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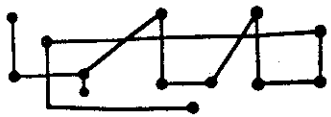
THE INNER AND OUTER COMPLEXITY OF MUSIC



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I. REDEFINING MUSICAL COMPLEXITY

IN A CULTURE where everything seems to need a label if it is to attract any attention, "the new complexity" is one that has arisen in contemporary music recently. To the intellectually inclined it suggests something more stimulating than "the new romanticism," one of its competitors, and to the even more sophisticated it captures something of the *Zeitgeist* embedded in "the new physics" and articulated by visionary thinkers such as Prigogine. But in street parlance the new complexity just means "a lotta notes."

My concern here is not to either debunk or extol the virtues of any particular style of music that suffers under the weight of that label—after all, if it works as music for an audience it needs no further justification nor merits any denigration. My argument is that to the extent which the music of a "new complexity" pursues the path of abstraction, it is based in fact on a conventional notion of complexity that has tenuous validity as a path for the future. The alternative requires a redefinition of the classical Western concept of musical complexity. Stated simply, the traditional notion refers only, or at least mainly, to music's inner relationships—what will serve here as a functional definition of "abstract" music, music whose elements are organized only in relation to each other. The music of a truly "new complexity," I will argue, is based on both its inner and outer relationships and creates a situation where the two sets of relationships are inextricably linked.

In an age where all of the arts, and contemporary music perhaps most of all, are becoming marginalized in society, I seriously doubt that we can afford to train thousands of young composers with the belief that "abstract is best." Nor do I take much hope from those who resort to styles of music that are acceptable to corporate society, such as the "new romanticism." The forces that can counterbalance the corporate machine are losing ground in North America. Sound, word, and image—the staples of the fine arts—are monopolized by the mass media which are the primary tools for the corporate sector to recruit its audience. A loyal, but aging, core of arts supporters still exists, but we are destined, I fear, to be fighting a rearguard battle for survival over the next few decades. What's worse is that if music becomes polarized as a mass-market commodity on the one hand and a meaningless series of esoteric abstractions on the other, it will speak to no one's emotional, aesthetic, intellectual, or spiritual needs.

The stakes involved with the paradigm shift I am referring to are, therefore, enormously high. Even if a writer such as Berendt (1992) is only partly right in asserting that society desperately needs the wisdom and harmony to be found in an acoustic orientation to the world, as opposed to the visual dominance of Western society, it is clear that there is much to be done in the aural domain. Hence, the extent of the wasted talent when the best and most sensitive of compositional energy is focussed with "tunnel vision" on an outmoded model of what art music is all about. It's not that there aren't rare gems of beauty still to be found in that much worked vein; it's that it will become increasingly difficult to justify the expenditure of any of society's resources in supporting the effort to extract them.

There's no "quick fix." A paradigm shift is not a fashion one can buy and instantly look good. It must come from within and it can't be

legislated or prescribed. It probably can't even be accurately defined until it has already occurred, as Kuhn (1962) has documented in the case of scientific revolutions. However, given the lack of grounding that many younger composers feel about the basis of their art, an attempt to reconceptualize that basis may be useful. Elsewhere (Truax 1992a) I have presented three levels on which I perceive there to be a paradigm shift away from traditional models towards what I have described as models of complexity.

The first level is that of our concept of sound, namely the acoustic and psychoacoustic level, the shift being what I have called "the end of the Fourier era." Characteristic of this shift is a moving away from linear acoustic models, separable and independent parameters of aural perception, and stimulus-response behavioral models towards a recognition of the role of nonlinearity, multidimensional percepts, and information processing. The second level concerns the compositional process and here I observe a moving away from the traditional literacy based on the score, what I have called "the end of the literate composer." The result may be a rediscovery of orality (voice, song, ritual, and the primacy of the ear) or it may involve the postliterate use of technology in such varied manifestations as the new acousmatic tradition of electroacoustic music diffusion or simply graphic programming languages such as MAX. The third level is that of the relation of music to the outside world, the paradigm shift being what I call "the end of the abstract work of art." It challenges the continued viability of creating music that appears grounded in no particular context, and the critical tradition that treats the work of art as separate from society. True, no work of art, or any other form of human communication, for that matter, can be entirely context-free, but I am struck by the degree to which, in composition, performance, and musical analysis in this society, we act as if it were indeed both possible and desirable.

It is this last level which I would like to explore further in this essay, supported by examples from my compositional experience. I would never claim that any of my pieces are paragon examples of the type of integration that I am speaking of—at most I sense a gradual shift in that direction—nor do I, as a composer, ever deliberately attempt to force the music to fulfil some theoretical goal—the materials themselves, and my reactions to them, are the main influences on the ultimate shape of the music. The real-world references must work for me at the musical level, and it is the cases where I feel that some degree of success has been attained in balancing the inner and outer aspects of the music that will be quoted here.

II. Inner and Outer Relationships

What I am calling the inner and outer relationships of music have often in the past been referred to as musical and extra-musical concerns. However, formulating this distinction as an antithesis deliberately separates music from its social context and thereby justifies its pursuit in isolation. Music that relies too heavily on extra-musical concerns is termed "programmatic" or "functional" with a thinly disguised disdain for its resulting second-class status. Shepherd (1992) more aptly suggests the levels of text and context, and refers to approaches in ethnomusicology which view music both textually in terms of its internal structure, and as a cultural text which implies "that social or cultural elements are contained within or passed through its sonic components" (129).

While contextual analysis would revitalize musicological analysis (McClary 1987), my concern here is the composing process and my aim is to legitimize the influence that context could have on it. As obvious as that may seem, I seldom see its presence pedagogically. Perhaps it seems safer to stick to compositional techniques or to work within a given style. To open oneself explicitly to the influence of "the real world" is inherently risky. One of the greatest risks, the one that drives most composers back to the relative safety of abstraction or the reliance on older music styles, is where an overly "engaged" music suffers as music. A typical example is so-called "political music" that has little musical interest despite the sincerity with which it expresses its subject. The problem with such music is that the external complexity is not sufficiently matched and integrated with its internal complexity. Such an imbalance is equally unsatisfying as the reduced dimensionality of abstract music—"reduced" at least by comparison to the complexity of the real world, against which the music's internally constructed complexity seems to pale. The ideal situation, in my mind, is to have a continual flow of influence back and forth between the internal and external levels of the musical process, where each informs and enhances our understanding of the other.

Another obvious pitfall is the question of what "inspires" a composer. Titles and program notes are the usual sites of such anecdotal evidence, and to judge by them one would think that practically all pieces of music, barring the occasional work titled something like "Structure #4," were full of external references. I would not underestimate the importance which such sources of inspiration have on the composer, but I suspect that in fact the source was instrumental simply in getting the compositional process started, or perhaps restarted from time to time. What we usually hear, particularly if we haven't read anything about the work, can usually be explained by reference to known stylistic elements. I seldom

detect that the composer has truly let the external references deeply influence the composition, deeply in the sense that they have directly shaped decisions about materials and their form in ways that would be impossible to imagine without that influence.

Another way to clarify the distinctions I am making here would be to put the external references of the "source of inspiration" type at one end of a continuum where the outer relationships influence only the most superficial aspects of the work. At the other end would be slavish attempts to faithfully map some external reference onto sonic data, with little concern for the musicality of the result. In fact, there have been recent attempts to extend the field of data visualization into such auditory maps or "sonification," on the premise that the ear is capable of hearing more simultaneous dimensions. When such techniques fall into the hands of composers, there is a natural tendency to try to find music within such representations, presumably based on a belief in structural analogies between music and other processes. However, the balance I am aiming for lies between these two extremes where there is a constant negotiation between the external referents and the internal musical qualities of the result. After all, if the result is not convincing on its own, without the listener having to be educated as to its value, the music will not likely survive.

To operationalize the concept being presented here, I propose to categorize the sites and level of context which may influence the compositional process, namely under three generic headings that refer to the physical, social, and psychological aspects of context. A music of complexity will likely refer to some or all of these levels, and in fact be inseparable from them. By contrast, it is indicative that the dominant paradigm which we have inherited treats each of these levels generically in order to promote the illusion of context-free art. In my opinion, both art and the environment have deteriorated through their separation, and a reintegration cannot come too soon.

II.1 THE PHYSICAL LEVEL

The physical contextual level includes all objective aspects of the musical event, such as the space or environment in which it occurs, the time or occasion, the performers, the voices and instruments involved, and not least, the audience. As already noted, most of these contextual aspects have become standardized if not anonymously generic in a great deal of contemporary music practice. Abstract music being read through by hired performers in a generic concert space for a fairly predictable kind of audience is unfortunately still the norm. Presumably such conditions have been adopted to serve the music by "protecting" it from external distractions, but it has also created a situation where the music seems precariously grounded and risks the failure to communicate because of the lack of any basis for its language. In an age where the individual too often becomes a statistic and experience exists only in a virtual electronic reality, such music does not seem to speak with a strongly humanistic force. Perhaps this accounts for the emotional and spiritual aridity which also characterize it. How far can we pursue abstraction before it loses any ability it has to communicate with an audience?

Sensing this lack of human dimension, some composers deliberately incorporate what is usually an excessive degree of physicality in their music, but in the conventional concert experience of it, the audience has no physical or emotional outlet for this level of stimulation, and usually protects itself from the music's energy or violence by admiring the ultra-virtuosity of the performer or analyzing the work intellectually. Survival in society today seems to necessitate the ability to protect oneself from the excesses of emotional bombardment over which one feels no control, whether in the form of the daily litany of horror and atrocity found in news broadcasts, or in reports of global crises of pollution, health, or social ills. Paradoxically, both the ascetic and excessive approaches lead to detachment—and in the latter case, it is we who "abstract" ourselves from the experience.

The acoustics of a space are influenced by all aspects of its size, shape, configuration, and materials. Hence, the relation of a music to its space is a classic case of complexity; until the advent of electroacoustics, the art and technique of acoustic design was largely involved with creating a functional balance between sounds and the space in which they occurred within the physical constraints of acoustic laws. No sound had ever been heard without its being colored by its environment, and similarly every sound and space brought with it a specific social and cultural context.

With typically paradoxical implications, electroacoustic techniques allow a sound to be taken from its original context and placed in any other, whether appropriate or not, while at the same time such techniques provide unprecedented potential for designing sounds free from acoustic constraints, enhancing existing spaces, and for creating imaginary environments. The techniques of electroacoustic diffusion (i.e., performance via multiple loudspeaker placement) allow unlimited potential to perform music in any environment whatsoever, outdoors or indoors, thereby linking the space within the music to the external environment. The social implications alone of taking music outside of the traditional concert hall should inspire composers and attract new audiences.

The complexity of interaction between performers and their environments seems to exist along a continuum extending from complete interdependence to a surprising degree of independence and isolation. A striking example of the former extreme occurs in the two recordings *Deep Listening* and *The Ready Made Boomerang* made by Pauline Oliveros, Stuart Dempster, and Panaiotis in a large underground chamber known as the Cistern in Washington State. Because of the extreme reverberation time (forty-five seconds), music performed in this space would be unintelligible if extreme care were not taken by the performers with respect to each other and to the space. Music and space are heard in these remarkable recordings as profoundly integrated.

At the other end of the continuum one might cite standard multitrack recording-studio practice where each musician performs in isolation from the others in an acoustically dead space, communication between performers and producer being largely via headphones. "Space" is added later in postproduction as an "effect" that can be added or subtracted without ever being heard by the performer. Classical music has been much more reluctant to leave its traditional attachment to acoustic spaces during recording sessions, except for visionaries such as Culshaw (1972) and Gould (1966) who saw the potential of a medium unconstrained by physical reality. The point is not which approach is better, but rather to establish the legitimacy of allowing the physical or virtual space to influence the compositional process at every stage.

Given that a space can influence a composition through its acoustical ramifications, there are probably few who would debate its importance, even if they give it little consideration during the composing process. However, an even subtler aspect of the physical context is its temporal aspect. The only manifestation of the importance of temporal context that has come down to us in the West seems to be the idea of "occasional" music, which to most people still has a quaint, functional ring to it. The typical Western musician smiles at the concept in East Indian classical music that a specific raga is linked to a time of day or season; jokes about "well, it's evening in Delhi" are not uncommon when East Indian musicians transpose their practice into the Western concert-hall context. Most of our inherited notion of the homogeneity of time seems to stem from the Western scientific realm—experiments must be able to be repeated anywhere at any time with the same results in order to have universal validity. Aristotle pointed out the obvious when he mocked the notion of uniform space with the example that no one would treat the space above a fire as the same as that beside it; he probably could have found an equivalent example for the temporal domain.

One of the few contemporary examples where a composer has specified both a space and time for a work to be performed is R. Murray Schafer's *Music for Wilderness Lake* (Westerkamp 1981) which must be performed at dawn and dusk around a lake in order for the reflections of the sound to behave in the desired manner. We can debate whether it is the reduction of time to a one-dimensional parameter in physics, or the advent of shiftwork in industrial societies, or the modern "convenience store" hours that seem so important to consumers today which are responsible for the trend to homogenization. That a contemporary artist might reflect this trend is not surprising. But, we can also ask ourselves whether we can fully abandon the psychological, if not physiological, need for a marking of the diurnal cycle, the sense of occasion, and the need to observe points in the various temporal cycles we experience.

What I am calling the "physical" level can easily be transposed into the imaginary domain with little loss of contextual reality. Electroacoustic techniques are quite adept at creating imaginary spaces, and likewise temporal markers can be suggested that resonate in people's memories. I have attempted to incorporate simple references of this kind in recent pieces (Truax 1992b). For instance, in *Pacific* (1990) there is a symbolic marker of the New Year referred to in two of the four movements, one being the practice in Vancouver of the ship horns sounding at midnight in the harbor, the other being the Lion Dance that marks the Chinese New Year. Local listeners will likely recognize the sounds directly, and others can refer to analogous experiences if they choose. The symbolism of the New Year involving death and rebirth imagery was the reason for these references, and as well these events provided the sonic materials for the movements in question.

In *Dominion* (1991), the reference is to noon in four different regions of Canada, marked by a sound signal (cannon, bells, siren, and whistles) that occurs at that time in certain cities. The conductor of the instrumental ensemble in the piece adds a visual dimension to the reference by moving his arms like a clock approaching 12:00 noon at the start of each subsection, a gesture that also conveniently allows the conductor and performers to reset their stopwatch and score times. Given the number of time zones in the country, the notion of a staggered noon is not uncommon to the Canadian experience.

Finally, in *Song of Songs* (1992), the traditional Song of Solomon text is divided into a diurnal cycle of four movements, titled *Morning*, *Afternoon*, *Evening*, and *Night and Daybreak*, reinforced by appropriate environmental ambiences characteristic of those times of day. Sound signals and ambiences are such common temporal markers, yet culturally specific, that they can easily trigger an entire framework of social experience without the audience having to be "educated" with elaborate program notes.

The split between the composer and the performer over the past two hundred years has been accompanied by an acceptance of the fact that the two will probably not know each other and will not need to be simultaneously present for a performance. Therefore, it is hardly surprising that the composer assumes a generic level of playing ability when writing and leaves it at that. Of course, there are many cases where a specific performer's abilities have been an inspiration, and commissions by a performer to a composer are luckily not a rarity, but composers are generally aware of the trade-off involved in making a piece too specific to a certain performer lest it have no future in that person's absence. Even rarer is the instance where a composer might be inspired by aspects of a performer other than his or her playing ability. The norm is still the score where the only requirement of the performer is to possess a specific instrument and have the ability to play it.

The industrial mentality of the three-hour unionized rehearsal call to read through a score clearly mitigates against a more personal involvement. However, I am not going to indulge in a romantic notion that somehow a performer could get more personally involved in a piece of music under such conditions. Performers have techniques to provide the requisite sense of emotional expression even when sightreading, and if that is not sufficient, then it's best to write for a dedicated soloist or group building a repertoire.

However, there are many other techniques that can be used to involve the performer more directly in a piece, particularly with electroacoustic technology. One means is simply to record sonic materials from the voice or instruments in question and then recombine the worked versions of these with the live performer in the concert situation. I find the "larger than life" images that can be projected with electroacoustics particularly attractive as an environment, coherent with the performer yet magnified, as in my pieces *East Wind*, *Nightwatch*, and *Tongues of Angels*. In *Nightwatch*, for marimba and tape, I even used an improvisation by the original performer, Russell Hartenberger, played on a specific instrument that once belonged to my father, as a direct and minimally altered part of the piece. Instead of manipulating the material and probably destroying its musicality, I left it intact on tape and chose to compose a live part with which the soloist could carry on a dialogue with himself, as it were. Interactive computer systems designed for live performance also have a great potential for allowing the performer to influence the composition.

Last but not least, the physical context I am referring to includes the audience. Although much has been written about whether composers "care" or not about the audience, such arguments usually revolve around the composer's perceived willingness, or lack of same, to appeal to the audience's taste and stylistic preferences. At worst the arguments are used to stifle any kind of innovation or provocativeness on the composer's part. Those programming events need to find a balance between artistic validity and audience appeal. They also need to match the works presented with what I call the "listening environment," the physical and social characteristics of the situation which determine how people are prepared (or not) to listen. A special challenge for the composer and presenter arises when that situation is largely indeterminate, as with radio, installations, or other forms of reproduced music. Familiarity with the dimensions and levels of listening in various environmental situations (both natural and mediated) is useful to the composer in structuring a work that will function well within those contexts (Truax 1984).

In terms of the argument I am presenting here, all of the aspects I am referring to as "context" provide the basis for a mutual language between composer and audience. In other words, the audience which starts out in my model as being part of the physical context, provides the crucial link to the other two levels, namely the social and psychological. Too often, however, we see little dialogue between the musical models of interest to the composer and those understood by the listener. For instance, I see little point in the composer infusing music with personal meaning without considering how it will be perceived and understood by others. Nor am I very excited by the prospect of communicating only within one of the many styles that are well known to the audience. What I am calling the dynamic relation between the inner and outer complexity of music is directly mirrored in the composer-audience process of communication.

II.2 THE SOCIAL LEVEL

I am using the term "social" to include all of the material aspects of the context surrounding the musical performance that only indirectly affect it. These aspects are usually labelled social, political, cultural, economic, environmental, and so on. They form a rich fabric of associations on which the composer may draw. Traditionally such references rely on the presence of text, except where an instrument can imitate a real-world sound. Text, of course, is still important, even if problematic, and every piece has at least one piece of text, namely the title, with which to establish a framework of references that can condition the audience's understanding of the work.

Electroacoustic practice brings a much richer range of options into the compositional process by allowing recorded environmental sounds to be included, modified, or imitated, as well as purely imaginary sounds to be

created. Simon Emmerson (1986) has pointed out that a continuum exists between mimesis and abstraction on at least two levels, namely the sound material itself, and the syntax that organizes the material, by which he means that structures may range from imitations of those found in the real world to completely artificially created systems. I make a similar distinction between the practice of *musique concrète*, which often transforms recorded sounds into purely abstract entities devoid of any of their original associations, and the soundscape composition (Truax 1984, ch. 13), which works intimately with those associations. Soundscape compositions also range from those that minimally alter the original material, for instance through transparent editing, to those where the sounds are highly modified in order to put them into musical or other relationships. What all have in common is that listener recognizability of the source is maintained by choosing particularly clear and unambiguous source material, and that the composition involves the listener's knowledge of environmental associations to interpret its meaning.

Although my first piece realized with granular synthesis, *Riverrun* (1986), is entirely synthesized, the title and the various granular textures strongly suggest both the sound and the "life cycle" of a river, from the smallest droplets at the source, through their powerful accumulation and eventual absorption by the sea (Truax 1990c). The piece, however, is far from literal in these references, the idea being to suggest the archetype and open the listener to its symbolic implications. On a more direct level, it prepares the listener for the sheer volume of sound (as opposed to its loudness) that most people find exhilarating when experienced with waterfalls and cataracts. This type of physicality of sound is seldom associated with music, and electroacoustic music too often relies on brute force amplification instead of creating volume inside the sound.

The work *Dominion*, which was cited already, deliberately refers to the cultural and political makeup of Canada, and it is not coincidental that it was composed at a time when the country was experiencing a constitutional crisis that threatened its unity. However, as with all music that invokes external elements, the challenge was how to make the result musically interesting and yet engage the audience's cultural awareness. At one extreme, a simple collage of recognizable soundmarks would have probably triggered the latter, but been of little musical interest. At the other extreme, transforming the source material (identifiable only in program notes) into something of aural interest would be more aesthetically satisfying but would not likely involve the listener otherwise. My attempted solution, made possible by the granular time-stretching technique (Truax 1990a and 1992b), was to preserve the attack of the sound, thereby guaranteeing recognizability, while stretching the main body of the sound to reveal its constituent harmonics. This suspension of the temporal envelope allows timbre to emerge as the principal musical variable and gives the listener the opportunity to allow the sound to evoke whatever connotations or memories it may be related to. The sustained harmonics and inharmonics also provide a reference pitch which is given to the instrumentalists for direct imitation and enhancement, thereby symbolizing the relation of landscape to populace.

However, even without the use of recorded environmental sounds, political and cultural issues may be raised musically through the role given to the live performer, but here again one must abandon the notion of the generic musician. I know of very few pieces that specify the performer's sex, age, class, or race, for instance. With abstract music it clearly doesn't matter, but in an age where such roles are being questioned and reevaluated, I could imagine a composition that is strongly influenced by thoughts on those matters. For instance, the performer's gender could be specified, and given the instrument, certain timbral implications would follow, if Shepherd (1987) is right in asserting that timbre, more than any other musical parameter is related to "the nexus of experience that ultimately constitutes us all as individuals. The texture, the grain, the tactile quality of sound brings the world into us and reminds us of the social relatedness of humanity." Further, a composition could refer to specifically masculine and feminine archetypes and symbolically represent their relationships. Lest one fear a reduction to stereotype, it should be clear that the fight against sexism includes a denial of stereotype, and such a redefinition of roles could be portrayed in terms of musical relationships.

Few pieces seem to integrate the social within the musical successfully. One of the best contemporary examples, in my opinion, is Rzewski's *Coming Together*, which has become popular with audiences, perhaps as a result of such an integration. The title and text, of course, make the real-world reference unmistakable, but ultimately it is the parallel processes found in the ensemble and the vocal soloist, energized by the relentless tempo, that make the piece both psychologically powerful and musically satisfying. One has only to imagine the text without the music, or vice versa, to understand how each reinforces the other. The key to this successful integration seems to be finding a way to symbolize real-world relationships musically—in *Coming Together*, by the incessant repetition combined with an equally inexorable moving forward through the text and pitch material. When articulated with the appropriate emotional energy, such structures seem to achieve the deepest level of communication, both through words and beyond them.

II.3 THE PSYCHOLOGICAL LEVEL

If the social level offers a rich fabric of external references, what I am calling the psychological level opens up a seemingly limitless world of internal possibilities, for this is the domain of emotions, archetypes, imagery, metaphors, myths, symbols, and dreams. Some would say that music has always been an effective language for externalizing precisely this domain, for expressing it symbolically where words fail. It still has this potential, but in contemporary society the composer has powerful rivals in this domain from advertisers who are also anxious to communicate effectively with the audience (Truax 1992c). The main difference may not be the commercial motive, but rather the disproportionate access to technology, media, and audiences which the advertiser has.

One of the most talented and influential sound designers working in advertising is Tony Schwartz, whose "responsive chord" model (Schwartz 1973 and 1983) has profoundly influenced the way in which advertisers communicate. Instead of trying to "pound" a message into the consumer, he suggests trying to evoke the images and associations that are already within the viewer or listener. Such associations are then linked to the product through repetitive experiences of the ad. Since the images are unambiguous and often stereotypical, they do not require much attention and therefore can be communicated effectively in "accompaniment" media situations where the listener's attention is primarily directed elsewhere. This type of communication has the added advantage of bypassing any significant form of critical evaluation or analysis, that is, it usually circumvents rational or linguistic formulation. At a later time, Schwartz argues, when product choices are being made, particularly from among semi-identical ones, the product name, logo, and visual image will trigger the presumably positive associations communicated by the ad.

Specific styles of voice and music, as well as evocative sounds, are particularly effective when successfully linked to products in this manner. Although content or story line may have some importance—usually they simply provide continuity—it is the nonverbal image created by sound that has the deepest effect. Traditionally, this has been the domain of the poet and musician, to craft patterns of sound that appeal to the inner psychological world, to give it expression and in turn to develop its form of analogical thinking. Given that a typical student will absorb around fifty hours per week of reproduced electroacoustic sound (Truax 1984), even if not all of it has an explicitly commercial intent, it is easy to see why artistic communication is not on a level playing field in this domain.

This dilemma also points to the great need and potential for artistic approaches to myth and storytelling. Those involving electroacoustic techniques seem best suited to expressing the desires and fears of today's world, yet we see remarkably little use of this medium by opera, theatre, and ballet companies, despite its economical advantage and contemporary appeal. Film and video offer perhaps the most accessible formats for electroacoustic music, as do other forms of mixed-media production. However, even with modest resources, the traditional chamber-music format can incorporate features of myth and storytelling, particularly with gifted performers who are able to act out an imaginary persona. In *Beauty and the Beast* (1989), for instance, I attempted to create the illusion that the soloist (playing oboe d'amore and English horn) is the narrator of the story, by having his score embedded in a large storybook whose pages were projected above him. A reading of the specific text was analyzed for pitch inflection and rhythmic contour which were then imitated in the instrument's melodic line. Once this "text" is finished, the performer turns the page in an obvious gesture and the story continues in the computer graphic slides, created by Theo Goldberg, and on the tape which was composed with granulated and time-stretched versions of the dialogue. At the end of the piece, a mask that the Beast character uses in the graphic illustrations is suddenly discovered by the live performer and used in a similar gesture before exiting. This is an attempt to bridge the illusory world of the graphics and the magic of the story they tell, back into the real world where the psychological truths of the story also reside.

Sound can also establish a metaphor or suggest an archetype based within the sound and the way it is processed or structured. For instance, in *Basilica* (1992), the stretched and harmonized versions of the church bells create a voluminous sound that is a metaphor for the edifice itself. The fact that internal resonances emerge from within the bell timbre and suggest singing voices further reinforces the image. Thus, "entering" the bell sound becomes a symbol for entering a place where one hopes to find spiritual meaning.

Pacific (1990) creates a more elaborate system of metaphors based on the way in which environmental sounds are processed (Truax 1992b). In the first movement, "Ocean," a metaphor is established linking the rhythm of ocean waves to that of human breath. This "breath" is in fact the sound of the waves enveloped by a long "grain" whose duration is progressively shortened as the movement progresses. Simultaneously the image of submersion beneath the waves is suggested by removing the high frequencies and stretching the wave sound to allow vocal-like resonances to appear. The rapid breath pattern and the sudden return to the original waves at the end of the movement is intended to be symbolic of birth.

In the second movement, "Fog," a metaphor links the sound of boat horns that are blended together by the original reverberant environment and the subsequent time-stretching, to the sensation of being enshrouded in fog. Over this harmonically rich texture, the stretched voices of young people add a series of prolonged melismas that weave in and out. The effect is intended to be symbolic of lovers entwined in each other such that distinctions of self and other are blurred. In the final movement, "Dragon," the metaphor links the stretched sounds of the Chinese instruments, cymbals, drums, and firecrackers, to the fiery fury of the mythical Dragon, the symbolism of which, like the Phoenix, is that of death and rebirth.

III. Conclusion

Radical new ideas about complexity have had a remarkable influence in contemporary physics over the last few decades. One of those that has captured a great deal of popular attention is called chaos theory (Gleick 1987), or the study of nonlinear factors which cause simple systems to exhibit complex behavior. A remarkable aspect of this paradigm shift is that such complex behavior, even when exhibited in such obvious systems as a pendulum, had been ignored for centuries, presumably because it couldn't be explained by the types of linear equations that could be solved. The force of the dominant linear paradigm was to entrench a worldview in which nature was regarded as predominantly linear and predictable with more or less ignorable pockets of nonlinearity and chaos. The new view holds the reverse, that the world is fundamentally nonlinear and complex, and that instances of linear predictable behavior occur either rarely or when real-world influences are excluded from consideration.

I regard musical complexity that depends mainly on internal relationships or older musical styles in much the same way, and this music now constitutes about 90% of what appears on a typical contemporary music concert. The complexity of the real world has been bracketed out by standardizing the external context as much as possible at every stage from production to consumption. With stylistically derivative music, the internal "complexity" (it's often quite simplistic in fact) is based on cultural references to the past, borrowed complexity in essence. With the more abstract version, the internal complexity depends on reducing the inherent multidimensionality of acoustic events to a small number of single-dimension parameters (e.g. pitch, duration, dynamics), and subjecting such parameters to some kind of systematic organization, usually

of a kind that is imposed onto the materials, though some prefer to bolster their systems with claims to naturalness. Understood from within the system, both types of music may be considered complex, but from without, they may suddenly seem simple and predictable.

The music of complexity I envision finds its basis in the unique contexts of the real world. These include its physical attributes (space and time, acoustics, and environment), its social situations (specific individuals, institutions, and cultural heritages), and also its psychological realities (emotions, archetypes, imagery, metaphors, myths, and symbols). The composition and performance of a music of complexity cannot be conceived without being based on some or all of these aspects of reality. With most of today's music, the references to the real world seem shallow, anecdotal, or merely trendy. Our first task is to recognize the legitimacy of allowing such concerns to influence the compositional process deeply, in ways that may change our very notions of what music is and how it functions. The academic teaching of composition and performance will have to undergo a complete shift of mindset to achieve this goal. However, the challenge is also to match the external complexity with that of the internal relationships. A simple mapping of one onto the other is insufficient, as is the subordination of one to the other. The micro level must reflect the macro and vice versa. This simultaneous motion inwards and outwards provides a way of integrating sound and structure, where the two are inextricable, but it also can lead to the reintegration of music and context, and ultimately of composer and listener.

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