002), pp. 165–82.

²¹ These practices are traditionally passed on though oral/aural pedagogy though more recently they can be found in notated form as well.

²² José Luiz Fiadeiro, 'The Many Faces of Complexity in Software Design', p. 17.

²³ José Luiz Fiadeiro, 'The Many Faces of Complexity in Software Design', p. 8.

²⁴ Lydia Goehr, *The Imaginary Museum of Musical Works* (Oxford: Clarendon Press, 1992).

²⁵ David Roberts, 'Record Reviews', *Contact*, 18 (1977–1978), pp. 39–40.

²⁶ See Mark Katz, *Capturing Sound: How Technology Has Changed Music* (Berkeley: University of California Press, 2005) and Emily Thompson, *The Soundscape of Modernity: Architectural Acoustics and the Culture of Listening in America, 1900–1933* (Cambridge, MA: MIT Press, 2002).

²⁷ José Luiz Fiadeiro, 'The Many Faces of Complexity in Software Design', p. 11.

²⁸ I have in mind here people like John Zorn, George E. Lewis, William Parker, Evan Parker and the late Derek Bailey, among others. For insightful interviews with these and other artists see Lloyd Peterson, *Music and the Creative Spirit: Innovations in Jazz, Improvisation, and the Avant-Garde* (Oxford: Scarecrow, 2006).

²⁹ For instance, the virtuoso classical violinist Joshua Bell expressed to Gene Weingarten in a recent *Washington Post* article ('Pearls Before Breakfast,' April 8, 2007) that 'genius' is an overused word: It can be applied to some of the composers whose work he plays, but not to him. His skills are largely interpretive and to imply otherwise would be unseemly and inaccurate.

³⁰ Robert Axelrod and Michael D. Cohen, *Harnessing Complexity: Organizational Implications of a Scientific Frontier* (New York: Basic Books, 2000), p. 30.

³¹ Karl Weick, 'Improvisation as a Mindset for Organizational Analysis', *Organization Science*, 9:5 (1998), pp. 543–55.

³² Michael Zack, 'Jazz Improvisation and Organizing: Once More from the Top', *Organization Science*, 11:2 (2000), pp. 227–34.

³³ José Luiz Fiadeiro, 'The Many Faces of Complexity in Software Design', p. 14.

³⁴ In interesting ways the notion of sustainability as a defining element of musicking-in-the-world appears to apply equally well to the music of many indigenous cultures (e.g. BaAka, Kaluli, Aboriginals, Native Americans) as it does to contemporary network music.

³⁵ José Luiz Fiadeiro, 'The Many Faces of Complexity in Software Design', p. 14.

³⁶ Quoted in David Toop, *Haunted Weather: Music, Silence, and Memory* (London: Serpent's Tail, 2004), p. 242.

³⁷ David Toop, *Haunted Weather: Music, Silence, and Memory*, p. 242.

³⁸ See Barry Blesser and Linda-Ruth Salter, *Spaces Speak, Are You Listening?: Experiencing Aural Architecture* (Cambridge, MA: MIT Press, 2007) and Curtis Roads, *Microsound* (Cambridge, MA: MIT Press, 2001).

³⁹ Margaret Schedel, 'Editorial', *Organized Sound*, 10:3 (2000), pp. 181–83 (p. 182). See also the special issue of *Contemporary Music Review*, 24:6 (2005) on internet music.

⁴⁰ Tim Perkins, liner notes to *The Hub* (Artifact Recordings CD 1002) (1989).

⁴¹ See David Borgo, *Sync or Swarm: Improvising Music in a Complex Age* (New York: Continuum, 2005).

⁴² Mark C. Taylor, *The Moment of Complexity: Emerging Network Culture* (Chicago: University of Chicago Press, 2003), p. 3.

⁴³ The most common answer to this historical oversight maintains that nonlinear studies needed to wait for the advent of the digital computer to be able to model easily and accurately the long-term behaviour of complex equations. In his book *In the Wake of Chaos: Unpredictable Order in Dynamical Systems*, Stephen H. Kellert admits that this may be a partial answer, but he also argues that the overriding social interest in the exploitation of nature contributed to the institutional disregard of physical systems not readily amenable to analysis and manipulation. Kellert is only one of many philosophers of science who are currently seeking to tease out the cultural biases that often profoundly affect notions within the scientific community about what makes for interesting and worthwhile science. See Stephen H. Kellert, *In the Wake of Chaos: Unpredictable Order in Dynamical Systems* (Chicago: University of Chicago Press, 1993), p. 119–58.

⁴⁴ For a critique of this 'elephant' in jazz pedagogy see David Borgo, 'Free Jazz in the Classroom: An Ecological Approach to Music Education', *Jazz Perspectives*, 1:1 (2007), pp. 61–88.

⁴⁵ Rather than view improvisation as a specialized activity and something that simply augments a more traditional music education, as often happens now, we may wish to – riffing again on Stanislaw Ulam's pithy remark about nonlinearity – view improvisation as the study of all 'non-notated' aspects of music. From this perspective, improvisation is not simply an alternative approach to composition but rather an integral part of all musicking activities.

⁴⁶ In an unpublished paper ('The Composition-Instrument: musical emergence and interaction'), Norbert Herber argues for a coalescence of 'composition' and 'instrument' by examining the

synergies between experimental electro-acoustic, improvised, interactive and generative music and practices based on file sharing, electronic instrument construction and computer game design.

⁴⁷ Joel Ryan, liner notes to *or Air: Variations on the Music of Evan Parker*, <<http://www.xs4all.nl/~jr/orair%20Liner.htm>> [17/10/2007].

⁴⁸ Musicking has of course always had an intimate relationship with technology broadly conceived.

⁴⁹ For more on the disappearance of improvisation from Western art music practice see Angeles Sancho-Velazquez, 'The Legacy of Genius: Improvisation, Romantic Imagination, and the Western Musical Canon' (Unpublished doctoral thesis, UCLA, 2001).

⁵⁰ David Weinberger, *Everything is Miscellaneous: The Power of the New Digital Disorder* (New York: Times Books, 2007).

⁵¹ One significant challenge for the musical third order is to develop types of musical metadata that are musical and not simply words about music.

⁵² Marshall McLuhan, *Understanding Media* (New York: Mentor Books, 1964), p. 45. See also William Duckworth, *Virtual Music: How the Web Got Wired for Sound* (New York and London: Routledge, 2005).

⁵³ Margaret Schedel, 'Editorial', *Organized Sound*, 10:3 (2000), pp. 181–83 (p. 183).

⁵⁴ See Stephen Mithen, *The Singing Neanderthal. The Origins of Music, Language and Body* (London: Weidenfeld & Nicolson, 2005). Musicking, for our ancestors, may have enhanced cooperative survival, promoted group identity and collective thinking, and allowed an avenue for resolving intergroup conflict. Musicking is also an essential part of the infant-caregiver relationship. Not only is 'motherese' (a more musical use of language when addressing infants) a human universal, but musicking with small children establishes a form of mutual coupling and an intentional framework that may allow for subsequent language acquisition (by assisting with proper speech segmentation) and for the development of a theory of mind (through gaze following, among other things). For more on the developing field of biomusicology see the special issues of *Cognition*, 100 (2006), *Music Perception*, 24:1 (2006) and *The World of Music*, 48:2 (2007).

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