

CHAPTER 7

Constructing a Musical Reality

“... We must arrange our music...so that people realise that they themselves are doing it, and not that something is being done to them.”

– John Cage in *Generation*, an interview with Roger Reynolds, 1962. (Ascott 2003: 123)

Cage’s landmark “silent” piece, or as it is also called 4’33”, is the best example of this idea come into musical fruition. It is not a composer’s particular arrangement of sounds that makes music as much as it is the listener’s ability and willingness to include sounds in that privileged category. Musicians working in ways complementary to Cage contrast the traditional compositional proposition “I think this arrangement of sounds is interesting” with “What would it sound like if...” This is the imperative of Experimental music and one of the foundational musical questions behind the work of this thesis. Music that has an unknown outcome shares an ontological resonance with technoetic environments that possess similar uncertainties.

A more literal interpretation of Cage’s statement reveals one of the inherent tensions of Emergent music, and the relationship of music to technoetic environments in general. As one exists in these environments, his actions resonate throughout, potentially affecting every other person or element also within it. This kind of presence forms the basis of a relationship that not only includes the permeable sound/music boundary espoused by Cage, but a more literal version of the idea that “they themselves are doing it.” The interconnectedness of these environments is not unique. The Dalai Lama reminds us that in our immediate reality, “Everything we do has some effect, some impact” (1999: 63). The difference is that in technoetic environments these effects can be sensed more immediately, or they can be used for exploration and experimentation as a simulation, and as the foundation of a mediated reality with the ability to transform consciousness.

This view of the world, in relation to music and art, has suggested a path of inquiry that follows in the steps of cybernetics. As Roy Ascott originally suggested in 1967:

It is necessary to differentiate between *l’esprit cybernétique*...and cybernetics as a descriptive method. Now, art, like any process or system, can be examined from the cybernetic point of view; it can also derive technical and theoretical support from this science—as in the past it has done from optics or geometry. This is not unimportant, since the artist’s range can be extended considerably... But it is important to remember that the cybernetic vision in art, which will unify art with a cybernated society, is a matter of “stance,” a fundamental attitude to events and human relationships, before it is in any sense a technical or procedural matter. (2003: 127)

In this research, cybernetics has provided models and a framework for structuring new ideas and techniques. It has facilitated the development of a fledgling practice and given voice to thoughts that were initially easier to execute as an artwork than explicate in a larger or more robust context. This thesis is the culmination of a musical approach that draws on the theories and concepts of cybernetics but is not a literal manifestation of the circuits and wires one often associates with the field. Contemporary music practice exemplified by Eric Archer (<http://ericarcher.net>), Bleep Labs (<http://bleeplabs.com>), the Handmade Music community (<http://handmademusic.noisepages.com>), and circuit bending in general are deeply engaged in that visage of cybernetics, but I cannot speak to the deeper role of connectivity in these works. The approach advocated by this research looks at cybernetics as a means of

coordinating the behavioral relationship between the art work and person engaged in it. Like W. Ross Ashby's homeostat, music is regulated to be congruous with the dynamics of the environment and the behavior of those who exist within it.

7.1 Music as Behavior; Music as Movement

The idea of music as a behavior came not from discussions or writings about music but rather of biology. Humberto Maturana and Francisco Varela's research has contributed profoundly to informing this work. Structural coupling, the relationship of mutual perturbations that binds adjacent autopoietic unities in a shared environment became *structaural* coupling, in which two organizationally closed (like autopoietic) systems—a person and a system for generative music—are likewise bound in a continuous exchange of interactions within a mediated environment. Perturbation is the key concept in this relationship. All involved parties maintain their autonomy, organizational closure, functioning order, and so on, yet are still receptive to external forces. These forces (perturbations) cannot control them or specify changes in particular, but trigger responses within the domain of the system's requisite organizational closure. This relationship was particularly compelling because it precisely mirrored what I had established in the first experiments with interaction involving generative music systems.

Discussions of art are similarly useful. In the 1967 article previously quoted, Roy Ascott imagined that such an art practice was possible:

The necessary conditions of behaviourist art are that the spectator is involved and that the artwork in some way behaves. Now it seems likely that in the artist's attempt to create structures that are probabilistic, the artifact may result from biological modelling. In short, it may be developed with the properties of growth. (2003: 129)

Clearly, even from this early perspective, a cybernetic view of biology that facilitated the modeling of living systems held great artistic potential. The idea of music as a behavior was seeded with Maturana and Varela's structural coupling, but did not come to fruition until late in this research process. There were several initial ideas that did not sit well or "feel right" to me. One was the idea that any kind of music operating in an environment of mediated interaction must change. Change how? When? And into what? Throughout the history of computer games music has always changed in some way. Even *Space Invaders* (one of the earliest computer games made by Midway in 1978) would increase the tempo of a simple four-note melody as the player's situation grew more dire (Collins 2008: 12). I was determined to draw a clear distinction between the differences of this early approach, everything else that has happened since, and what it is that I do.

The second concern was the term "composition." This word is reminiscent of the western art music traditions that are far too deterministic to support the kind of music I pursue. Even the re-definition "organized sound" purported by Edgard Varèse, John Cage, Frank Zappa, and others did not appeal as they were too inclusive. Mozart organized his sounds too. The idea of organized sound is more appropriate to those musical practices that explore *sound* first and foremost. My background as an improviser and interest in developing music congruous to the ontology of contemporary technology focuses more on the *behavior* of music. Music was viewed as an unfolding process: What does it do over time? And how does it react in relation to one's use of the technology that supports it? Behavior is an ideal way to answer these general concerns and questions. It addresses the actions of music over time, and by viewing interactions as perturbations, it clarifies questions of change. This music doesn't just get slower, louder, or darker in relation to external events—it *behaves*.

Maturana & Varela write, "Behavior is not something that the living being does in itself (for in it there are only internal structural changes) but something that we point to" (1992: 138). Emergent music

is built around musical systems that are capable of sending and receiving perturbations. These stimuli trigger in each system “internal structural changes” that produce the events interpreted as “behavior” to an observer. Consider the following statement from *The Tree of Knowledge*:

Thus, the behavior of living beings is not an invention of the nervous system and it is not exclusively associated with it, for the observer will see behavior when he looks at any living being in its environment. What the nervous system does is expand the realm of possible behaviors by endowing the organism with a tremendously versatile and plastic structure. (Maturana & Varela 1992: 138)

Now replace all instances of *organism* and *living being(s)* with *music*, and *nervous system* with *generative system*:

Thus, the behavior of **music** is not an invention of the **generative system** and it is not exclusively associated with it, for the observer will see behavior when he looks at any **music** in its environment. What the **generative system** does is expand the realm of possible behaviors by endowing the **music** with a tremendously versatile and plastic structure.

This presents a welcome alternative to the standard notion that, in any work where music is coupled to interaction, “the music changes.” Yes, there is change. But “change” and “change of state” can be more robustly described as dimensions of behavior. There is no deliberate action, no pre-planned response defined *a priori* within a database of all possible actions of the generative system, but a genuinely unique response given the conditions/perturbations the system confronts in the moment of action.

The distinctions between linear music and Amergent music can be further clarified with an additional example offered by Maturana & Varela. In *The Tree of Knowledge* they discuss the case of a particular plant (*Sagittaria sagitfolia*) that can transform between aquatic and terrestrial forms depending on the current water levels in its environment. This is behavior because there are “...structural changes that appear as observable changes in the plant’s form to compensate for recurrent disturbances of the environment” (Maturana & Varela 1992: 143). They contrast this with the feeding behavior of an amoeba, arguing that the amoeba’s actions are much easier for an observer to interpret as behavior because there is visible movement, whereas the sagittaria moves so slowly in its transformation it is often mistaken as part of the plant’s development. An observer has a much more difficult time calling this kind of movement behavior. It is much easier for them to think the plant grew that way because there was either too much or too little water around it. They argue that behavior is a structural response to external forces no matter what the tempo.

The case of behavior vs. development in the sagittaria is much like the case of Amergent vs. linear music. Music that is composed in a linear model is told exactly what it must do to “behave” and meet the expectations of the person responsible for it. It operates in a prescribed situation and it must conform to a set of demands. Much of the music that can be heard in contemporary mediated environments and art works is trapped in such a model of linear thinking. Alf Clausen, composer for the cartoon series *The Simpsons* recommends, “score the emotion not the action” (Chilvers 2004). This is appropriate for cartoons but not for environments of mediated interaction. Namely—what emotion? The emotional tenor is unknown. Even if emotion could be surmised, it is not known what actions would produce it. It *is* known, however, what *ingredients* will be used to produce both action and emotion. That is the behavioral advantage of Amergent music.

It can, by comparison, act on its own accord. It is not “doing what it is told” nor is it predestined to purposefully connect with the events of its environment. The generative systems that give rise to it simply respond to perturbations in the maintenance of their own internal functioning order. Compared side-by-side, an observer may hear a piece of linear music and a piece of Amergent music and think that both suit their expectations given the environment. But alter or transform that environ-

ment, and due to the lack of behavioral adaptation in a linear piece, its presence will be awkward or ill-fitted when heard a second time. Like an organism, the Amergent piece is far more capable of responding to environmental changes and perturbations in the maintenance of its identity and functioning order.

7.2 First-, Second-, Third-order Cybernetic Systems

The cybernetic perspective of this research has served to inform a means of musical production that is ontologically congruent with the technoetic environments in which the music is created and heard. In the process of developing such a system, other factors surrounding the relationship between music, environment, and listener/interact-er came to light. *Structaural* coupling is a cybernetic model of interaction based on the relationship of structural coupling (Maturana & Varela 1992; Maturana 1978; Varela 1979). It was developed in an attempt to reconcile the emergent experience of mediated interaction with a musical experience that complemented these same dynamics. *Structaural* coupling is based on the idea of a generative music system coupled to the person engaged with the work. Both are organizationally closed, which means they are like the autopoietic unities of structural coupling, and function together through a series of reciprocal perturbations. The technical and musical functioning of this system was useful for the projects that were explored in the course of this research. In addition, its role in the larger context of music and art works had much to reveal about its cybernetic origins.

Throughout this thesis, various works of Experimental, Ambient, Generative, and Amergent music have been discussed. Cybernetics has played a role (implicitly or explicitly) in each. Especially as it concerns Amergent music, the relationship between the musical work and the system that creates it varies across the variety of projects presented here. However, the commonalities between these reveal a cybernetic relationship of a third-order, in which the person engaged in interaction becomes part of the very system that gives rise to the work they are experiencing.

7.2.1 First-Order Systems

Gordon Pask describes first-order systems (1°)¹ as “...classical black boxes and negative feedback” (1996: 355). Heinz von Foerster refers to another of Pask’s characterizations of first-order systems, stating that “...the observer enters the system by stipulating the system’s purpose” (2003a: 285). In short, 1° systems focus on autonomy and regulation. In a musical context this is represented by instructions that lead to the autonomy and regulation (or organization) of sounds. Table 7.1 cites examples of relevant musical works and presents a simple 1° stipulation. These first-order stipulations do not represent any of these works in their entirety. All, except for those works of Amergent music by the author, are not complete until they reach the second-order stipulation. The Amergent pieces must reach the third-order stipulation to be complete. The first-order can be loosely described as various means of structural organization and algorithms that will lead to the production and performance of a musical work.

7.2.2 Second-Order Systems

Again von Foerster agrees with Pask and characterizes the second-order (2°) as cases in which “...the observer enters the system by stipulating his own purpose” (2003a: 285). The observer’s purpose is frequently experimental: “what does (or could) this sound like?” This proposition calls to mind W. Ross Ashby’s characterization that a system is “...not a thing, but a list of variables. This list can be varied, and the experimenter’s commonest task is that of varying the list...that gives the required singleness” (1956: 40). In these 2° musical systems (see Table 7.2), sounds are integrated with the system as variables in a musical experiment.

¹ The abbreviations for first-order (1°), second-order (2°), and third-order (3°) are borrowed from Kenny & Boxer (1990).

Table 7.1 First-Order Systems in Experimental, Ambient, Generative, and Amergent music

TITLE (GENRE)	MUSICIAN	1° SYSTEM
<i>In C</i> (Experimental)	Terry Riley	Elastic structure; sequential progression through the set of 53 phrases
<i>Paragraph 7 of "The Great Learning"</i> (Experimental)	Cornelius Cardew	Instructions for piece: "Do not sing the same note on two consecutive lines" "Sing any note that you can hear" Otherwise, "choose your next note freely" (Eno 1976: 3)
<i>Music for Airports</i> (Ambient)	Brian Eno	Tape phasing structure at intervals of 21" 17" 25" 18" 31" 20" 22" (see chapter 2)
<i>Bloom</i> (Generative)	Brian Eno & Peter Chilvers	Looping drone; melody generator
<i>Dérive Entre Mille Sons</i> (Amergent)	Norbert Herber	Generative instruments: Shuffler(), DeckOfCards(), Seq(), End2End() (see chapter 2); spatial arrangement of audible zones

Table 7.2 Second-Order Systems in Experimental, Ambient, Generative, and Amergent music

TITLE (GENRE)	MUSICIAN	2° SYSTEM
<i>In C</i> (Experimental)	Terry Riley	Phrases composed loosely in key of C; progression advances at performer's discretion
<i>Paragraph 7 of "The Great Learning"</i> (Experimental)	Cornelius Cardew	"[A]ccidents that are at work" such as "'unreliability' of a mixed group of singers," "beat frequency," "resonant frequency" of the room, "preference" or "taste" of the individual performers (Eno 1976: 4)
<i>Music for Airports</i> (Ambient)	Brian Eno	Pitched sounds are phased at various intervals to produce shifting tonalities over time (see chapter 2)
<i>Bloom</i> (Generative)	Brian Eno & Peter Chilvers	Drone plays in multiple keys; melodies constructed of pitches harmonically related to the drone
<i>Dérive Entre Mille Sons</i> (Amergent)	Norbert Herber	Sound palette assigned to generative instruments and linked to individual sonic zones within a spatial layout

The system does not simply exist in some "final" form, but rather changes due to the role of the observer—the "composer" or musician who makes use of the system. In Generative and Amergent music, the system is a list of variables including the parameters of a generative instrument and a palette of sounds to which it is coupled.

7.2.3 Third-Order Systems

This stipulation applies only to the works of Amergent music discussed in this thesis: *Perturb* and *Sound Garden* (chapter 3), *Dérive Entre Mille Sons* (chapter 4), and *Londontown* (chapter 5). In the third-order (3°) the observer and system have a shared purpose. The observer's purpose is an extension of the 2° question, asking "*why* does it sound this way and what does that say about the 'place I'm in'?" In the 3°, the observer is more technoetically oriented and coupled to an ever-changing 2° system. The reciprocal perturbations constitute both a question and an assertion of an unfolding, mutual purpose, as interactions indicate intent or desire and seek to draw out experience.

This "drawing-out" in the 3° system demonstrates that both generative system and observer are situated inside the work as an environment. However, as von Foerster states, "...the environment as we perceive it is our invention" (2003b: 1). The work of Amergent music does not exist without the dynamics that are created and sustained between the generative system and the observer. This is illustrated in figure 7.1. It is the same *structaural* coupling diagram as presented in chapter 3, but with an additional layer of information that reveals the presence of 1°, 2°, and 3° stipulations. The recipro-

cal perturbations exchanged between observer and generative system construct a mediated reality of emergence and becoming. Chris Lucas writes:

The current ‘state-of-the-art’ is in third-order cybernetics, where the observer is part of the coevolving system. This is a more intrinsic (embodied) methodology and shows the ongoing convergence of all the various systemic disciplines, as part of the general world paradigm shift noticed recently towards more integrated approaches to science and life. In 21-st Century systematics, boundaries between systems are only partial and this implies that we must evolve with our systems and cannot remain static outsiders. Thus our mental beliefs echo our systemic behaviours, we co-create our realities and therefore internal and external realities become one. (2001)

In technoeitic environments this is a reality dominated by emergence, where the synergy of localized interactions churn endlessly, producing novelty in *this* moment, and in the next, and the next, and so on. There is an objective. These works produce a transformation of consciousness that can be sustained by the artwork, not just a transformation of *any* consciousness. Stafford Beer thought of cybernetics as the science of exceedingly complex systems—of systems that *become* in an unpredictable manner—and a science that focused “... on adaptation, on ways of coming to terms performatively with the unknown” (Pickering 2008: 129). As a musician who cultivates or helps to cultivate these kinds of mediated experiences, *becoming* is always known. The ontology of that becoming will always be partly determined by the capabilities of the technical system that sustains the processes of mediation. But within those capabilities there is a great deal that is unknown. *Structaural* coupling provides a 3° system that behaves so as to seamlessly integrate a musical becoming within the totality of the evolving, mediated reality.

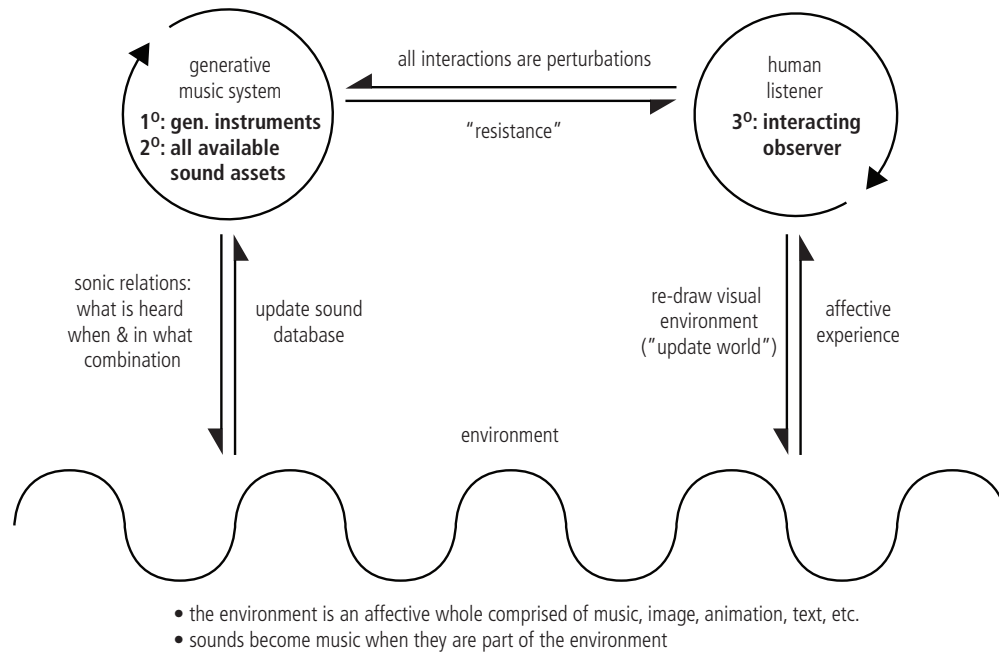


Figure 7.1: *Structaural* coupling facilitates interaction within a 3° cybernetic system. The 1° is represented by the generative instruments, and the 2° by the system of sounds used by these instruments to create a complete generative system. The interacting observer constitutes the 3° as the reciprocal perturbations shared between them and the generative system give way to the environment out of which the affective experience emerges.

In the context of business (strategic management) consulting, Vincent Kenny and Philip Boxer write:

We need to have a domain which contextualises the activities of, and relations among, the participant observer ontologies of the 2° domain... 3° cybernetics must be a domain which

allows us to come to contextualise this ‘subject’, with his ‘ethical system’ and his higher-order ‘purpose.’ We need to understand his phylogenesis as observer. (1990)

While the work discussed here is miles away from the field of business and strategic management consulting, Kenny & Boxer express a shared need to characterize the overall dynamics and possible outcomes for situations in which an observer is coupled to another system and the pair have a shared purpose. What is most interesting is their reference to this person as a “participant observer,” which implies he has both active and passive roles in this overall process. In a 3^o stipulation, system and individual evolve together. In works of Emergent music this partnership of transformation, continuous perturbation, and the tension of simultaneous (in)activity plays an essential role in shaping the experience of a technoetic environment.

7.3 Emergence and the Poiesist

This research began as a simple question directed at music and a coupled technological environment, but additionally led to unexpected answers concerning the person involved in the interaction. The relationship described earlier makes it clear that this person is more than a docile listener. But he is also not involved to the degree that would engage him in any kind of “work.” The role of this person and the experience it affords was one of the more elusive and surprising outcomes of this research process.

With information technology and usability, the term *user* is common and effectively suggests the demand this person has for the utility of an object or the mediated environment (Norman 1989; Krug 2006). The potential of involvement and engagement with an interactive art work calls for the use of the term *participant* (Cornock & Edmonds 1973; Popper 1975). But whereas *user* has too much implied agency, *participant* has too little for the discussion at hand. *Player*, as used in games, conveys a more carefree sense of agency but it also connotes the hands-on act of playing music. This is of course related, but too specific to other realms of music making to be of use in this context.

In her book, *Utopian Entrepreneur* (2001), Brenda Laurel used the term *partner* to suggest a mutual agreement between artists or designers and the person engaged in their work. She favored the term because unlike *participant*, there was clarity in the consensual nature of the agreement or relationship (Laurel 2001). There is also *vuser*, a combination of *viewer* and *user*, coined by Bill Seaman in 1998 (1999: 11), which encapsulates elements of surrender and agency inherent to these environments. In works such as those discussed in this thesis, a combination of *user*, *listener*, and *participant* is apropos, but none speak sufficiently to the ontology of technoetic environments.

Martin Heidegger’s lecture *The Question Concerning Technology* argues that it is not important to ask what technology can get for us, but to become aware of what it can reveal about ourselves and the world in which we live. Technology is most beneficial in the long-term when it is used to reveal and explore, not to exploit. If there is a question concerning technology, it is a question of *how*, and it focuses on a sustainable future. Technology itself challenges us to think about its essence—what is that? Heidegger discusses its tendency towards “revealing” and “enframing.” Through enframing, “... the subjugation of the world to already given human ends...” (Pickering 2008: 131), technology provides resources, tools, and processes—a “standing-reserve”—that gives way to further technological developments. It has a recursive essence that, if not handled carefully, subjugates us to the service of technology at the expense of spiritual and other aspects of human development. Heidegger writes:

So long as we represent technology as an instrument, we remain transfixed in the will to master it. We press on past the essence of technology. When, however, we ask how the instrumental unfolds essentially as a kind of causality, then we experience this essential unfolding as the destining of a revealing.

...When we look into the ambiguous essence of technology, we behold the constellation,

the stellar course of the mystery.

The question concerning technology is the question concerning the constellation in which revealing and concealing, in which the essential unfolding of truth propriates.

But what help is it to look into the constellation of truth? We look into the danger and see the growth of the saving power. (1977: 337-8)

Technology exists as a continuous cycle of "... revealing and concealing..." in which truth can be discovered. Through this process, "...the essential unfolding of the essence of technology..." should be approached with caution because the truth it offers is intertwined with demise. Pickering observes that Heidegger's notion of *revealing* "...points us to a politics of emergence..." (2008: 131). A vision of the tumult in a cellular automata creates a useful impression. Cells churning off and on, flickering in and out of coherent groups and patterns appears similar to Heidegger's processes of revealing and concealing. Like order in any self-organizing system, truth is evanescent.

Heidegger's dynamics of revealing are discussed as an entangled network in which technology contains equal measures of interwoven "danger" and "saving power." He writes:

Human activity can never directly counter this danger. Human achievement alone can never banish it. But human reflection can ponder the fact that all saving power must be of a higher essence than what is endangered, though at the same time kindred to it. (1977: 339)

The danger is the effect of technology, the tangible results of enframing and standing-reserve. The saving power is affect; the unfolding of "... ambiguity points to the mystery of all revealing, i.e., of truth" (Heidegger 1977: 337). Heidegger asserts that those who are attentive to the strand of revealing containing saving power are the ones who will become truly free. This dialectic of revealing is similar to the semantic tension between *effect* and *affect* that led to the term Amergent music. *Amergent* combines action and emotion. *Emergence* as a characterization of the action involved in reciprocal perturbation, and *Affect* as the emotional impact of this continuous exchange. Each dynamic is necessary to the processes that give rise to the musical experience.

While Amergent music has independence and autonomy within its environment, it does not unfold entirely of its own accord. The person who is simultaneously listening and engaged in the mediated environment is largely responsible for the totality of what is heard. This is the *poiesist*, the one who draws music out through the agency of their interaction. Heidegger writes:

There was a time when it was not technology alone that bore the name technē. Once the revealing that brings forth truth into the splendor of radiant appearance was also called technē.

There was a time when the bringing-forth of the true into the beautiful was called technē. The poiēsis of fine arts was also called technē.

...What was art—perhaps only for that brief but magnificent age? Why did art bear the modest name technē? Because it was a revealing that brought forth and made present, and therefore belonged within poiēsis. It was finally that revealing which holds complete sway in all fine arts, in poetry, and in everything poetical that obtained poiēsis as its proper name. (Heidegger 1977: 339)

Poiesis is a bringing-forth. In works of Amergent music the person engaged in the experience, formerly known as the *participant*, *user*, *player* and so on, is more appropriately called the *poiesist*. The experience of interaction facilitated by Amergent music is a poiesis—a bringing-forth or drawing-out—the catalyst to a becoming or emergence of sounds into music. The poiesist draws sound out to

reveal music; the poiesist engages with the “...the constellation in which revealing and concealing, in which the essential unfolding of truth propriates” (Heidegger 1977: 338). This process and the experience of sound it engenders is emergent.

7.4 Applications of Emergent Music

I am grateful to Brian Eno who has served as an advisor to help guide this research. At an advising session in July of 2006 we discussed the prospects of an approach to technoetic and media arts that leverages emergence. In particular, we discussed using generative processes in ways that connect actions to a musical transformation congruous to the dynamics of the mediated environment. While we agreed that this has very interesting and rich potential, there are a lot of obstacles—the most difficult of which involves explaining the concept in a way that others will understand and support. He related to me some of his difficulties in explaining the ideas behind Ambient music and said that not until he followed a similar approach to video art did he feel that people “got it.” What I gathered from his story was that the idea of music that changed so slowly and aspired to be “...as ignorable as it is interesting” (Eno 1996: 296) was a challenge for many listeners at first.

As of this writing, more than 30 years after *Music for Airports*, it is difficult to imagine how “ambient” could have been confusing; but so it went. Today, when I talk about Eno’s work with graduate and undergraduate students the sound of his music is not radical to their ears but the idea of a musician deliberately striving to make something ignorable always catches them by surprise. Eno’s statement runs contrary to the romantic stereotype of the “suffering artist with heart-wrenching truths to be communicated,” and it acknowledges a prevalent, contemporary engagement with music. North, et. al. and Levitin (see chapter 6) found that music is used as a physical or emotional asset, and that even in cases in which listeners are sonically detached, music is still capable of setting a mood for non-listening-related activities (2004; 2007). Whether it is a theme park, computer game, digital art installation, or many of the other works discussed in this thesis, music is frequently employed to create the right atmosphere. In discussing the procedural music system behind *Spore*, Aaron McLaren said he aspired to a situation in which players thought that the music facilitated their creativity and allowed them to focus on game play, but was never intrusive (2008). Emergent music similarly aspires to a useful transparency, but it has always sought to leverage affect as a direct result of the events that transpire within a mediated environment. The mood is not defined but seeded as a variety of sound potentials. It is up to the poiesist to draw these out and discover what is unique about the environment in which he finds himself.

Over the past years I have gained a great deal of confidence from Eno’s support of my work and his optimism for the use of generative techniques within technoetic and media arts. This research, and the music that was produced in the process, is not however immune to criticism. Because Emergent music draws on some of the same foundational concepts established by Ambient music, many concerns or critiques it receives are motivated by similar misunderstandings. Emergent music is meant to register affect, and to serve as a catalyst for transforming consciousness within works of technoetic and media art. While the original musical works discussed in this thesis are useful for illustrating the concepts of Emergent music, there are still aspects of each project that need to be addressed for the ideas presented here to fulfill their greatest potential.

7.4.1 Critique of *Londontown* Music

When Brian Eno relayed his story about the difficulties of explaining Ambient music to others I could identify with him. I was two years into this research process and grappling with similar semantic challenges. We discussed how I might be able to overcome this struggle and he suggested using a false narrative. This turned out to be the best advice of all, though instead I was able to participate in a project where there was an actual narrative. *Londontown* was precisely the right opportunity for

this course of research. As a narrative-driven virtual world it perfectly met my need for a project with robust interaction that gives way to profound emergence.

The first prototype was based on *Londontown*'s journalism quest (as already discussed in chapter 5). This was an ideal way to start, though when the work was done it turned out to be more of an experiment than anything else. The musical results produced by the prototype revealed that the scope of the narrative requiring music would be much larger than initially anticipated. As related to the quest, in which the player tries to enter the journalism profession by gathering leads for new stories, I developed music based on Intensities for reputation, conversation, and story lead tally. After some testing it was clearly successful on a musical level, but the overall approach only worked for the journalism quest *in particular*. It was too specific given the proposed scope for the entirety of *Londontown*. The idea of using Intensities had to be scaled to a more general level that could be applied to the widest possible variety of characters. Though it will not be used directly in future versions of the project, this first prototype is unique. It was the first simple, straightforward demonstration of Amergent music I was able to make. It presents a narrative that is easy to understand, and the music connects to the story in very (to borrow Kevin Lynch's term) "legible" ways. It has been a useful tool for presenting the ideas behind this research to audiences with general and specialized knowledge alike. To see and hear the journalism quest prototype, go to section 6 of the supporting DVD. Or to try it for yourself, see the DVD Instructions earlier in this document.

As previously discussed in chapters 2 and 5, a more robust software prototype was developed with Max/MSP and Logic to explore the combination of Intensities and sound palettes relative to the various avatars one can become once they enter *Londontown*. The results of this work are documented in section 6 of the supporting DVD. There are four annotated quest walk-throughs that demonstrate how the Amergent system proposed for *Londontown* will respond to perturbations both made and received in the virtual world. These were produced similarly to the Journalism quest walk-through. Using quest scripts for a lower-class thief, a lower-class street artist, a middle-class tailor, and an upper-class curator, I simulated the possible interactions and "played" the generative instruments that fit within each character's Profession, Reputation, and Skills Intensities. Each example represents a *possible* rather than *definitive* sonic version of each quest. Time was taken exploring all potential interactions so as to document the widest possible range of musical potential offered by each quest. What was done serves the purpose of this research in a musical sense, and as a project for experimenting with the ideas proposed in this thesis, it has been successful. As a musical work I do not believe that it is finished, however. The underlying system of Intensities, the generative instruments, and the available palette of sounds all require further development. I believe the current system to be sufficient for work being done in the commercial world. But for future projects, knowing that the full potential has not been realized, every aspect would benefit from some modifications and improvements.

In the current version of the Max/MSP prototype there are no visuals that make reference to the world and no narrative that ensues when a player is engaged in a quest. This makes it difficult to comprehensively evaluate the effectiveness of the music. It is possible to toggle settings on and off as done with the initial journalism quest prototype. As the one *doing* this, there is a clear sense of agency: I know what events are happening, I manipulate the mouse to make those happen, and I hear the results. Listening to these recordings after the fact does not produce the same affect. As will be discussed in the next section, Amergent music requires perturbation if it is to sound as intended. Hearing it with no discernible connection to the interactions that were performed leaves one with an incomplete picture. However, each of the four recordings that were made tells a different story. Though it is not clear precisely what happens in each, the fact that there are four distinct narratives is a sign that the music is performing as intended.

Londontown is based on an ontology of emergence. As a virtual world, it *becomes* through countless player-to-player, player-to-world, and world-to-player interactions. There is no trace of binary affect, but rather a spectrum of what can help and what can damage, what is confusing and what is discernible. Choices must be made based on the context of one's situation and environment, which is always in flux. This was the reason for developing a musical system that is similarly rooted in an ontology of emergence. When the musical system can manifest behavior congruous to that of the technoetic environment that supports it, the two become very capable partners. One way to sustain an absence of binary values in the music was through the idea of Intensities. Deleuze characterizes intensity as the becoming of a quality. It neither *is* nor *is not* a particular quality, but rather some combination producing the affect of a particular quality. Profession and Skills are two such qualities that significantly affect a player's existence in *Londontown*, and are treated as Intensities in the generative music system.

In terms of differentiating the various profession types in *Londontown* (action, exploration, achievement, and social), the musical results produced through this Intensity are successful. For professions within the same social class (thief and street artist) or across different classes (middle-class tailor vs. upper-class curator), the music that plays relative to the interactions of each character is unique. The Skills Intensity needs improvement in this regard, however. This Intensity was organized by class as well. The use of skills by lower-, middle-, and upper-class characters are heard on viola, cello, and full string section respectively. In context, the differences in this arrangement are too fine to be heard clearly. Most importantly, there is no way to distinguish how one kind of skill might potentially be different from another (a mental vs. a physical skill, for example). While a Skills Intensity is an important part of the overall musical system, there needs to be a more thoroughly developed sound palette that represents the variety of possible skills that can be mastered in the *Londontown* world.

Also, in terms of the overall sound of the music, I am pleased that it sounds “cinematic” as was requested by the lead designer. While it does not have a distinctive Hollywood sound, it does have moments of sweeping drama and, most importantly, it does not become too musically active so as to demand a surplus of listening attention. The class eigentones also give the music of each social class a distinct sonic fingerprint. Current recordings of this music demonstrate that it is difficult to achieve the spatial quality I had intended. This may be due to the eigentones themselves, or to the unpredictable dynamics in other parts of the overall musical mix. Whether it is a problem of engineering or software design, it is nonetheless one worth solving. The eigentones currently serve an unintended role in the *Londontown* music that makes them a vital part of the overall composite sound. When the other parts of the music reach a point of rest (as will happen from time to time) the eigentone track can be heard playing very softly. In moments that might otherwise be overly sparse, these tracks add just enough interest to act as a primer and to hold the music together until future sonic events unfold.

7.4.2 Listening & Interaction

The aesthetic tension between “ignorable” and “interesting” is one of the essential ingredients in Brian Eno's Ambient music. This can initially be interpreted as a sort of polar relationship, but on closer examination one finds that these dynamics are something of the strands of cord that twist into a braid—they are at once separate and same. A related quality Eno emphasized is that “Ambient Music must be able to accommodate many levels of listening attention without enforcing one in particular...” (1996: 296). These statements are similar, but there is a difference in that “ignorable/interesting” speaks to the music itself, whereas “mobile levels of listening attention” reflects on the involvement of the listener.

In discussing *Composition-Instrument Study I* with me via e-mail, Eno offered the following critique on 10 February 2008:

I personally feel there is little value added (and even possibly some subtracted) by ‘interaction’ of the kind that your system makes possible. But that might be my taste. However, when I want to listen to music, I normally want to enter a state of something like surrender to it...I don’t want to be the controller. Of course I love being the person who sets up the rules for the piece, but then I want to see what it does by itself without my input.

In the same e-mail message he went on to discuss how, when developing *77 Million Paintings* (2006), he considered various options for allowing viewers a degree of navigational control:

I toyed with these for a long while, but ultimately I decided against any of them: it seemed to me that futzing about with a controller was an entirely different mental process from actually watching and enjoying the work itself, and in fact the two activities seemed inimical to each other. (2008)

He concluded his e-mail critique with specific concerns about the piece I asked him to consider:

I don’t want this to sound like a negative criticism: I think where you’ve found yourself is a very interesting place. But what I also think is that there is a danger that you end up between two stools - on the one hand making a musical experience that isn’t rich enough to be sustaining, and on the other making a tool which isn’t fine enough to exert any meaningful control. (2008)

This was one of the most useful critiques I received throughout the entire research process. Eno’s comments speak directly to my initial research question and address one of the fundamental relationships of sound and interaction discovered along the way. I first found that when a generative system was coupled with a person and their interactions, the entire system could be characterized in ways that were indicative of both a musical instrument and a composition. All works of Emergent music presented here have this dual nature. It is experienced most keenly by the poiesist engaged in the work itself. But as the one responsible for setting the initial conditions of the music, I find that it is difficult not to approach the work in all possible permutations: as a composition, as an instrument, and as a composition-instrument. Eno’s critique asked me to reconsider the experience of the poiesist and think more carefully about the balance between surrender and agency.

I agreed with Eno’s statements over e-mail that “... futzing about with a controller was an entirely different mental process from actually watching and enjoying the work itself...” I found this to be true with *Sound Garden*, where gardening provided a metaphor for interaction. The actual process involved a mouse and keyboard, but it was slow. Those who planted and pruned sounds in the work could interact and then wait to hear the affect of what happens. Later projects that involved a less asynchronous mode of interaction were more challenging in this regard. *Dérive Entre Mille Sons* was the first project that gave me an opportunity to experiment with less physically overt modes of interaction. As discussed in chapter 4, breath-controlled navigation in Char Davies’ *Osmose* was an important touchstone. Though both the iPhone and iPod Touch are an ideal platform with a three-axis accelerometer, a Nintendo Wii controller (Wiimote) was incredibly successful in the development of a project prototype. There are also future plans for a physical installation using the WiiFit Balance Board that would allow poiesists to sit in a meditative position and shift their weight (rather than tilt a device) in the direction of their *dérive*. In some ways this may be the ideal interface, as there is nothing in the hands of the poiesist yet they still have a great deal of control over the environment created through their interactions. The amount of effort exerted would (hopefully) not get in the way of such an experience.

As it specifically concerns Emergent music, there is another dimension to this as well. Surrender, or the giving-over of oneself to an experience, comprises part, but not the entirety of Emergence. Surrender alone is too passive. In the kind of relationship that is established between a poiesist and the

environment created through a musical experience there is both action and emotion. Experience is constructed through one's negotiation of the perturbations he encounters. The poiesist draws-out or brings-forth the affective experience. Their role is one both of agency and surrender. The affective tension between agency and surrender is similar to the kind of listening experience surrounding a Suikinkutsu (see chapter 6). With this device, one kind of activity (washing hands) serves to engender an experience of sound, and in it to reveal something unknown. The suikinkutsu calls one's attention to natural sounds within the temple, many of which are unnoticed. Through the act of washing there is a bringing-forth, and the process of purification reveals what has always been but has not been perceived as such. In Amergent music this is the kind of experience that is created. It is not a listening experience of complete surrender to sound, nor is it as intensive or goal-oriented as a flow state (Csikszentmihalyi 1990). It is both active and introspective—an experience of consciousness that is brought-forth through a dynamic kind of surrender. The poiesist constructs this experience of reality through his very participation in it.

In *Composition-Instrument Study I* and *Composition-Instrument Study II*, this was most apparent through the use of mazes. In other sections of the studies (particularly the “dérives” over psychogeographic maps of Boston and Paris), the visual interface suggested that there was something important on the screen. This assumption subtracted from the overall musical experience. It created the impression that there was an objective or goal to visit each sound-emitting zone, like an aural form of the worst kind of tourism. The *dérive* is a pursuit of impressions that is far more concerned with the experience of play and exploration than it is the collection of trophies. I found, through my own experience and interviews of others, that while it was focused on finding one's way through a maze, this puzzle-solving activity superseded any thought of intentional music making. The difference was that in the mazes of these studies, music as a “goal to be achieved” was replaced by an activity which gives rise to music and musical experience that could be characterized by saying, “I found a way out of the maze... and it sounded really interesting along the way.” Musical experience is a consequence of one's presence and engagement in the mediated environment.

Projects like *Londontown* benefit from this kind of interaction as well. Though the virtual world is still in development, the prototype interactions I have designed demonstrate similar affects. The music comes to life only through perturbations (interactions) within the world and dulls when there is no activity. It is possible to say that, musically speaking, there is nothing worth *surrendering to* unless something is happening. While not an ideal approach for all works, this arrangement suits *Londontown* perfectly. It is a burgeoning virtual world filled with the activities of human player-characters (avatars) and AI-controlled non-player-characters. The myriad interactions between these parties should ensure that the musical experience of *Londontown* is rarely stale and consistently congruous with the dynamics of the world itself.

In the end, “between two stools” is exactly where this work needs to be, though not in the original sense of that phrase! Eno's e-mail critique identified one stool as a musical experience and the other as an instrument. What I have sought to do is avoid these extremes, and explore the musical possibilities of a rich middle-ground. Amergent music departs from a similar position as Ambient music in that it is meant to function within an environment. Environments have changed however. Contemporary technology has created augmented spaces and new “places” characterized by their liminality and emergence. These environments are mediated. One's use-of and presence-within them can be simultaneously observed and used to make the aural experience of the environment congruent with the visual. In the way Schafer asserts that we are all responsible for the soundscape of our physical world (1977), Amergent music allows poiesists to shape the sound of the mediated realities they visit.

In works like *Londontown* this is, in some ways, easier to accomplish because people have a reason to visit the world. Their actions and presence can be tracked across various Intensities and used to

construct a musical reality. Poiesists are more deeply engaged with what they are doing in the world, and less-so concerned with the musical consequences of their actions. The overall affect is a fusion of action and sound. This, paired with visual and other elements of the world, comprises the totality of a mediated experience. Pieces like *Dérive Entre Mille Sons* make this relationship more challenging, primarily because they are stand-alone works. There are no characters or story, simply sounds and the potential for a poiesist to engage them in different ways. In my research these kinds of projects have been, I believe, less musically successful. I am not discouraged, however. The process of creating, experiencing, and sharing *Dérive Entre Mille Sons* with others has demonstrated that a stand-alone work of Emergent music requires a different kind of connection between sounds and interaction than has been established in the other works discussed here. The use of Intensities is still viable, as are various modes of interaction that demand a minimal amount of physical effort. The challenge of a stand-alone work is in defining the relationship between sound and poiesist so as to find the most compelling balance of action and listening experience. I endeavor to create works in which one's engagement is as carefree as that of the *dérive*, where listening and drifting become part of a single act. While none of the stand-alone musical works created thus far have been able to achieve such a relationship, the process of this research—including both artistic and academic endeavors—has revealed that it is possible, and that it holds great potential for making music uniquely suited to the emerging landscape of technoeitic and media art.

Conclusion

In the *Biology of Cognition* (the first part of *Autopoiesis and Cognition*) Humberto Maturana tells a story (1980: 53-5) that serves as a useful (and final) summary to the musical ideas presented in this thesis:

Two groups of workers are assembled and each given the task of building something. In the first group a leader is appointed and he is given a book with drawings, measurements, and a discussion of the materials required to build a house. The leader dutifully follows the *descriptions* in the book and guides his team through all of the various tasks required to build their house to suit every last detail of the design.

The second group has no leader. Instead each member starts in a single row and is given an identical copy of a book filled with a general set of instructions. In it there is no mention of *house*, no discussion of pipes or windows or electrical wires, and no drawings whatsoever. There are only instructions specifying what a worker should do given their starting position and all other possible positions they might encounter as the process ensues and their relations to the other workers changes.

An observer visits the worksite of the first group to see that they are in fact building a house. He clearly sees that it is a house and the workers know that it is a house they are building. They have seen the plans and discussed them to be certain that the finished product matches the description which they were provided.

The observer then travels to visit the site where the second group is working. There he finds that another house is in the process of construction, though if he were to ask the workers what it is they are building they could not give a definite answer, all they could do is point to individual steps within the process such as, “when the two-by-four is positioned like that, I put the nails in like this.” In the second group there is no description to follow, only steps that constitute a process of changing relationships between the workers and available materials. Maturana writes:

That the observer should call this system a house is a feature of his cognitive domain, not of the system itself. (1980: 54)

Performing a similar transposition from earlier in this chapter, the statement yields:

That the observer should call this system **music** is a feature of his cognitive domain, not of the system itself.

The observer sees what he sees and hears what he hears. That it is a house or a piece of music is his construction and a function of his cognitive domain. The origin or defining order of what he hears is particular to the generating system and does not need to be known in advance for an observer to form his perception(s). Emergent music, like the working process of the second group in Maturana's story, *becomes*. It is emergent through a series of interactions based on changing relationships. How this is done is of little importance to the poet, yet he can hear transformations and accept them as part of his ongoing mediated reality. From a musical perspective this is not done to deliberately model what Maturana tells us about human cognition. It is not an attempt at making mediated reality *really* real. It simply offers a mechanism for creating music that is complementary to the flow of becoming in the human domain of perception, and for making that flow congruous to the perpetual emergence experienced in technoetic and media arts.