Listening to Acousmatic Music

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ABSTRACT

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This study contributes to the fledgling music-theoretical literature concerned with electroacoustic music. Specifically, it explores issues related to music composed for acousmatic listening—that is, music created using sound recording technology and experienced solely by means of diffusion through loudspeakers. Such music poses special challenges for the music theorist and analyst, as conventional analytical tools often emphasize pitch structures and the study of scores—elements often absent in acousmatic music. Attention to listening as an analytic tool has therefore gained prominence within existing theoretical literature concerned with electroacoustic music in general and acousmatic music in particular. Among the issues investigated in this study, then, are concepts of modes of listening and new models for ear training, drawing on the writings of Pierre Schaeffer, Denis Smalley, R. Murray Schafer, and others.

Acousmatic music is also defined by the use of recorded environmental, or "everyday," sounds as raw compositional material; thus, questions regarding the relationship between sound and source (or implied source) are raised, leading to an investigation of concepts of mimesis in this music that stirs up nineteenth-century debates over absolute versus programmatic music. Issues of sound and source and how they may evoke a sense of virtual space or place in the listener play a part in analyses presented for Denis Smalleyj's *Wind Chimes* (1987), Hildegard Westerkamp's *Cricket Voice* (1987), Judy Klein's *The Wolves of Bays Mountain* (1998), as well as a discussion of Yves Daoust's *Mi Bémol* (1990).

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To Mom and Dad

Chapter 1: Musicology, Music Theory and Electroacoustic Music

From a North American perspective, the field of musicology is nearly as young as electroacoustic music. The New York-native-yet-German-educated Otto Kinkeldey was, in 1930, the first person to be appointed professor of musicology at an American university; earlier that same year, the New York Musicological Society was born counting Dr. Kinkeldey, Henry Cowell and Charles Seeger among its founding members. Four years later, the New York Musicological Society dissolved itself or, more accurately, re-branded itself as the American Musicological Society (AMS), electing Kinkeldey as president (Mitchell 1970:2–4). I am recounting this history as a means of introducing the following abstract for a paper read by Kinkeldey at a meeting of the Greater New York Chapter of the AMS in 1936, entitled "The Music of the Future. A Phantasy":

> If the musician could be enabled to manipulate his sound effects as the painter handles his pigments, if he could mix his tones and overtones, his tone-colors and tone-shadings in infinite variety without the aid of . . . musical instruments, and if finally he could fix the resulting complicated sound curve upon a lasting medium like the sound film, capable of being acoustically reproduced at will with the aid of electric apparatus, he will have reached the autonomy and independence of the painter. . . . How soon a race of men accustomed to hearing music as we now hear it, with the intermediary interpreter ever present in the consciousness of the hearer, could adapt itself to a direct reception from the composer, is a difficult question. (Brook 1970:vii)

Here we have Kinkeldey fantasizing about a music that would be captured on "a lasting medium like the sound film"—a fantasy that, as Barry Brook notes, would prove prophetic just over a decade later, delayed—or, perhaps, accelerated—by the intervening World War II. The medium for such a music was introduced just one year prior to Kinkeldey's paper, when in 1935 the German appliance company AEG presented the first magnetic tape recorder, the *Magnetophon K1* produced by BASF, at a German radio exhibition in Berlin. In 1939 Seattle, as war broke out in Europe, John Cage composed

his *Imaginary Landscape No.1*, a work created for broadcast over the radio and whose instrumentation included two variable-speed phonograph turntables; nonetheless, *Imaginary Landscape No.1* still required four performers as well as two traditional musical instruments (muted piano and cymbals) and therefore fell short of realizing Kinkeldey's fantasy. In 1943, while Paris was still under German occupation, French radio engineer Pierre Schaeffer founded the Studio d'Essai at Radiodiffusion Française,[1] where he pursued experiments in manipulating sounds recorded to wax cylinders. In 1948, twelve years after Kinkeldey mused about the music of the future, Schaeffer coined the term *musique concrète* and composed his first works for magnetic tape, the *Etudes de Bruits*.

1948 was also the year in which the *Journal of the American Musicological Society* (JAMS) published its first issue. How would this coincidence resonate with the journal's contributors given the earlier statement by the society's founding president? Apparently, not at all: during the journal's founding years, I find on its pages no mention of any musical works for the magnetic tape medium—whether by Schaeffer or any other composer, European or otherwise. Indeed, articles published within JAMS during its first two decades barely touched music of the nineteenth century, let alone the twentieth century. Charles Seeger's communication to the journal in 1952 offered an excuse of sorts, albeit an unsatisfactory one, when he noted: "Musicology is not the only discipline among the humanities which has long shown lack of interest in time present" (Seeger 1952:67).

The field of music theory, in contrast, whether viewed as a sister or subsidiary of musicology, has traditionally taken greater interest in "time present"—perhaps

necessarily so, as music theory, especially in its prescriptive form, has generally shared a close relationship with the instruction and practice of musical composition. When the *Journal of Music Theory* (JMT) premiered in 1958, a number of studios loosely resembling Schaeffer's Studio d'Essai were emerging at institutions throughout North America. Unlike at JAMS, this coincidence *was* reflected in the pages of JMT, as the electronic music studios at Columbia University, the University of Illinois and the University of Toronto were all profiled within the pages of JMT. During its first decade, JMT published a fair number of articles that describe equipment for such studios, both in terms of their inner mechanisms and musical applications, as well as technical descriptions of the physics of electronic sound. The majority of such articles appearing in the 1960s are framed in terms of "electronic music," although the term "computer music" appears toward the 1970s. The German influence pervades not only in the use of the term "electronic music" over the more francophone term "electroacoustic music" (I will say more on the distinctions between these two terms later), but also in the close relationship between electronic music and serial techniques that pervades in many of the articles. Indeed, the very first article to appear in JMT concerned with this type of music is a review of the English translation of the first two volumes of the German journal *Die Reihe*, respectively devoted to "Electronic Music" and "Anton Webern"; as *Die Reihe* was basically a mouthpiece for the serialist composers working out of the electronic music studio in Cologne, the term "electronic music" here implies the use of serialist techniques. Serial composition was, of course, the overriding aesthetic at many American institutions at the time—especially those perhaps best represented in the pages of JMT, namely Yale, Columbia and Princeton—and thus it is in some ways unremarkable that so

much attention was given to electronic applications of serialist techniques. The articles published in JMT during the 1960s indicate interest in other musical uses for electronic technology as well, such as applications in automation, microtonality and style modeling.

In Appendix A, I present an outline of pertinent articles published in JMT; in so doing, I notice a peak of interest in electroacoustic music in the 1960s, followed by a gradual decline in the 1970s. Meanwhile, *Music Theory Spectrum* (MTS), founded in 1979 and marking the creation of the Society for Music Theory as an entity distinct from the American Musicological Society, has displayed very little interest in Kinkeldey's "music of the future": while numerous articles can be found on computer assisted analysis and instruction (especially for aural skills), there seems to be little specific discussion of music acoustically produced with the aid of electronic equipment as only one article and a few book reviews related to the subject appear in the journal over the first two and a half decades of its existence.

While interest in electronic music in the two major American journals aimed at career music theorists seems to have waned after the 1960s, it has fared better in the journal *Perspectives of New Music* (PNM: founded 1962). Being less a journal of music theory than a journal of open discussion on contemporary music, it publishes a strong base of articles written by or about living composers; its editorial board is chiefly made up of composers and composer-theorists, with a few "pure" theorists added to the mix. This increases the likeliness of finding articles that address issues related to electronic music; indeed, the number of articles pertaining to electronic music published in PNM remains more or less constant from the 1960s through the 1990s, unlike the sharp decline in such articles in the more strictly theory-oriented JMT and MTS.

Why this lack of interest among music theorists in a subject matter that is apparently quite relevant to certain of their contemporary composers? One possible factor to this situation is that electronic music—especially in its early days—requires a technical knowledge outside of that of the traditional musician-theorist; or, at least, this seems to have been the opinion of the editors at JMT, which is perhaps why they felt the need to publish so many articles in the 1960s that dealt with the explanation of acoustic theory and various electronic equipment.[2] This early focus by the music-theory community of so much attention on the particulars of this or that apparatus or piece of software perhaps contributed to the eventual loss of interest in electroacoustic music among music theorists; for, however alluringly technological or novel it might be, such knowledge becomes obsolete very quickly. In any case, most of the discussion of technological aspects of electroacoustic music since the 1960s seems to have been funneled to specialist journals whose general readership are more likely to already possess the requisite background knowledge (and are less likely to be music theorists), such as the *Leonardo Music Journal* (founded in 1968), and the *Computer Music Journal* (founded in 1977).

Another possible factor is the lack of conventional scores for many electronic works. A score is a tangible object, a tactile and visible representation of a specific musical work. Leeman Perkins (2003) has demonstrated that in medieval Europe the emergence of the work-concept—and, by extension, the concept of authorship of a musical work—is closely bound to the development of musical notation. In vocal and instrumental music, a score represents a set of "essential parameters" for the realization of a musical work, drawn up by the composer in order to be brought to sound-life by a

performer. Before the advent of sound recording technology in the latter half of the nineteenth century (with the appearance of Thomas Edison's phonograph and Charles Cros' paléophone in 1877; Gorne 1995), the score was the only archivable record of a musical work, and as a consequence score-reading was the only means by which such a work could be accessed outside of live performance. Indeed, many countries still require composers of electronic works to create some sort of written documentation, often in the form of "aural scores," in order to establish publishing copyright.[3] For many musicians and others in Western culture, the traditional instrumental score-as-work is immutable in the abstract, while the performance-as-work is mutable in the concrete. Even though acousmatic works are more-or-less fixed and therefore immutable even in the concrete, the inherently ephemeral nature of diffusion-realization comes as a great challenge to music analysts and theorists more accustomed to studying with their eyes than their ears. Moreover, as most of the theoretical tools used to analyze works within this repertoire have primarily evolved from—and are therefore tailored to—the study of scores, these tools are geared and graduated for those "essential parameters" notated in the score, with a specific emphasis on pitch organization.

A need among theorists to compensate for the lack of a score is evident in the many efforts to develop a new standardized form of notation for electronic music. One early example is Brian Fennelly's 1967 article in PNM, "A Descriptive Language for the Analysis of Electronic Music," in which he proposes a kind of shorthand that can be combined with traditional musical notation as a means for transcribing electronic works, thereby offering a readable map for analysis. Fennelly's shorthand resembles chemical formulae in its combination of letters and numbers as symbols for predominantly

qualitative descriptions of sound units; super- and subscripts modify the basic formula of timbre X, attack Y and enhancement E (XYE). Using this notation, he represents the opening sound from Bülent Arel's *Fragment* as "$5_{L2}D_a^o0$": a sound with the timbre of white noise ("5") made up of only low frequency components (subscript "L") within a medium-low registral range falling approximately between F#2 [92.499Hz] and A3 [220Hz] (second subscript "2"); an attack envelope with a rapid growth (D) continuing with a steady state (subscript "a") without transients (superscript "o"); and no additional enhancements ("0").

Robert Cogan employed spectral photographs of both instrumental and electronic works in his book *New Images of Musical Sound* (1984), which received favorable reviews in both JMT (Swift 1986) and MTS (Sandell 1990). Cogan's analytical approach using spectral imaging was seen as especially promising for electronic works, as it served as a kind of quantitative notation of such works in terms of frequency spectra, amplitude and time. As I will explore in chapters 3 and 4 of this dissertation, however, questions have been raised regarding the perceptual validity of such quantitative mappings. More recently, French researcher Pierre Couprie (2004) has proposed a new form of notation that combines both quantitative and qualitative sound analysis into a kind of iconic notation system. This iconic method of graphic representation for sound has been incorporated into the Acousmographe software program developed by INA-GRM (the center that evolved from Pierre Schaeffer's Studio d'Essai).

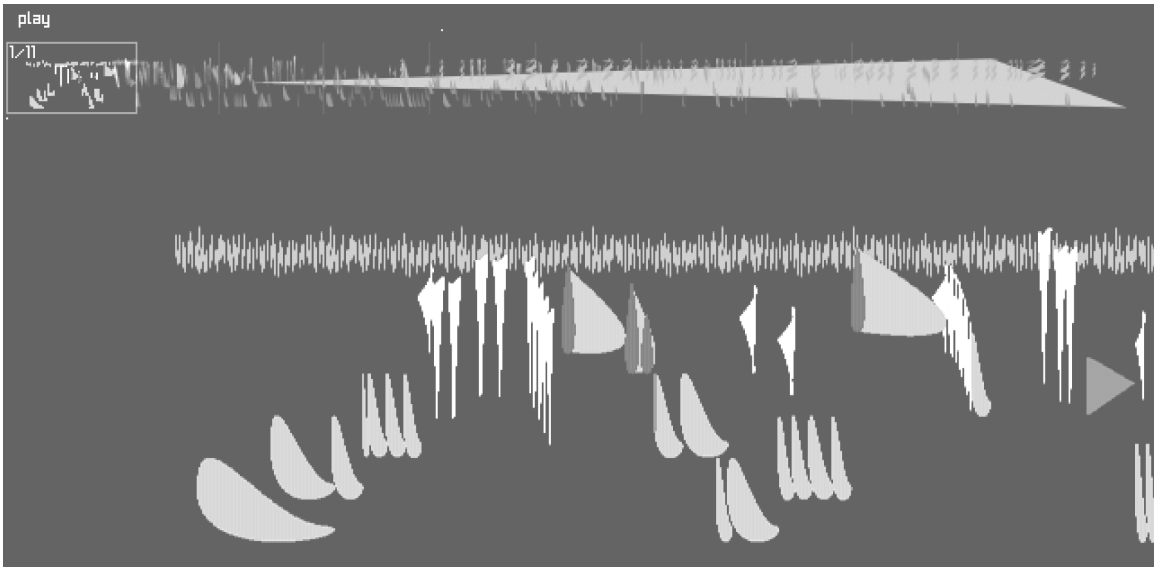

Figure 1.1: Graphical representation of Bernard Parmigiani's *De natura sonorum: Ondes croisées* created using the Acousmographe (INA-GRM 2000: Entendre).

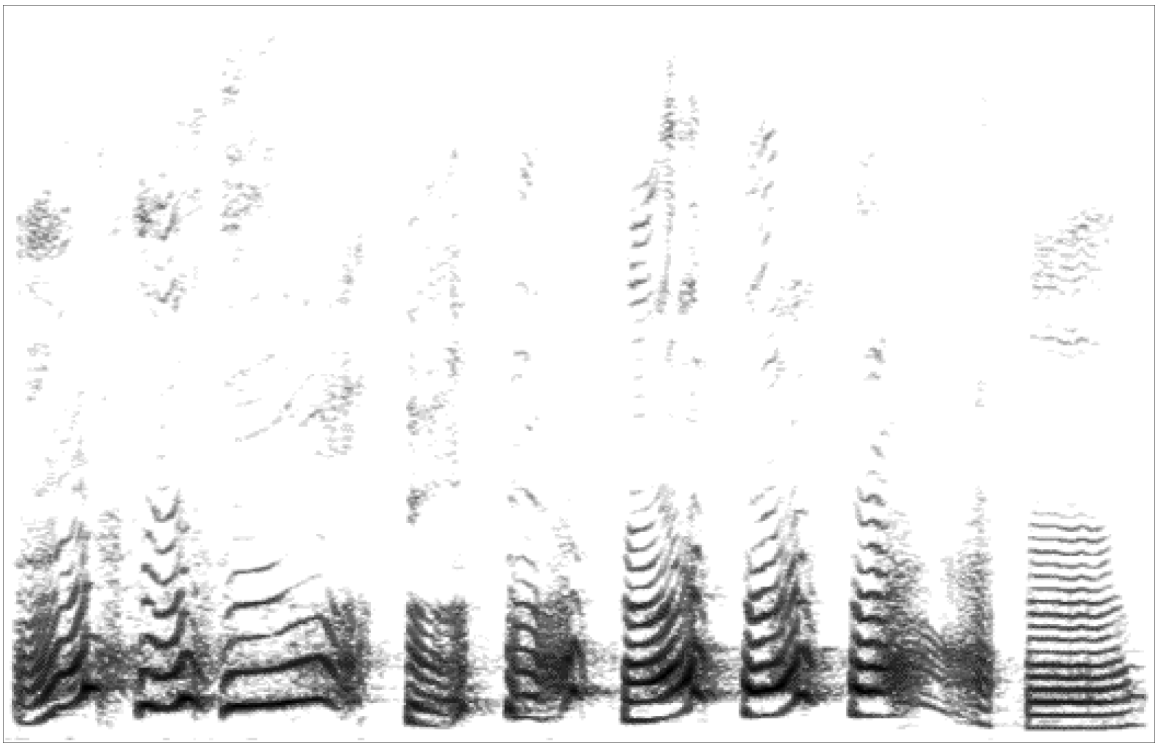

Figure 1.2: Sonogram of a sampled sound (IRCAM 2000: Représentation graphique du son).

As an example of the willingness to accept such visual representations of sound at major centers of research in electroacoustic music, both sonograms and acousmographe notation were presented in the analyses featured on the GRM CD-ROM *la musique*

électroacoustique (2000; see Figure 1.1); sonograms were also used for visual representations of sounds on the IRCAM CD-ROM *10 jeux d'écoute* (2000; see Figure 1.2).

While Fennelly, Cogan and Couprie offer differing approaches to the notation of electronic music, they are similar in their understanding of the problem or deficiency of conventional music notation; that is, they understand the major difference between instrumental and electronic music to be the inability to describe the timbre of sounds through simple means of instrument names in the latter, as well as the additional tendency for electronic music to include sounds of unclear or unspecific pitch, such as white noise.

It does seem that many American theorists—and composers—viewed timbre as the most striking aspect and "new contribution" of electronic (and electroacoustic) music. Most attempts by American theorists to develop a systematic theory of timbre built upon observations by the German physicist Hermann von Helmholtz regarding the relationship between timbre and vowel forments. Such is the case with Cogan's theory of phonology, supported by his "new images," as well as Fritz Winckel's 1963 article in JMT, "The Psycho-Acoustical Analysis of Structures as Applied to Electronic Music," and Wayne Slawson's 1981 MTS article, "The Color of Sound: A Theoretical Study in Musical Timbre."

Slawson seems mainly interested, both in his 1981 article and later in his book *Sound Color* (1985), in developing a systematic theory of timbre that would make it possible to identify discrete "timbres" or, more precisely, timbral *intervals* that can then be ordered and transformed using operators common to serialist compositional techniques

(retrograde, inversion, etc.). In Slawson's theory we find, then, not only a continuance of the type of serialist methodology promoted by both the German-based composers of *elektronische Musik* from the 1950s as well as American composers who were early pioneers in the electronic medium such as Milton Babbitt, but also an example of composer-oriented, as opposed to listener-oriented, theories of music.

Warren Burt recalls how composer Kenneth Gaburo, teaching at the University of California at San Diego in the early 1970s, attempted to get his students to listen to electronic music in terms beyond pitch relations and score study:

> Kenneth had us analyze Charles Dodge's *Changes*. *Changes* is a computer piece which is concerned, on one level, largely with pitch. But Kenneth's analysis assignment was, without transcribing the piece, to analyze it purely in terms of the heard sound. That is, without dealing with an idea of pitch relations in the piece produced by transcription, was there any other way we could penetrate to some sort of essence of the piece? A difficult assignment, which we all expended much energy on, but one which got us listening in ways we might not have done otherwise. (Burt 1995:149)

This quote is taken from an article Burt wrote in which he discusses ten tape pieces by Gaburo; judging from his discussion, Burt's solution to Gaburo's challenge is a combination of identifying sources and studio techniques and speculating on compositional intent based on his personal knowledge of the composer. Burt's approach falls short of advancing a tangible theory for the analysis of tape music in general, aside from the firmly composer-oriented method of asking "how did the composer do that?" with the ulterior motive of discovering "how can *I* do that?" I include mention of it here because Gaburo's challenge demonstrates a recognition of the shortfalls of attempts to account for electroacoustic music and the like using the tools of traditional music theory, and Burt's response to Gaburo's challenge, while privileging the technological, admits by implication that for Burt, at least, a key to understanding these works might be in

exploring how they evoke so-called extra-musical associations in the form of memories and source-hearing.

It is fitting, perhaps, that the bulk of articles concerned with electroacoustic music published in music theory journals lay stress on either qualities of tone color or the use of electronics—two elements to which Kinkeldey called attention in his description of the "music of the future." But what of the emphasis in Kinkeldey's statement given to the so-called autonomy that will be gained by the composer through this "music of the future," and the consequent adjustment that will be necessary to the "consciousness of the hearer" caused by the absence of the intermediary performer?

In Kinkeldey's view, instrumental composers are professionally "dependent" upon performers; without performers, a composer's work could not be heard. Following this reasoning, if composers could compose their sounds directly to a fixed medium like sound film, their work would become immediately audible using some sort of electronic sound projector, therefore eliminating the role of the performer as "intermediary interpreter." Kinkeldey's states that in eliminating the performer, the audience gains a "direct reception" of the work from the composer, which implies a more authentic or "purer" experience of the composer's artistic vision.

Experience has proven, however, that electronic music has lead composers who have chosen that medium not to independence but to substitute their former dependence on performers for a new dependence on a collection of other people. J. K. Randall, in a report on his experiences with the Music IV computer program in the mid-1960s, remarks on his "sudden dependence on the independent and not-so-independent work of others:

composers and theorists, colleagues and students, professional and semi-professional programmers, musicians and musical dabblers" (1965:84).[4] Indeed, it has not been unusual for composers to work collaboratively with technicians and programmers on specific works—such is the norm at institutes such as IRCAM (Born 1995:113; 252–269). While a small group of composers insist on writing their own software programs, presumably to ensure both their independence and the "authenticity" of their compositions, many composers rely on audio software written by others—thus leaving the door open for critics to wonder which aspects of the compositional decision-making were, indeed, made by the composer, and which were enforced by the software program (or, more accurately, the software program designer).[5] Even those composers who choose open-source software programs are susceptible to such questions, as open-source communities are in essence collections of co-dependent creators.[6]

If Kinkeldey's forecast for the autonomy of the composer of "the music of the future" might now be viewed as naïve, what of the question he raised regarding the effect the absence of the performer would have on the "consciousness of the listener"? He asserts that in the case of "music as we now hear it"—that is, live performances of instrumental and vocal music—the performer is "ever present in the consciousness of the hearer." What does this mean, exactly? Is it that the listener is ever conscious of the performer's presence because the performer can be seen? What of live performances where the performing musicians are hidden from the audiences view, as was the case, for example, at certain convents in fifteenth-century Italy (Monson 2004)? Or recordings of instrumental music? Emily Thompson recounts how early audiences—predating

Kinkeldey's statement above—seemed to show little difficulty in making the mental leap between live performance and recordings:

> From 1915 to 1926, the company sponsored Tone Tests, recitals in which phonographic "re-creations" of musicians, as reproduced by the Edison Diamond Disc Phonograph, were compared directly to live performances by those same musicians. In auditoriums and concert halls across the nation, curious crowds gathered to engage in a very public kind of critical listening. Opinions may have varied as to whether or not the Diamond Disc re-creation was truly indistinguishable from the original, but more important, Tone Test audiences universally accepted the premise of comparison. The act of listening to reproductions was implicitly accepted as culturally equivalent to the act of listening to live performers. . . . Tone Tests demonstrated, and perhaps helped bring about, a new willingness to accept these reproductions as an authentic aspect of musical culture. (Thompson 2002:237–38)

The inability to *see* the musicians playing while listening to the sound recording of their performance may have brought some "magic" to the audience's listening experience; however, the audience was still aware of what instruments were being played and the physical (human) effort that went into producing the original sound (especially if the musicians performed the same piece of music live right before or after the recording was played). The audience was then still able to associate the sounds they heard diffused through loudspeakers as being firmly connected to the actions of real people blowing, scraping or tapping on real material objects.

In the case of the nuns singing from behind convent walls, meanwhile, the audience may have either recognized the voices as human, or been willing to believe that the sounds in some way represented the disembodied voices of angels descended from heaven (this may, indeed, have been the whole point). Either way, the voices would have still been recognized as *voices* and therefore understandable as physical phenomena. Prior to the invention of the sound recording and electroacoustic means of sound generation, then, the pipe organ—an instrument, the nuns' voices, also notably associated with

religious ceremony—was perhaps the best example of "mysterious" sound production, even though it clearly required a human keyboardist.

With the mainstream focus within the music-theory community, as I mentioned before, on uncovering pitch structures, there has not been a lot of attention paid to the relationship between musical understanding and the physical presence of the human performer. There are a few notable exceptions to this, of course, such as Suzanne Cusick's article "Feminist Theory, Music Theory, and the Mind/Body Problem" (1994) and Andrew Mead's article "Bodily Hearing: Physiological Metaphors and Musical Understanding" (1999). Nonetheless, the general lack of attention to the impact of the physical presence of the performer on the listener's experience makes it difficult to speculate on the impact of the removal of this element from the musical experience.

But perhaps Kinkeldey meant to imply that a radical change in the listener's consciousness occurs only when visual absence of a performer is combined with new "tone colors" mixed directly by the composer's hand, such that they were not recognizable as reproductions of sounds made by musical instruments, that is, sounds familiar to the audience? Such is the case in so-called *acousmatic* music—a term whose etymology implies a concern with the obscuring of a sound from its physical source, as I will describe in the next chapter.

The object of the study at hand is Kinkeldey's "music of the future"—a music which has been called different names by different people for different purposes. In the next chapter, I explore a few of these names: electroacoustic, electronic, and computer music; *musique concrète* and *elektronische Musik*; tape music and acousmatic music.

How have these terms been defined by different authors? How do different definitions for the same term compare and contrast with each other? What concepts lie behind the usage of differing terminology? These are the types of issues I try to address in chapter 2.

As Kinkeldey seemed most concerned with the aural experience of this music, I investigate theories of listening and ear training in chapters 3 and 4, respectively. More specifically, I devote chapter 3 to the contemplation of theories concerned with distinguishing among different *modes* of listening. These include the writings of Pierre Schaeffer, whom I have already mentioned as an important figure as the founder of *musique concrète*; Denis Smalley, a London-based composer-scholar of electroacoustic music who has built on Schaeffer's theories; and R. Murray Schafer, a Canadian composer and researcher who has been influential with his theories of acoustic ecology and "soundscape" composition. In addition, I draw on the writings of Canadian composer Barry Truax, a colleague of R. Murray Schafer, and American composer Pauline Oliveros, both of whom have worked extensively with electroacoustic music.

In chapter 4, I shift my investigation of musical listening—and the writings of Schaeffer and Schafer—to the perspective of ear training or, as it is called in French, *solfège*. In addition to exploring the ideas that the two previously mentioned authors have on the subject, I review the interactive CD-ROM, *Atelier Ircam: 10 jeux d'écoute* (2000) as a collection of ear training exercises produced by the prominent *Institut de Recherche et Coordination Acoustique/Musique* (IRCAM) in Paris.

In chapter 5, I directly address issues concerned with the musical question of sound and source mentioned in earlier chapters as I discuss notions of mimesis, imitation, representation and gesture in music. Here, I return to the writings of Denis Smalley as I

more fully explore the analogy he draws between different approaches to electroacoustic music composition and the nineteenth-century debates between the relative merits of "absolute" and "program" music.

In chapter 6, I draw on issues raised in previous chapters as I approach three different works from a listener's perspective. The first, Denis Smalley's *Wind Chimes* (1987), serves as a classic example of "acousmatic" music as well as an illustration of Smalley's theories. The second, Hildegard Westerkamp's *Cricket Voice* (1987), presents a slightly different set of considerations with respect to the relationship between sound and source as well as my sense of acoustic space; Westerkamp, like Schafer and Truax, is concerned with issues of acoustic ecology and the concept of the "soundscape." The third piece, Judy Klein's *The Wolves of Bays Mountain* (1998), presents the relationship between sound and source, as well as concern with acoustic space and soundscape, from yet a different perspective.

Finally, I conclude with a summary of the issues and concerns uncovered over the preceding discussions. In this chapter I also propose ways in which my study may serve as a springboard for other areas of exploration connected to the experience of acousmatic works. In addition, I suggest opportunities for investigating how an awareness of issues raised in this study with respect to acousmatic works might also allow for fresh perspectives in the analysis of other forms of contemporary music.

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[1] Actually, the French radio station did not officially receive the title "Radiodiffusion Française" (RDF) until 1945. With the advent of television, the French national broadcasting agency was renamed in 1949 to "Radiodiffusion Télévision Française" (RTF) and again in 1964 to "Office de la Radio et de la Télévision Française" (ORTF). The agency was split into seven institutions in the mid-1970s, and Pierre Schaeffer's studio, now called the "Groupe de Recherches Musicales" (GRM) was housed within the "Institut National de l'Audiovisuel" (INA), where it remains to this day.

[2] This emphasis might have also been a means to avoid within American music theory the foibles found in discussions of electronic music in *Die Riehe*; as mentioned above, this volume was the subject of review in

early issues of both JMT and PNM, and both review authors harshly criticized the excessive jargonism and inaccurate use of technological terminology it contained (Helms 1959; Backus 1962).

[3] Of course, mechanical copyright is established through a recording. Publishing copyright is needed to prevent other people from re-creating (or reverse engineering) an electroacoustic work using new samples, etc., and calling it their own.

[4] Randall's notion of "musical dabblers" warrants comment; however, I will refrain from walking down that path at this time.

[5] For example, does the composer use the sampled and synthesized sounds preset with the program or make her own? Does the way the software is set up favor certain operations over others—that is, do the software's graphical user interface (GUI), input mode or other parameters suggest certain compositional strategies over others?

[6] The continuing interest in incorporating live performance through the use of live electronics, real-time sound processing and interactive technology suggests that some composers—despite their commitment to using the "new technologies" offered by electronics and computing—are not interested in the total control offered by such complete "independence."

Chapter 2: Classifications and Definitions

The *Oxford English Dictionary* offers one definition of "theory" as a "[s]ystematic conception or statement of the principles of something"[1]; theoretical enterprise, then, is closely associated with the formulation of concepts and definitions. Often, in Western thought, theories of something may be born of an impulse for classification: to compare and contrast, group and separate, distinguish and differentiate. With classification also comes hierarchization, as things or concepts are grouped and subdivided.

One means for classifying Western art music has been according to the perceived body of origin for each musical type. This practice dates at least as far back as Boethius who, writing in the sixth century AD, classified music into three categories: *musica mundana*, *musica humana*, and *musica instrumentalis*. The first of these, *musica mundana*, defined the harmony of the cosmos; *musica humana* defined the harmony of the human body and spirit; and *musica instrumentalis* defined the harmony of musical instruments, including the voice (in this way, only the last category refers to music as a sounding product of human culture). Theodoricus de Campo, writing in the fourteenth century, renamed Boethius' *musica instrumentalis* as *musica artificialis*, or "artificial music," which he further subdivided into vocal music and instrumental music.[2] By the fifteenth century, Johanan Alemanno recast the three categories of music into *theoretical*, *natural* and *artificial*. Here, "artificial" refers to instrumental music while "natural" refers to vocal music.[3]

I will say more about the definitions for these early classifications of music in chapter four; I mention them here mainly to point out the long tradition of defining categories for the classification of music in the name of music theory, and how the names

and definitions of these categories seem to mutate, however subtly, from author to author. In this chapter, I will explore differing definitions for terms used to classify certain musical works that employ sound recording technology during the compositional process. There are many possible reasons for the differences among these varying categories and definitions used by the authors I reference, such as different times, places and languages of writing. Such situational differences, however, are in essence factors of cultural difference, revealing differences in aesthetic valuation—bordering perhaps at times on the political (?)—among the different authors, even when these authors may appear at the surface to be talking about the same things.

Electroacoustic, Electronic, and Computer Music

The terms "electroacoustic" (sometimes hyphenated as "electro-acoustic"), "electronic" and "computer" are often employed interchangeably as adjective qualifiers of music. At times the distinctions among these three terms might seem clear, especially with respect to individual compositions; but at other times they appear more nebulous, particularly when the person using the terms tries to arrange them into some sort of hierarchical relationship with one another. The tendency among composers and scholars to display a preference for one of these terms over the other two generally reveals an underlying affinity toward an associated field of scientific investigation, that is, electroacoustics, electronics, or computer programming, respectively. To elaborate on this point, I first turn to potentially conflicting definitions of these terms from four different sources.

The New Media Dictionary was a project undertaken by the Groupe de recherche en arts médiatiques at the Université de Québec à Montréal (UQAM). Francis Dhomont and Robert Normandeau—both Montreal-based composers with strong ties to the GRM[4]

in Paris—were among the group members who prepared definitions for music-related terms. They offer the following definition of the term "electroacoustic music":[5]

> ELECTROACOUSTIC MUSIC—Generally adopted in the late 1950s to refer broadly to electronic music or musique concrète pieces, techniques that finally merged. . . . Composers of electroacoustic music use as their raw material sounds of concrete origin (recorded by microphones) or sounds that are produced electronically (using an oscillator) and stored in any type of medium. These "sound" components are then subjected to various alterations by the composer. . . . Electroacoustic music for concerts is specifically designed to be broadcast over a varying number of speakers in sundry configurations. (Poissant 2001:161)

Already within this definition is an implied hierarchy with respect to the relationship between electroacoustic and electronic music—namely, that the latter is a sub-genre of the former. It seems somewhat paradoxical, then, to note that the authors define electroacoustic music as being created from sounds "stored in any type of medium," thus precluding music performed live on electronic instruments such as the Buchla or Moog synthesizer; do the authors not consider such music to be "electronic"? They offer the following definition for that term:

> ELECTRONIC MUSIC—Originally, music whose content was not pre-recorded, but was obtained solely through synthetic means using electronic oscillators that produce waveforms, white noise generators, filters and ring modulators. Such content was then recorded on tape and manipulated in complex ways, as noted by Herbert Eimert . . . In 1953, German composer Karlheinz Stockhausen produced his first work of electronic music, entitled *Étude 1*, for sinusoidal sounds. . . . Today, synthesizers, wavetables and computers have replaced primitive oscillators, making it possible to create much more complex sounds and textures, qualities seriously lacking in the first works produced in this genre. (261–62)

The first sentence of the definition, beginning with the word "originally," sets up an expectation for the final sentence beginning with "today." What has changed in electronic music between "originally" and "today"? "Originally, . . . [electronic music] was obtained solely through synthetic means"—does this part of the definition change for the authors

"today"? No. For the authors, the difference between electronic music then and now is that "primitive oscillators" have been replaced by more sophisticated "synthesizers, wavetables and computers"—all still synthetic means of generating sounds. In this way, the authors carry on the traditional distinction between the uses of "concrete" and "electronic" sound material used in musical composition. Their mention of Herbert Eimert and Karlheinz Stockhausen reinforces this understanding, although they do not make reference to the importance of serial techniques in the historical genre of *elektronische Musik*. The authors write that "such content was then recorded on tape"—using the past-tense "was," allowing the reader to wonder whether the practice "today" might be somewhat different. However, no mention is made to this part of early practice in the "today" clause. It remains unclear, then, whether this definition requires electronic music to be composed with sounds "stored in any type of medium" rather than generated live in performance. Clarification does arrive finally, a little further down the alphabet with the following dictionary entry:

> LIVE ELECTRONIC MUSIC—The live presentation of a musical work. It can combine any of the following: prerecorded sound elements on any type [of] medium; electroacoustic and digital manipulations in real time; performance of written scores and improvisation for voice, acoustical and electrical instruments involving any number of performers. Live electronic music does not refer to any specific technique or method of composition. (162)

Comparing the above definitions for "electronic music" and "live electronic music," it is clear that the authors in this case understand the former as existing primarily in recorded form—that is, non-performance related—and linked historically to the *elektronische Musik* of the 1950s, while the latter covers all types of musical performance involving electronics—that is, music realized in real time by performers playing electronic instruments.

The New Media Dictionary is a joint effort among various artists and art scholars working within the field of "the new media" (that is, digital technology), not just musicians, and is therefore not targeted solely at a specialized musicological audience. Indeed, its English translation was published in installments of *Leonardo: Journal of the International Society for the Arts, Sciences and Technology*—hardly a core journal of the musicological community. For the sake of comparison, then, I turn to the entry for "electro-acoustic music" in the *New Grove Online* (electronic full-text version of *The New Grove's Dictionary of Music and Musicians*).

This entry was written by Simon Emmerson and Denis Smalley, both London-based composers, who—like Dhomont and Normandeau above—have ties to the GRM in Paris, especially Smalley. Within their discussion of "electro-acoustic music," Smalley and Emmerson draw a similar distinction between "electronic music" and "live electronic music," although they would seem to prefer not to use the term "electronic music" at all. In their discussion of terminology associated with electroacoustic music, they write: "To confuse matters, as studios spread 'electronic music' lost its specialized German connotations and in many countries came to be synonymous with 'electro-acoustic music' as a collective term for all approaches to the medium. 'Electro-acoustic' gradually became the dominant term, although 'electronic' is still in use."[6] Indeed, under the entry for "electronic music" in the *New Grove Online* is simply written, "See *electro-acoustic music*."[7]

Consensus regarding the use of the terms seems to have been reached here among the authors for the above entries in both the New Media Dictionary and *New Grove Online* that the term "electronic music" should be reserved as an English translation of

the historical term *elektronische Musik*, with all the implied technical and aesthetic restrictions of its meaning. It seems odd, then, that the definitions above from the New Media Dictionary were published in *Leonardo* in an installment entitled "Dictionary Terms—Part III: Electronic Music." This title certainly seems in conflict with the definitions of the terms it assumes to circumscribe, which leads one to wonder whether it was the editors of *Leonardo* rather than the authors of the definitions who chose it.

I suggest that perhaps the term "electronic music" was chosen by the editors of *Leonardo* because the editorial headquarters of the journal are in the United States, and it is particularly in this country that the term "electronic music" is more commonly used as the more general term, despite Emmerson and Smalley's assertion that "electroacoustic" is dominant. Joel Chadabe, composer and president of the Electronic Music Foundation (based in New York State) offers his own interpretation of the terms "electroacoustic music," "electronic music," and "computer music" in his book *Electric Sound:*

> Electronic music includes all music made with electronics, whether specifically with computer, synthesizer, or any other special equipment. I view the use of the term in much the same way that we'd use the term *orchestral music*, for example, to designate music played by an orchestra. Among other terms in current use, *computer music* too specifically connotes music made with general-purpose computers, . . . and *electroacoustic music* suggests, at least to me, systems that combine electronic and acoustic sound generators. Electronic music, to my way of thinking, is the generic term, even if in Germany it may cause confusion with *elektronische Musik*, which refers specifically to the philosophy of the Cologne studio in the early 1950s. (Chadabe 1997:x)

Chadabe acknowledges the potential for confusion between his contemporary usage of the term "electronic music" and its original, more limited meaning as a translation of *elektronische Musik*. It should be recognized at this point that Chadabe's understanding of the term "electroacoustic music" is not radically different from that in the New Media Dictionary or *New Grove Online*. Moreover, as Emmerson and Smalley

admit in the latter, "[i]n Paris towards the end of the 1950s 'electro-acoustic music' was promoted as a better term for representing the cohabitation of the *concrète* and electronic approaches to sounds. At this stage, however, 'electro-acoustic' referred only to music on tape."[8] Thus both terms, "electroacoustic music" and "electronic music," had narrowly defined meanings in their early usage in the 1950s that have, to a varying extent in different circles, eroded to embrace a wider variety of activities. The disagreement on the contemporary definition of both terms among established composers and scholars in the field has unfortunately led to confusion among younger practitioners. For example, in a published review of Chadabe's book, Douglas Geers offers the following definitions:

> Today, several terms are used to describe sub-genres of the field I am calling "computer music." These include *electro-acoustic music* (which implies the participation of live instrumentalists), . . . *computer music* (which to some aficionados indicates tape music without live performers, but which can be understood more generally—as I do in this review—as any music in which the computer takes on a primary role in the composition or performance) . . . Technically, all of these computer music genres are sub-genres of electronic music (which also includes pieces that employ non-computerized electronic devices for music making). (Geers 2001:124)

Geers' implied definition for electronic music appears to follow that of Chadabe. His definition for "electro-acoustic music," however, mutates Chadabe's "systems that combine electronic and acoustic sound generators"—in accordance with the 1950s usage to denote works that combine pre-recorded "concrete" and electronically synthesized sounds—into works that involve "the participation of live instrumentalists." Here, Geers probably confused "acoustic sound generators" with acoustic instruments—thus the need for "live instrumentalists"—and thereby displays a lack of awareness of the history of the term "electroacoustic music" as discussed above.

Geers' list of definitions calls attention to the term "computer music," which I have up to now ignored. The New Media Dictionary does not list the term. *New Grove Online* provides a discussion of the use of the computer as a tool for music composition under the rubric "computers and music" rather than "computer music." Emmerson and Smalley mention the term in their discussion of "electro-acoustic music," although their explanation of the term is more implied than defined: "'Computer music' entered the vocabulary when the computer became a significant compositional tool . . . The earliest computer music studios were distinct from (analogue) electronic music studios. Today all electro-acoustic music may be regarded as computer music, and although 'computer' may not fully represent the technological means employed, the term continues to be widely used." Their definition of the term would seem compatible with Geers'—although they stop short of claiming electroacoustic music as a sub-genre of computer music, as Geers asserts.

Perhaps one source of confusion in the above definitions is the implicit need the authors seem to feel to enforce some sort of superior hierarchical status of one term over the others among the three terms "electroacoustic music," "electronic music," and "computer music." Geers goes so far as to posit a three-tiered hierarchy, subsuming "electroacoustic music" under "computer music," and "computer music" in turn under "electronic music." In contrast, Emmerson and Smalley refer to the terms "electronic music" and "computer music" as surrogates for what they consider to be the preferred term "electro-acoustic music." The authors of the New Media Dictionary restrict the definition of "electronic music" to its 1950s usage in order to have "electroacoustic music" reign as the more general term, while Chadabe does the reverse in favor of

"electronic music." In the process, all of the authors focus primarily on the technologies involved as a means of defining these terms, rather than making any explicit references to the aesthetic tendencies these terms might imply. Yet it is the aesthetic tendencies implied by each of these terms that fuel the drive for those within the field to prefer one term to the other.[9]

Emmerson and Smalley open their discussion of electro-acoustic music by defining the term as "[m]usic in which electronic technology, now primarily computer-based, is used to access, generate, explore and configure sound materials, and in which loudspeakers are the prime medium of transmission." Such a broad definition, with an emphasis on the technologies employed as the delineating factor, could stretch to embrace most music today, at least with respect to how most music is experienced (or consumed) in the twenty-first century. This definition also gives a nod to the other two terms at the very beginning, in mentioning the use of "*electronic* technology" that is "now primarily *computer*-based"—this seems to suggest that such music could perhaps indeed equally fall under the rubric of "electronic music" or "computer music." The underlying justification for the authors' preference of the term "electro-acoustic" might be less immediately obvious; however, it is present in the very last clause of the definition, in the subtle suggestion that in such music "loudspeakers are the prime medium of transmission."

Surely, loudspeakers are equally necessary for the aural transmission of electronic or computer music, but neither Chadabe nor Geers mention them in their definitions for these terms. The authors of the New Media Dictionary, however, are even more specific about the role of loudspeakers, saying "[e]lectroacoustic music for concerts is specifically

designed to be broadcast over a varying number of speakers in sundry configurations." This implies that something about electroacoustic music might serve to exploit the use of loudspeakers—at least in terms of their number and arrangement within a space. In an entry in the New Media Dictionary for the term "electroacoustics" (considered separately from "electroacoustic music"), the authors write "[c]ombining acoustics and electronics, electroacoustics is the study of the transformation of a sound wave into an electrical signal and vice versa; the treatment of sound waves by electronic means; the recording of sound waves; and the reproduction and deferred transmission of sound waves. Microphones and speakers are transducers located at each end of the link of this process" (Poissant 2001:261). This further places an emphasis on the role of loudspeakers, as well as microphones, within the concept of electroacoustics—and, by extension, electroacoustic music.

Chadabe defines electronic music as "all music made with electronics," elaborating that the term should be understood in "the same way that we'd use the term *orchestral music* . . . to designate music played by an orchestra." With his emphasis on the use of electronics in *making* and *playing* music, Chadabe privileges the role of electronic sound generators, granting them instrument status alongside that of orchestral instruments. The term "electronic music," then, places an emphasis on the role of instrument building; this, by extension, implies an aspiration toward live performance, which perhaps explains the preference in both the New Media Dictionary and *New Groves* for the qualified term "live electronic music."

The preference for "electronic music" as the more general term is particularly strong in the United States, where the association between music studios and electronic

instrument building has also been particularly strong. The historic Columbia-Princeton Electronic Music Center (CPEMC), for example, is in many minds closely associated with composer Milton Babbitt's use of the RCA Mark II synthesizer in the 1960s. A slightly different type of relationship exists between the Center for Computer Research in Music and Acoustics (CCRMA) at Stanford University and the commercially successful Yamaha DX-7 synthesizer series of the 1980s: the DX-7 incorporated an FM synthesis technique patented by CCRMA's founding director, composer John Chowning, and royalties from Chowning's licensing agreement with Yamaha helped fuel the center's growth (Chadabe 1997:117–18).

In more recent years, with the advent of personal computing, electronic instrument building has taken a back seat to software development and interface design. Chadabe's definition of "computer music" as "music made with *general-purpose computers*" (emphasis added), while perhaps a pertinent distinction in the 1970s and 80s, has lost some of its meaning in the twenty-first century. Geers' initial definition of the term as "tape music without live performers" is puzzling, given that he defines tape music as "any piece in which the final form of the piece consists entirely of prerecorded audio" (124)—a description that already precludes the participation of live performers, thus rendering redundant the qualification "tape music without live performers."

The second definition he offers, that of "any music in which the computer takes on a primary role in the composition or performance," is more helpful, although it requires some interpretation to fill in the conceptual blanks. What would be the motivation for having a computer take on such a "primary role"? The computer is classically associated with mathematical modeling and data processing, thus classic

computer music is associated with compositional approaches such as algorithmic composition, style modeling, and data sonification. More recently, however, as computers have become synonymous with digital technology in general, the concept of computer music has expanded to include possibly any music composed or rendered using digital audio technology—including sound editors, mixers, sequencers and a myriad of other audio software.

Thus the terms "electroacoustic music," "electronic music," and "computer music," might best be thought of as different conceptual filters for talking *about* music, rather than categorically different types of music. A scholar investigating a specific works in terms of electroacoustic music may be more apt to write about the acoustic properties of sound materials and their diffusion through space; another scholar speaking about the same work in terms of electronic music would tend to focus more on the electric instruments or hardware used to create the piece; while yet another scholar may talk about the same work in terms of computer music, placing emphasis on the programming language or software used in its creation. All three analytical approaches are equally valid, and the fullest understanding of a work might include aspects of all three, although some works might lend themselves more readily to one or two of the approaches than the other.

Musique concrète versus elektronische Musik

The above discussion mentions other musical terminology that may or may not be familiar to the reader. Two of those—*musique concrète* and *elektronische Musik*—refer to historical idioms and are therefore rather easily explained. The term *musique concrète*, associated with the work of Pierre Schaeffer in the late-1940s and '50s, refers to music

composed entirely of pre-recorded sound material. Schaeffer was interested in exploring the musical qualities of everyday sounds—inspired in part by his work as a sound-effects engineer for a French radio station. The pre-recorded sounds were then manipulated and combined using a restricted set of techniques available at the time.

Especially in the 1950s, *Musique concrète* stood in a kind of opposition to *elektronische Musik*—the latter associated with Herbert Eimert and others working out of a studio within a radio station in Cologne. Eimert and his crew constructed sounds from sine waves generated by electronic oscillators. Most accounts of *musique concrète* and *elektronische Musik* usually stop at this point, differentiating between the two by placing an emphasis purely on the source materials used. However, such accounts tend to miss what I believe to be the more fundamental ideological differences in compositional approach between the two genres, particularly when they gloss over Eimert's use of additive synthesis as a means of applying serialist techniques at the most atomic level of musical composition. I reinterpret the difference between *musique concrète* and *elektronische Musik*, then, in terms of ideology concerned with compositional activity. In *musique concrète* the composer begins with the concrete (sound) and works toward the abstract (structure), while in *elektronische Musik* the composer begins with the abstract (structure) and works toward the concrete (sound). That is, in *musique concrète*, the role of the composer is to extract sound objects from the real world and then systematically classify the objects to construct new sound worlds for musical composition; while in *elektronische Musik*, the role of the composer is to be actively involved in the construction of the sound object itself, striving for the utmost precision, as humanly and mechanically possible, in defining that object.

There may well have been aesthetic reasons to segregate the use of pre-recorded acoustically generated sounds from electronically generated sounds in the early days. Listening to early works of *musique concrète* and *elektronische Musik* reveals what I might call a fuzzier sound quality to the former and a more sterile sound quality to the former—showing the limitations at that time of microphone and recording technology on the one hand, and sound synthesis techniques on the other. Awareness of this difference in sound quality is echoed in the New Media Dictionary entry for "electronic music," when the authors mention the possibility today "to create much more complex sounds and textures, qualities seriously lacking in the first works produced in the genre" (Poissant 2001:262). As technology advanced to allow for "cleaner" recordings and more complex synthesis techniques, the need to choose between acoustically or electronically generated sound material became less of an issue. The ideological differences underlying the divide between *musique concrète* and *elektronische Musik*, which perhaps reflect opposing viewpoints on compositional methodology in general within the world of Western art music, have both continued and merged in various strands.

Tape Music and Acousmatic Music

The term *tape music*, unlike *musique concrète* and *elektronische Musik*, derives from the medium on which the music was stored rather than the means by which the sound material were generated—that is, magnetic tape. The origins of the term can be traced to the activities of New York-based composer Vladimir Ussachevsky, who began experimenting creatively with tape recorders in 1951. Ussachevsky used both acoustically and electronically generated sounds recorded and manipulated on tape in his compositions. His use of electronically generated sounds differed somewhat from that of

elektronische Musik in that he did not incorporate serialist techniques in his use of oscillators. His use of acoustically generated sound materials also differed somewhat from that of *musique concrète*: in addition to everyday "noise" as sound material, Ussachevsky would freely use conventional musical instruments as sound sources—this differs from Schaeffer's handling of instrumental sounds, which he would chiefly use only in altered form, either by "preparing" the instrument at the time of recording (as with the "prepared" piano) or using tape editing techniques to obscure the source's identity in production. Also, while Schaeffer generally restricted his use of such instruments to recordings of single tones for the creation of discrete "sound objects" (a term I will discuss in the following chapter), Ussachevsky was not opposed to recording performances of entire passages of instrumental music as source material—as evident in his *Piece for Tape Recorder* (1956) which contains two instances of what sounds like sped up recordings of musical excerpts played on the piano.[10]

On the selection of source sound material, Ussachevsky writes that "a sound is often chosen not for what it is but rather for what it will become through electronic modification" (1960:202). Whether, by "what [a sound] is," he was referring to the identity of the sound source (that is, physical object or event) or the acoustical properties of the raw (pre-processed) sound is here left open to interpretation. If the former, then his approach might be considered similar in ideology—at least in one respect—to that of Schaeffer. While composers of *musique concrète* sought to create structure from sound events and *elektronische Musik* sought to create sound events from structure, Ussachevsky encouraged composers of tape music to approach their work from both sides: "An intricate interrelation exists between an abstract formal concept which a

composer might have formed about his forthcoming composition and the manner of developing his raw sound material. There can be a decided interaction between the two which makes itself felt through all the early experimental stages" (206).

Ussachevsky and others who have written on the topic of tape music tend to present any aesthetic valuations in the form of advice from a more experienced composer, rather than that of an overriding theoretical doctrine. This reinforces the idea that it is the tape medium more than anything else that determines a work's classification as tape music. A slight shift in the meaning of the term has, however, occurred over the years. Writing in 1980, Robert Morris associates tape music with the use of tape recorders (as opposed to the use of synthesizers or computers) and, by extension, tape-editing techniques, during the compositional process (1980:337). More recently, Emmerson and Smalley define "tape music" as music that "in its final form is recorded on magnetic tape"[11]—dropping the role of tape techniques during the compositional process. Geers drops the physical requirement of tape altogether, defining tape music as "any piece in which the final form of the piece consists entirely of prerecorded audio on tape, CD or other media" (2001:124).

Emmerson and Smalley suggest that use of the term "tape music" is decreasing "now that tape (analog or digital) is no longer the only final storage medium," thus implying the term should be relegated historic status along with *musique concrète* and *elektronische Musik*. Instead of "tape music," they use the term "acousmatic music," which for them denotes music that is "intended for loudspeaker listening and exists only in recorded form (tape, compact disc, computer storage)."[12] They explain the etymology of the term as follows:

> The word ‘acousmatic’ refers to the *akusmatikoi*, pupils of Pythagoras who, so that they might better concentrate on his teachings, were required to sit in absolute silence while they listened to their master speak, hidden from view behind a screen. In a radio talk in 1955 the French writer Jérôme Peignot used the expression ‘bruit acousmatique’ to describe the separation of a sound from its origins as encountered in *musique concrète*. Schaeffer in his *Traité des objets musicaux* (1966) compared the role of the tape recorder to the screen of Pythagoras, emphasizing the concentrated listening facilitated when working in the studio with sound recorded on tape: repeated listening encouraged a better appreciation of the detailed abstract attributes of sounds. In 1974 the composer François Bayle, head of the Groupe de Recherches Musicales, suggested adopting the term as more suitable than ‘electro-acoustic music’ for representing the special conditions of listening to music on tape.[13]

As evident from this description, the term "acousmatic music" was first used within the GRM studio in Paris; as it continues to be most widely used among those with connections to the GRM, others have inferred within the term an aesthetic doctrine associated with Schaeffer's *musique concrète*—even though Emmerson and Smalley define the term to be more or less synonymous with tape music. For example, Geers interprets the term as music "which usually is tape music that involves highly processed samples of non-instrumental sounds" (2001:124). Although Joel Chadabe does not use the term "acousmatic music" anywhere in his book, in keeping with his emphasis on instruments he does mention the *Acousmonium*, an instrument created by GRM composer François Bayle that was in essence "a loudspeaker orchestra created specifically for playing tapes. The Acousmonium consisted of eighty loudspeakers of various sizes placed across a stage at different heights and distances from the proscenium" (1997:68). Interestingly, the definition for "acousmatic music" offered by the New Media Dictionary—whose authors have close ties with the GRM—also refers obliquely to this instrument: "Acousmatic compositions are created on a physical medium (a tape or some other analog or digital medium), just as a cinema is on film, and are meant to be

circulated (projected) *through an orchestra of loudspeakers*, without any real-time instrumental or vocal contribution" (Poissant 2001:261; emphasis added).

Putting aside for now the issue of the kind of loudspeaker array for which acousmatic music is allegedly intended, Emmerson and Smalley do call attention to two aesthetic tendencies within the genre:

> The more 'abstract' approach is concerned with developing discourses of sound types and timbres; the other favours recognizable 'real-world' sounds (including other music), a more radiophonic approach, which can border on the documentary, and is sometimes referred to as 'anecdotal' music. However, the two tendencies can merge and should not necessarily be regarded as polarized. The argument as to whether anecdotal music is inferior to more abstract music is a continuation of the debates concerning the merits of programme music.[14]

Reading this quotation, I wonder why Emmerson and Smalley felt the need to add that final sentence, which implies by suggestion that so-called anecdotal music (a term most closely associated with the music of Luc Ferrari) might in some way be "inferior"—whatever that might mean—to so-called abstract music. From the above descriptions, I would presume that Smalley would classify his own acousmatic compositions as 'abstract' music. This re-awakening of the debates over absolute versus program music from the late-nineteenth century, together with the hegemonic implication that one type of music may be inherently superior to another, betrays an underlying desire on behalf of the authors to portray acousmatic music—and electroacoustic music in general—as directly descended from and therefore laying claim to the tradition of Western art music.

The above discussion serves not only to clarify the usage of different terminology associated with what I will call acousmatic music, but also to introduce some of the issues that have apparently been of concern for composers who work within the medium.

In the next chapter, I will begin exploring some of those issues as they relate to different ways of qualifying the act or process of listening. Specifically, I will investigate theories of listening posited by two theorists already mentioned in this chapter—namely, Pierre Schaeffer and Denis Smalley—as well as thoughts on the relationship between modes of listening and electroacoustic technology presented by R. Murray Schafer, who has been influential in the field of acoustic ecology and so-called soundscape composition.

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[1] "Theory §5," *Oxford English Dictionary*, Second Edition. Oxford: Oxford University Press (1989).

[2] Bruno Nettl: "Music §III: The concept in scholarship, 6. Classification," *Grove Music Online* ed. L. Macy (Accessed 16 November 2005), <http://www.grovemusic.com.arugula.cc.columbia.edu:2048>

[3] Or poetry. Don Harrán, "Alemanno [Alemann], Johanan," *Grove Music* Online, ed. L. Macy (Accessed 17 November 2005), <http://www.grovemusic.com.arugula.cc.columbia.edu:2048>

A similar use of the terms "natural" and "artificial" to distinguish between vocal and instrumental music was also made by the philosopher al-Fārābī writing in the tenth century; see "Musica §4" in *The Harvard Dictionary of Music*, Fourth Edition, edited by Don Michael Randel. Cambridge, MA: The Belknap Press of Harvard University (2003).

[4] *Groupe de Recherches Musicales*, as identified in Chapter 1.

[5] The dictionary was originally published in French—in both book and online format—and later translated in installments into English for publication in the journal *Leonardo*. Apart from a few added comments for clarity, the English definitions in *Leonardo* vary minimally from their French online counterparts. See the *Dictionnaire des Art Médiatiques* <http://www.comm.uqam.ca/GRAM/Accueil.html>.

[6] Emmerson, Simon and Denis Smalley: "Electro-acoustic music," *Grove Music Online* ed. L. Macy (accessed 12 July 2005), <http://www.grovemusic.com.mizuna.cc.columbia.edu:2048>

[7] "Electronic music" *Grove Music Online* ed. L. Macy (accessed 12 July 2005), <http://www.grovemusic.com.mizuna.cc.columbia.edu:2048>.

The entry for "Electronic music" in *The Harvard Dictionary of Music* (edited by Don Michael Randel. Cambridge, MA: The Belknap Press of Harvard University Press, 2003) similarly defers to the entry for "Electro-acoustic music" within the same volume.

[8] Emmerson, Simon and Denis Smalley: "Electro-acoustic music. §2.Terminology," *Grove Music Online* ed. L. Macy (accessed 12 July 2005), <http://www.grovemusic.com.mizuna.cc.columbia.edu:2048>

[9] More overtly politico-linguistic concerns may also be factors in the preference for one term over the other among certain peer groups. For example, McEvilly (1999) suggests that many English-speakers, especially within the U.S., find the term "electro-acoustic" to have elitist connotations, most likely because of its French origins. He draws similar conclusions from the American preference for the term "tape music" over "acousmatic music."

[10] These occur in the work approximately between timepoints 1:40–1:58 and 2:33–2:50 (measured in minutes and seconds).

[11] Emmerson, Simon and Denis Smalley: "Electro-acoustic music. §2.Terminology," *Grove Music Online* ed. L. Macy (accessed 12 July 2005), <http://www.grovemusic.com.mizuna.cc.columbia.edu:2048>.

[12] Ibid.

[13] Emmerson, Simon and Denis Smalley: "Electro-acoustic music. §3.Acousmatic music," *Grove Music Online* ed. L. Macy (accessed 12 July 2005), <http://www.grovemusic.com.mizuna.cc.columbia.edu:2048>

[14] Ibid.

Chapter 3: Modes of Listening

Having investigated in the previous chapter different definitions and classifications for music specifically associated with audio technology, I address my attention to one such classification, that of acousmatic music. Acousmatic music, by Emmerson and Smalley's definition, places emphasis on the listening experience by drawing a metaphorical curtain between the listener and the sources of the musical sounds. With all visual cues absent, the listener is allegedly able to better concentrate on different aspects of sound; this higher concentration may in turn call the listener's attention to the actual act and process of listening. In this chapter I reflect on the concept and process of listening by investigating the different ways in which various composers of acousmatic works have dissected the notion of listening into different modes or functions. I will begin by reviewing more general reflections on listening by Pauline Oliveros and Barry Truax, followed by a more in-depth exploration of the *quatre écoutes* distinguished by Pierre Schaeffer, the three "listening relationships" posited by Denis Smalley, and the two types of musical listening by R. Murray Schafer.

Listening Attention

For both Pauline Oliveros and Barry Truax, the act of listening is bound with the concept of *attention*. Oliveros, in her paper "Quantum Listening: From Practice to Theory (To Practice Practice)," differentiates between *hearing* and *listening* by claiming the former as an involuntary act associated with the unconscious and the latter as a voluntary act associated with the conscious. She states that "[l]istening actively directs one's attention to what is heard" and that "[w]e interpret what we hear according to the way we listen" (1999:6). According to this view, hearing is characterized more in terms of the

physiological and objective, while listening is characterized more in terms of the psychological and subjective. Hearing might be thought of in this way as an unselective process of gathering data from the world around us, while listening is a selective process that seeks meaning in that world. Having defined listening as voluntary and attentive, Oliveros identifies two types of listening—focal and global—specifically in terms of attention. For her, focal listening draws attention to a singular sound, while global listening involves a more general attention to a field of sounds.[1]

Barry Truax speaks in terms of the *significance* of a sound for the listener as a means for distinguishing among his three levels of listening attention: "listening in search," "listening in readiness," and "background listening." While Oliveros characterized listening as a direction of attention to something heard, Truax's first level of listening attention, in effect, reverses this process into an active search for something to hear, or a search to hear a specific something; Truax characterizes this level of listening attention as being when "listening is at its most active, involving a conscious search of the environment for cues." At this level of attention, then, the listener is actively searching for a particular sound that bears some sort of pertinent meaning. Truax's second level of listening attention is "an intermediate kind of listening . . . in which the attention is in readiness to receive significant information, but where the focus of one's attention is probably directed elsewhere" (2001:22). This level is at play in a listener's attunement, through personal experience or social training, to react to certain sounds but not to others.[2] Lastly, Truax characterizes his third level of listening attention as occurring "when we are not listening for a particular sound, and when its occurrence has no special or immediate significance to us. However, we are still aware of the sound" (24). Here,

Truax describes what seems more like a state of inattention than attention; with his emphasis on unconscious awareness, Truax's "background listening" bears more resemblance to Oliveros' notion of "hearing" than her definition of "listening."

In the above examples for classifying the concept of "listening," both authors drew on the notion of attention but qualified it in different ways. Oliveros qualified listening attention in terms of concentration, while Truax qualified attention in terms of signification. Both methods come into play, to varying degrees, in Pierre Schaeffer's effort to qualify listening into four listening modes, or *quatre écoutes*.

Modes of Listening I: Schaeffer's *Quatre Écoutes* [3]

Schaeffer's theory of acousmatic music, as portrayed in his *Traité des objets musicaux* (1966), builds its foundation on the belief that *listening*, with the human ear, is the best tool for music analysis. In his *Solfège de l'objet sonore* (1967), the audio companion to the *Traité*, he finds that an increased "scientific" precision in measuring sound—in terms of "frequency in cycles per second, intensity in decibels, and time in seconds" (1998:17)—does not in turn lead to an increased understanding of music, concluding "if a music-gauging machine does exist, then we all carry one around, it's wonderfully handy and economical, and that machine, gentlemen, is our ear" (27). In the *Traité*, Schaeffer explores different functions of listening, distinguishing four separate yet interrelated activities related to the ear. He identifies these four modes with the four French verbs: *écouter*, *ouïr*, *entendre*, and *comprendre*. These modes may be defined as follows:[4]

1. ***écouter*:** to listen to, to direct one's attention toward an event marked by sound; essentially, this is an act of *information-gathering*, where the sound serves as an index to our knowledge and experience of the world;

2. ***ouïr*:** to hear; the raw perception of sound;
3. ***entendre*:** to listen out for; the directed listening for certain elements or qualities within the sound itself;
4. ***comprendre*:** to comprehend, to grasp; the act of understanding the sound, often by means of combining the information from modes 1 and 3 (*écouter* and *entendre*).

Schaeffer suggests that the four modes regularly interact within the listening process, although the focus on one mode or the other may change for different listening contexts. For him, mode 1 (*écouter*) would be the focus of *natural listening*, that is, the kind of listening attuned for survival in the natural environment; this is supported by mode 2 (*ouïr*), which represents interaction between the physiology of the human ear and the physics of acoustics. Mode 3 (*entendre*) would be the focus of *structural listening*; while mode 4 (*comprendre*) would be the focus of *cultural listening*, which includes deciphering the significance of a spoken word (language), sirens, alarms, as well as musical signs and tropes. (Palombini 1992:44).

Schaeffer draws attention to the distinction between these different modes of listening as a means of introducing his idea of the *sound object*,[5] so central to his theory as a whole. For him, the emergence of the sound object begins with the raw perceptual data of mode 2, as the sound becomes detached from the referential aspects of mode 1 listening. Sound recording technology takes on an important role for Schaeffer as a means for facilitating the emergence of the sound object, not only by the physical manner in which it separates a sound from its original source event, but also by the way in which it allows for the exact repetition of a sound fragment. In this way, Schaeffer's concept of

the sound object is a direct correlate to his idea of *reduced listening*, which consists of two preliminary processes:

> To *distinguish* an element (to hear it in itself, for its texture, its matter, its color).
>
> To *repeat it*. Repeat the same sound fragment two times: there is no longer event, there is music. (Schaeffer 1952:21).[6]

Reflecting on the concept in 1969, Schaeffer's reduced listening becomes a form of meditation. The importance of repetition remains present:

> [A]n auditor listens to a sound . . . One offers to his listening this piece of sound which is repeated, and to which he applies himself in the same way as he would fix his gaze on a door handle or the horizon line. He receives neither his God nor the flux of his own body, but rather a sign of the external world, whose sonic image takes shape in his consciousness. To consider it, he also needs to pay attention and make silence; to appropriate it, paradoxically, he also needs to cast off everything he previously knew about it; let him discard meanings, indices, and even any suggestions concerning this signal. Listening to it again, now, in a few hours, or in a few days, he will learn more, not only about the object he is considering, but also about the faculties of this subject that he is, and which observes itself observing. (Quoted in Palombini 1992:53).[7]

The auditor's self-awareness of his subject-object position in observation points to the influence of phenomenology (à la Merleau-Ponty) in Schaeffer's thinking. His reference to a sound as "a sign of the external world" reveals a similar influence from semiology—indeed, like Saussure's *langue*, Schaeffer's sound object is to be understood as a structure distinct from the world. Schaeffer's typo-morphology of sound objects, which I will discuss later in conjunction with Denis Smalley's spectromorphology, is also indebted to Saussure's structuralist approach to linguistics.

With respect to Schaeffer's typo-morphology, and returning to his four modes of listening, it is the third mode—*entendre*, to listen out for—that is called upon in his structural approach to qualifying and appraising sound objects. Conventional solfège,

with its focus on pitch and rhythm, might also be understood as emphasizing this same mode of listening; his is a new ear training, one that is *not* chiefly concerned with identifying pitch and rhythm. Indeed, in the forward to his *Solfège de l'objet sonore*, he alludes to the inadequacies of the old system dealing with acousmatic music: "Sound still remains to be deciphered, hence the idea of an introduction to the sound object to train the ear to listen in a new way: this requires that the conventional listening habits imparted by education first be unlearned" (1998:11).

Modes of Listening II: Smalley's Subject-Object Listening Relationships

Composer Denis Smalley's writings on acousmatic music are much indebted to Schaeffer's thought. Indeed, Smalley received a *Diplôme de musique électroacoustique et de recherche musicale* from Schaeffer's GRM studio in the early 1970s. Smalley synthesizes Schaeffer's four modes of listening with Ernest Schachtel's psychological theory of perceptual activity[8] in order to characterize listening in terms of relationships between listeners and sounds. Smalley posits three relationship types:

1. *indicative relationships*—sounds serve as message carriers to the listener; the listener does not explore the sound beyond this significance;
2. *reflexive relationships*—sounds invoke a knee-jerk emotional response in the listener; the listener does not explore the sound beyond this visceral reaction;
3. *interactive relationships*—the listener focuses attention on exploring the qualities and internal structure of the sound itself.

Smalley understands his *indicative relationships* as embracing Schaeffer's first listening mode (*écouter*) and his *interactive relationships* as embracing both Schaeffer's third and

fourth modes (*entendre* and *comprendre*). I find, however, such a mapping to be a misrepresentation of Schaeffer's fourth mode (*comprendre*), which, as we saw above, he defined as combining information from both *écouter* and *entendre*. Reinterpreted in this way, both Schaeffer's second and fourth modes (*ouïr* and *comprendre*) disappear in Smalley's model, while Smalley introduces emotion as a factor not present in Schaeffer's model of listening. Furthermore, I notice two subtle differences between Smalley's and Schaeffer's approaches to qualifying listening. First, while Schaeffer's four modes of listening implied a certain degree of interdependency among different modes, with one coming to the fore at different moments for different purposes, the description Smalley provides for his three listening relationships imply a certain degree of mutual exclusiveness. Second, the listener is the active agent—with the role of sound remaining neutral—in distinguishing among Schaeffer's modes, while Smalley's distinctions are couched in terms of a listener's *response*, placing—it seems to me—a certain amount of responsibility on behalf of the sound in determining the nature of the subject-object relationship.

While Schaeffer conceived both *écouter* and *entendre*—Smalley's indicative and interactive listening relationships—as contributing co-dependently to *comprendre* (understanding), his solfège concentrates on training *entendre*, that is, his third mode of listening. Smalley sees indicative relationships as the norm for listening to music, with interactive relationships primarily experienced by composers during the process of composing electroacoustic works, but not on the whole experienced by listeners (including other composers) of an electroacoustic work in concert. He quotes Nattiez, referring to Schaeffer's reduced listening, as "hearing *as experienced by a composer, who*

hears sounds with extreme attentiveness before integrating them into a work" (Nattiez 1990:95; as quoted in Smalley 1996:106; Nattiez's italics).

Furthermore, Smalley warns against "technological listening"—like the kind of listening I found Warren Burt using in chapter 1—saying:

> This listening attitude belongs to the music technology subculture (composer, researcher, technician, manufacturer) and is encouraged by proliferative innovation and rapid obsolescence. Listening to technology is a necessary pursuit for those seeking new and improved musical means, but it is disquieting to realize that music that is not perceptually viable is too frequently presented as if it were. Composers (not only electroacoustic composers) often fruitfully conceive their music following processes, ideas and systems that are not perceptually determined; but the composer who ultimately refuses to confront the perceptual consequences abdicates cultural responsibility. Regrettably, there is too much electroacoustic music that demonstrates a disdain for listeners' indicative needs and the spectro-morphological means of achieving them. (1996:106)

This reveals a contrast in motivation for Smalley's spectromorphology as compared to Schaeffer's typo-morphology of sound objects. Schaeffer's typo-morphology was concerned with refining listening skills, creating a new system of solfège to encourage listeners to pay attention to the internal structures of sound as separate from the outside world. Smalley's spectromorphology, in contrast, is not so much concerned with ear training as with systematizing—from a composer's standpoint—methods for identifying and evoking certain types of *indicative* relationships in sounds for listeners. He asserts that listeners have a "*natural* tendency to relate sounds to supposed sources and causes, and to relate sounds to each other because they appear to have shared or associated origins" (1997:110; Smalley's emphasis), and he invents the term *source bonding* to represent this tendency.

Smalley is not, however, interested in direct mappings between sounds and sources in the listening process. For him, the information conveyed to a listener through

sound in an indicative listening relationship can also be abstract, penetrating "both more extensively and deeply into the relationship between musical experience and our experiences of living." From this position, he conceives the notion of *indicative fields*:

> The term 'indicative' signifies that the musical manifestation of a field refers to or indicates related experiences in the non-sounding world. Nine fields are identified. Three are archetypal: gesture, utterance and behaviour. . . . Human utterance and the consequences of gesture have traditionally provided the fundamental sounding models for music. The behaviour-field is concerned with sounding relationships in space and time, which can be considered analogous to certain modes of human relationship, observed relationships among things or objects, or human-object relations. The six remaining fields are energy, motion, object/substance, environment, vision and space. (1996:83)

Smalley explains that these fields are not to be understood as mutually exclusive, but combine into networks in an often codependent manner; in this way, they are used by listeners to construct meaning. He adds that, while listeners chiefly draw on gesture and utterance to construct meaning in conventional (instrumental) Western music, they make use of more variable and complex indicative networks for electroacoustic music—which he cites as a possible explanation for the "special attractions" of the latter.

Smalley's emphasis here on indicative relationships implies a dissolution of the notion of "absolute music"—if a listener will always seek external relationships for sounds, Smalley asserts, "it is impossible for music to be purely intrinsic." Smalley does not completely abandon intrinsic, structural listening, however. Rather, he claims that "identifying extrinsic relationships will not of itself uncover the meaning of a sound-event or work. In order to explain extrinsic workings and qualities we shall need to focus our attention on an intrinsic analysis of spectro-morphological features and their structural context" (105). Thus, for Smalley, the internal structures of a sound are the source for uncovering its external associations. Recasting this claim in terms of his

listening relationships, he asserts that "[i]nteractive listening is the very means of penetrating the intrinsic qualities which determine the power both of the indicative networks and of the reflexive listening relationship" (106).

Reflecting on Schaeffer's and Smalley's qualifications of listening, I find it interesting that, while they both refute the notion of absolute music on the practical level—noting the inevitability of the listener's indexical associations with sounds—they both retreat in affirming privilege to the internal properties of sounds and sound composition through structural listening and analysis as the best means for *understanding* or uncovering *meaning* in music.

Pierre Schaeffer's emphasis on reduced listening and the non-indexical sound object might be understood as a plea to have his compositional experiments be received as music rather than as sequences of sound effects—perhaps because his ideas on *musique concrète* sprang in part from his work as a sound effects engineer for French radio. Similarly, Denis Smalley's theoretical output may be motivated by a concern to have his (chiefly) acousmatic works accepted within mainstream musicological circles (and thereby studied and, potentially, canonized)—circles in which even today so-called absolute qualities of music are often held in highest esteem, and electroacoustic music is treated as a fringe element having little in common with instrumental works. Perhaps for these reasons, Smalley concedes any "referential" aspects of acousmatic sounds as equivalent to similar references in instrumental music (especially in terms of abstracted references such as "gesture"). His rebuking of "technological listening" might be an attempt to distance himself from a kind of technology-fetishism allegedly evident in other

electroacoustic works, a fetishism that he perhaps sees as serving to further marginalize the genre as a whole.

Modes of Listening III: Concentrated vs. Immersed—Schafer's Dichotomy

Canadian composer R. Murray Schafer, although evidently familiar with Pierre Schaeffer's theory of listening,[9] might conceive the distinctions Schaeffer makes among his *quatres écoutes* more in terms of different approaches to the analysis or classification of sounds rather than different modes of listening to sounds; at least, the four approaches to classifying sounds that Schafer lists in his book, *The Tuning of the World*, seem to run nearly analogous to the distinctions both Schaeffer and Smalley make with respect to modes of listening:

> Sounds may be classified in several ways: according to their physical characteristics (acoustics) or the way in which they are perceived (psychoacoustics); according to their function and meaning (semiotics and semantics); or according to their emotional or affective qualities (aesthetics). (Schafer 1977:133)

Schafer characterizes Schaeffer's approach as being concerned with psychoacoustics, which would imply that Schafer would map the "psychoacoustics" model for classification to Schaeffer's *entendre* and Smalley's "interactive listening relationships." Extrapolating from there, "acoustics" may be mapped to Schaeffer's *ouïr*, while "semiotics and semantics" may be mapped to Schaeffer's *écouter* (and *comprendre*?) as well as to Smalley's "indicative listening relationships." Schafer's characterization of the "aesthetics" model (as remote as it might seem from the like-named branch of philosophy) would then map to Smalley's "reflexive listening relationships."

Schafer himself finds limitations in the separation and isolation of such processes—whether defined as modes of listening or analytic approaches. As the founder

of the World Soundscape Project—a kind of conservation awareness program for the acoustic environment—Schafer is more interested in exploring modes of listening in terms of the quality of the acoustic environment rather than in terms of the listener's quality of attention. In relation to his conservation awareness program—what he calls *acoustic ecology*—Schafer distinguishes between two types of acoustic environments: the high-fidelity, or *hi-fi* environment; and the low-fidelity, or *lo-fi*, environment:

> The quiet ambiance of the hi-fi soundscape allows the listener to hear farther into the distance just as the countryside exercises long-range viewing. The city abbreviates this facility for distant hearing (and seeing) marking one of the more important changes in the history of perception.
>
> In a lo-fi soundscape individual acoustic signals are obscured in an overdense population of sounds. The pellucid sound—a footstep in the snow, a church bell across the valley or an animal scurrying in the brush—is masked by broad-band noise. Perspective is lost. On a downtown street corner of a modern city there is no distance; there is only presence. (1977:43)

Although Schafer makes an attempt at objective, disinterested definitions for these two terms, his aesthetic preference of *hi-fi* over *lo-fi* acoustic environments are betrayed by his word choices. He characterizes lo-fi soundscapes in the negative with "obscured signals" and "lost perspective"; meanwhile, he associates hi-fi soundscapes with positive values such as "pellucid"—clear and pure—sound, as well as with his favorite sonic virtue: "quiet." Schafer's distinction between the hi-fi and lo-fi acoustic environment is central to his ideas on sonic design, with the hi-fi environment presented as the ideal goal.

Running parallel to these two types of acoustic environments, Schafer distinguishes two types of listening related to music: *concentrated*[10] and *immersed*. He associates concentrated listening with the concert hall, where music that stresses "higher frequency sounds to make its directionality clear" is "placed in a container of silence to make detailed investigation possible." In contrast, he associates immersed listening with

"the indoor concert from which distance and directionality are absent" and "the listener finds himself at the center of the sound; he is massaged by it, flooded by it" (1977:117). Whereas concentrated listening is associated with music that stresses higher frequency sounds, immersed listening is associated with music that stresses lower and medium frequency sounds.

In addition, Schafer draws a parallel between his two listening types and types of society: music made for concentrated listening, with its emphasis on distance and directionality, reinforces distinctions among social classes; while music made for immersed listening belongs to "a classless society, a society seeking unification and integrity." Curiously, Schafer points to medieval European society as an example of the latter, citing "the singing of Gregorian chants" in stone cathedrals where "the voices seem to issue from no point but suffuse the building like perfume" as evidence. Quoting Kurt Blaukopf, Schafer explains that such a practice within church walls served to strengthen "the link between the individual and the community" (118). Is this the same as demonstrating "a classless society"? Was there not a strict class hierarchy in medieval Europe, including a strict hierachical structure within the Catholic church? Rather than saying such music represents a classless society, it might be better to say that music associated with immersed listening projects an *ideal* of unification within society, rather than the reality of a society. For me, the metaphorical implication of feeling immersed or flooded by sound implies less a sense of unification with my fellow listeners than a sense of being overwhelmed by a greater power—perhaps this better explains the effect of Gregorian chant sung in medieval cathedrals, as it represents the omnipresence and

omnipotence of the Christian deity more so than the equal standing or unification of the congregation, monks and parishioners?

Schafer links both concentrated and immersed listening to indoor music listening. He adds the term *peripheral listening*[11] for outdoor music contexts; such music, he says, "does not demand great attention to detail" and is thus listened to in a manner similar to "the way the eye drifts over an interesting landscape" (117). He is less specific regarding the social implications of such listening, although he associates it with folk music, rock music and the transistor radio—perhaps implying that it belongs to the lower classes of a classed society? Or might be best characterized as music for the general masses? What happens when, for example, music written for the concert hall is performed outdoors, such as when the New York Philharmonic performs in Central Park? Does the audience still apply peripheral listening, attempt concentrated listening, or a fluctuation between the two? What of Schafer's own work, "Patria 9: The Enchanted Forest," composed for outdoor performance[12]—was this created with peripheral listening in mind?

Although Schafer's three listening types—concentrated, immersed and peripheral—do not directly correspond to Smalley's three types of listening relationships, the distinctions do exhibit a common underlying notion that the listener's engagement with sound is at least in part dependent on the composition of the sounds themselves, as opposed to being solely motivated by the listener's intentions as implied in Schaeffer's four listening modes. Smalley, however, does not offer many clues regarding what particular sonic characteristics afford *indicative* as opposed to *reflexive* or *interactive* relationships between listeners and sounds, merely asserting that "an interactive relationship is necessary for the fullest appreciation of Western art music" (1992:82).

Schafer, in contrast, is much more specific in aligning listening types to acoustic qualities, aligning concentrated listening with music performed indoors and with an emphasis on higher frequencies, immersed listening with music performed indoors with an emphasis on lower frequencies, and peripheral listening with music performed out-of-doors—where, presumably, there are no acoustically reflective surfaces to enhance resonance and thus Schafer's distinction between the structural implications of lower versus higher frequencies do not come as much into play.

It should be noted that Schafer only mentions *peripheral listening* in order to contrast it with *concentrated hearing*; he argues that the latter was only made possible with the introduction of the concert hall, which implies that the former was the normal mode of listening up until that time. Concentrated listening, according to Schafer's definition, requires a clear distance and separation between music (performers) and audience; the music is, in a way, set in opposition to its audience. Schafer uses this distinction to then contrast concentrated listening with *immersed listening*, in which the audience has the sense of being enveloped by the music, rather than witnessing it from afar (or from a safe, objectifying distance)—the distinction between the audience and the music begins to break down. From this distinction, one might expect that listening to music diffused through stereo speakers allows for concentrated listening, while listening to music diffused through a quadraphonic (or multi-) speaker array incites immersed listening. Schafer argues, however, that music "of the living room stereo set" produces immersed listening because "distance and directionality are absent" (1977:117). Schafer presents *earphone listening*—that is, listening to sound/music using headphones—as an

extreme form of immersed listening, as it "directs the listener toward a new integrity with himself" (119).

It is important to read Schafer's comment regarding home stereo systems within the context of his writing in the 1970s. At that time, there was a predilection among North American consumers to increase the level of bass response versus treble in their home audio systems. This emphasis on low frequencies is consistent with Schafer's definition of immersed listening. The stress on low frequencies is more a matter of consumer taste, however, than an inherent property of loudspeaker diffusion, especially with regards to the high-quality loudspeakers available on the market today. As demonstrated in exercises nos. 8 and 9 from CD-ROM *Atelier Ircam: 10 jeux d'écoute* (IRCAM 2000),[13] which test a listener's ability to sense directionality over loudspeakers or headphones, available sound processing tools make it possible to manipulate recorded sound in order to simulate such effects such as directionality and distance. Thus loudspeaker diffusion per se does not necessarily incite immersed—as opposed to concentrated—listening. The current trend toward 5.1 surround sound in home entertainment systems for more "realistic" audio performance further underscores this point.

Concentrated listening, then, requires that a listener has a sense of perspective, from an observer's standpoint, vis-à-vis the music; this is possible even when the listener is surrounded by sound, as is the case in a quadraphonic or multi-speaker array, as long as the listener is able to distinguish and locate discrete sound objects within the music. Expanding on this thought, one might say that concentrated listening is possible in music that exists on a human-sized scale; as Smalley notes, "high pitches are regarded as

physically smaller" (1997:122) and therefore one would expect the implied material sources of higher-frequency sounds to be *fathomable* in human terms.

Although Smalley does not make use of Schafer's distinction of concentrated listening, he does make some claims regarding human perception that would support the relationship Schafer draws between concentrated listening and higher frequency sounds. In his discussion of space and spatiomorphology, Smalley writes "high degrees of spectral mobility are concerned with higher registers . . . which can often be clearly localised compared with the vague, more spread localisation of bass sounds" (1997:122); furthermore, with respect to spectral space and density, Smalley claims "[t]here are perceptual limits to how much spectromorphological information can occupy spectral and stereo space: high density is the enemy of low-level detail" (121).

In contrast, Schafer's concept of immersed listening might be understood as being not so much concerned with listeners being surrounded by sound—as in a multi-speaker array—as with listeners being oversaturated by sound. Just as I have linked Schafer's association between concentrated listening and higher frequencies to implied sound sources of human-sized proportions, I would argue that the sense of immersion in the listening experience associated with music that stresses lower frequencies comes from the implied material sources of these lower-frequencies sounds being, in a sense, larger than life, or more awesomely large in physical terms. In this way, I question Schafer's assertion that such music is the resulting evidence of a classless society; rather, I understand such music—as with the Gregorian chant example mentioned above—as being inspired by or seeking to evoke the profound or unfathomable, those things that render human existence small by comparison. Such an interpretation does not

immediately refute Schafer's claim, as one could argue that immersed listening is an act of communion with the profound, which renders all human life as equal in its smallness and thereby reflects a classless, integrated society; such an argument overlooks, however, that an imbalance of power still exists between the listener and the thing producing—or represented as producing—the music.

Schafer's ideas regarding the relationship between listening type and society might have been influenced from the media theories of fellow Canadian Marshall McLuhan. After suggesting that the distinction between concentrated and immersed listening reflects the difference between the nineteenth and twentieth centuries, Schafer writes: "Perhaps we can even appreciate McLuhan's claim that electricity unites men together again" (118). Schafer might be referring here to McLuhan's idea that, more than anything else, "it is the speed of electric involvement that creates the integral whole of both private and public awareness. We live today in the Age of Information and of Communication because electric media instantly and constantly create a total field of interacting events in which all men participate" (1964:248). Indeed, Schafer clearly identifies electricity with immersed listening in the following table, reproduced from *The Tuning of the World* (1977:118):

High frequency	*Low frequency*
Sound from a distance	Wraparound sound
Perspective	Presence
Dynamics	Sound wall
Orchestra	Electroacoustics
Concentration	Immersion
Air (?)	Ocean-womb

Here, while the type of music that affords concentrated listening is understood as emanating from a traditional orchestra, the music that affords immersed listening is

identified with electroacoustics. By extension, orchestral music is associated with dynamic range while electroacoustic music is associated with a "sound wall." Does electroacoustic sound necessarily exclude dynamic range and a sense of perspective as Schafer suggests?

Schafer may seem overly restrictive in his characterization of electroacoustic sound as necessarily denying the listener any sense of distance or direction. The latter, at least, would seem to be refuted by the exercises in spatial localization from the *10 jeux* on the IRCAM CD-ROM (2000). These exercises were specifically engineered to create a sense of virtual space through earphone—as opposed to distant loudspeaker—listening. Given such a possibility for spatial perspective, is Schafer still correct in his assertion that earphone listening is necessarily an extreme form of immersed listening? Or, in contrast, might earphones be understood as the ultimate "container of silence" characteristic of music made for concentrated listening? A closer look at his characterization of earphone listening betrays his cultural (and technological) perspective at the time of his writing in the 1970s:

> "Head-space" is a popular expression with the young, referring to the geography of the mind, which can be reached by no telescope. Drugs and music are the means of invoking entry. In the head-space of earphone listening, the sounds not only circulate around the listener, they literally seem to emanate from points in the cranium itself, as if the archetypes of the unconscious were in conversation. . . . [W]hen sound is conducted directly through the skull of the headphone listener, he is no longer regarding events on the acoustic horizon; no longer is he surrounded by a sphere of moving elements. He *is* the sphere. He is the universe.
>
> Headphone listening directs the listener toward a new integrity with himself. But only when he releases the experience by pronouncing the sacred *Om* or singing the Hallelujah Chorus . . . does he take his place again with humanity. (1977:118–19)

Headphone listening, by creating a personal virtual world around the listener, incubates and disconnects the listener from the outside world. Schafer may understand loudspeaker

systems—especially multi-speaker arrays and "surround sound" varieties—as similarly creating virtual worlds that distort listeners' impressions of their immediate physical environments, particularly when the electroacoustic technology *simulates* acoustic perspectives of distance and direction. While Schaeffer and Smalley may use the term "acousmatic" to describe the experience of listening to sounds over loudspeakers, Schafer prefers the term "schizophonia": by his own admission, he employs what he calls "this 'nervous' word in order to dramatize the aberrational effect of this twentieth-century development" (237).

In this chapter, I have explored a number of different qualifications of the concept of listening, some that focus on the intention of the subject as listener, others that focus on the quality of the object of listening. Denis Smalley implies that his "interactive listening relationships"—analogous to Schaeffer's modes *entendre* and, perhaps, *comprendre*—require a specialized training; as Barry Truax states: "Disintegrating a total sound impression into its component parameters appears to be a skill that must be learned" (quoted in Schafer 1977:133).[14] While R. Murray Schafer partially blames electroacoustic technology for desensitizing listeners from the sounds of the world around them, Pauline Oliveros suggests that the same technology may be used to reverse this situation:

> I have been training myself to listen with a very simple meditation since 1953 when my mother gave me a tape recorder for my twenty first birthday. . . . I immediately began to record from my apartment window whatever was happening. I noticed that the microphone was picking up sounds that I had not heard while the recording was in progress. I said to myself then and there: "Listen to everything all the time and remind yourself when you are not listening." (Oliveros 1999:3)

In the next chapter, I will further explore the concept of acousmatic listening through more practical models of "ear training" provided by both Pierre Schaeffer and R. Murray Schafer, as well as ten "listening games" for electroacoustic sound presented by the pedagogical studio at IRCAM.

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[1] Oliveros defines two further types of listening in terms of *awareness*: 'deep listening' is a meditative-like state which she characterizes in terms of "heightened awareness"; 'quantum listening' is defined as "listening to more than one reality simultaneously" and thereby describes a kind of pluralistic awareness (1999:1).

[2] Truax gives the example of a mother who sleeps through loud traffic noises but awakens at the sound of her baby crying (2001:22).

[3] Carlos Palombini, in his presentation of Schaeffer's theory, refers to these as Schaeffer's four *functions* of listening (1992:31) while Denis Smalley refers to them as four *modes* of listening.

[4] The definitions provided here are syntheses of those provided in discussions of Schaeffer's terms in Palombini (1992:33–42) and Smalley (1996:78–79).

[5] *L'objets sonores*, alternatively translated as "sonic objects."

[6] "*Distinguer* un élément (l'entendre en soi, pour sa texture, sa matière, sa couleur).
Le répéter. Répétez deux fois le même fragment sonore: il n'y a plus événement, il y a musique."

[7] Original citation is "Reflexions de Pierre Schaeffer" in *Pierre Schaeffer* by Sophie Brunet and Pierre Schaeffer (Paris:Richard-Masse, 1969): 212.

[8] Smalley refers to Schachtel's *autocentric* and *allocentric* perceptual modes, as described in Schachtel's book *Metamorphosis: On the Development of Affect, Perception, Attention and Memory* (New York: Da Capo Press. 1984).

[9] Schafer makes passing reference to Schaeffer's *Traité des objets musicaux* in his own book *The Soundscape: Our Sonic Environment and the Tuning of the World*, references specific enough to imply Schafer has at least skimmed Schaeffer's work.

[10] Schafer later refers to this as *focused listening* (1992:7).

[11] Schafer first calls this *peripheral hearing* (1977:117) but later refers to it as *peripheral listening* (1992:7). I have chosen to use the later usage to avoid any confusion between the notion of *listening* and *hearing*.

[12] See Eatock, Colin: "Mystic Composer in a Magical Forest," *The New York Times* August 27, 2005.

[13] I will discuss this CD-ROM more thoroughly in chapter 3.

[14] Barry Truax, "Soundscape Studies: An Introduction to the World Soundscape Project," *Numus West* 5, 1974:37.

Chapter 4: Ear Training, Solfège and Sound Education

In the previous chapter I explored how sound recording technology, together with other advances in the field of acoustics and psycho-acoustics, has facilitated the development of a number of different theories all based on the concept of there being different, distinct *modes* of listening. As Pierre Schaeffer demonstrated, repeated listenings of the same, brief sound recording can allow for a dissection of sorts of the listening process. If, as Marshall McLuhan suggests, advances in audio technology have not only led to increased awareness of different modes of listening but actually have served to alter the sense of listening, has this been reflected in electroacoustic music? If so, perhaps the traditional method of ear training, as practiced in conservatories of Western music, is obsolete in the face of this music?

Such is the opinion of Pierre Schaeffer, and it is for this reason that he proposes a new kind of ear training in his audio presentation *Solfège de l'objet sonore* (1967), based on the theory of listening put forth in his *Traité des objects musicaux* (1966). Others, too, have sought new methods of ear training that incorporate listening strategies appropriate for the electroacoustic medium; a recent example can be found in the exercises from the interactive CD-ROM *10 jeux d'ecoute* (2000) developed by researchers from the pedagogy team at IRCAM. Some composer-theorists take a slightly different stance from Schaeffer with respect to the impact of modern technology on listening. R. Murray Schafer, for example, has developed a new kind of ear training which he refers to as *ear cleaning*, motivated by his belief that contemporary listening skills have been dulled by the constant roar and hum of electric technology; although he introduces his concept of ear cleaning in his earlier writings, he deals with it perhaps most thoroughly on a

practical level in his book, *A Sound Education: 100 Exercises in Listening and Sound-Making* (1992). In this chapter, I will take a detailed look at Schaeffer's *Solfège de l'objet sonore*, IRCAM's *10 jeux d'ecoute*, and R. Murray Schaeffer's *A Sound Education* to explore both the similarities and differences in their approaches to the subject and practice of ear training, and speculate how the listening skills propounded by these three sources might inform listener-oriented analyses of electroacoustic—and in particular acousmatic—music. To begin, however, I find it useful to briefly review the practice of traditional ear training.

What is Ear Training?

Ear Training, as practiced in conservatories of Western art music, is based on the identification of interval relationships among pitches, more specifically the practice of solmization that was developed in eleventh-century Europe.[1] "Ear" in this case is taken figuratively, having to do with the activities of hearing and listening associated with the ear rather than a literal reference to the ear's physiognomy as an organ of the human body; the English term is most likely a translation of the German *Gehörbildung*, which refers to the education (*Bildung*) of hearing (*Gehör*). In French-speaking countries, ear training is referred to as *solfège*, maintaining a direct acknowledgement of the emphasis on the solmization system. The French term *solfège* also encompasses what in English is commonly referred to as music theory rudiments: scales, keys, meter, rhythmic values and other basic music-theoretical concepts considered foundational to a musician's education and training within the tradition of Western art music—and, ultimately, revolving around music notation. The practice of ear training conventionally involves either listening to a musical excerpt and trying to notate it on a musical staff as accurately

as possible, or reading a notated melody and trying to sing it as accurately as possible—with an emphasis placed on pitches and metered rhythm in both cases.

Although this practice of ear training and solmization was developed to handle the European tradition of modal and tonal music, it has been adapted through the twentieth century to additionally handle specimens of post-tonal music that are organized, at least in part, in terms of interval relationships among pitches. These include most contemporary vocal and instrumental music, and even some electroacoustic music—specifically, electroacoustic works which seem to use pitch relationships as organizing structures, especially those that follow in the serialist tradition, including the historical *elektronische Musik* and much algorithmic music. Traditional solmization, however, is at a loss when confronted with music composed of sounds without clear pitch centers, or music in which pitches are not treated parametrically as units of structural organization, such as *musique concrète* and its progeny. Not only is such music not organized in terms of interval relationships between pitches; also, discrete pitches are often difficult to discern, as is any sense of metered rhythm. Moreover, as composers create such works "directly" with sound materials by combining and manipulating recorded sounds, the relevance of conventional musical notation for musicians working solely in this medium is sharply reduced.

Schaeffer's *Solfège de l'objet sonore*

Pierre Schaeffer presented his "answer" to the deficiencies of conventional ear training in his *Solfège de l'objet sonore* (1967), the aural companion to his *Traité des objects musicaux* (1966). Schaeffer conceived of the *objet sonore*, or "sound object," as the basic compositional unit of electroacoustic music to replace the unit of pitch, which, in terms of

solmization, formed the basis of traditional vocal and instrumental music. Indeed, his new solfège is intended not only to replace but to *counter* traditional solfège, which he sees as inadequate, as evident in this statement in the forward to *Solfège*: "Sound still remains to be deciphered, hence the idea of an introduction to the sound object to train the ear to listen in a new way: this requires that the conventional listening habits imparted by education first be unlearned" (1998:11).

As a prologue to his *Solfège*, Schaeffer contemplates the relationship between nature and culture with respect to music, raising questions that aim themselves at the foundations of certain previous theories of Western music. He asks, quoting E. T. A. Hoffman:[2]

> "But does not the spirit of music, like the spirit of sound, pervade all of nature? A sounding body, when touched mechanically, comes to life and reveals its existence or rather its structure, and thus enters our field of knowledge." . . . But what does this knowledge involve? Does the harmonic series—which would seem to be a sequence of integers—relate to man or to nature? Are intuition and logic shared between music and sound? (1998:15; CD1:03–04)

While not wavering from a structuralist definition of musical knowledge, Schaeffer's question regarding the harmonic series is aimed squarely at those who—following the tradition from Rameau to Riemann and Helmholtz—use the harmonic series as an explanation for origins of tonal music, drawing on Pythagoras's ancient observations regarding the acoustic properties of string division.[3]

Continuing with this critique of the values of traditional Western music theory, Schaeffer complains that "we often neglect the framework which sound gives to music, and concentrate only on notation; musical objects are boiled down to signs which refer to structures" (15; CD1:05). To illustrate his point, he plays a recording of an excerpt from the Ricercare of J.S. Bach's *Musical Offering* performed on the harpsichord, followed by

a recording of the same passage as orchestrated by Webern. Given the close relationship between musical notation and traditional solfège (here translated as "theory"), and the emphasis in both cases on pitch relationships, Schaeffer remarks:

> Thus we become aware of the fact that one dimension is missing from the conventional score, that of "timbre." We suddenly wish we were able to fashion some "Klangfarbenmelodie" under the safe guidance of a theory, But as to the question of timbre, theory's simplistic reply is that a flute is identifiable by its flutelike sound. One is a little disappointed. Does theory, by any chance, conceal some serious deficiency? Are we to challenge its most commonplace maxims: a minim equals two crochets? (15; CD1:07)[4]

Schaeffer further investigates the relationship between solfège and conventional musical notation in terms of how they account for what he calls the four elements of solfège: pitch, rhythm, timbre and intensity. He notes that while conventional score notation allows for a "quasi-mathematical" expression of pitch and rhythm, its account of timbre and intensity is "approximate and even empirical." Using the analogy that "a foreign language cannot be reduced to the familiar patterns of our mother tongue," Schaeffer attempts for his new solfège to break free of the bias and familiar patterns of the old by first appealing to relatively recent discoveries in the field of acoustics:

> We now hesitate between a pilgrimage into the past and an act of faith in science. For our four musical values, acoustics offers three inexhaustible parameters, each with its specific unit: frequency in cycles per second, intensity in decibels, and time in seconds. The basic question is then the following: are musical objects reducible to these parameters? If the answer is yes, then acoustics can account for music. If not, it will merely provide music with information concerning the physical properties of sound, whose relationships with musical qualities remain to be established. (17; CD1:11)

Schaeffer divides his discussion in *Solfège de l'objet sonore* into nine "themes," devoting the first six—two thirds of the total—to this question regarding the reduction of musical objects to quantifiable acoustic properties (which he ultimately answers in the negative). Laid out in this way, themes one through six of *Solfège* serve as aural illustrations of

parallel discussions in chapters 10–14 of his *Traité*. This portion of *Solfège* is reminiscent of experimental demonstrations in introductory courses on acoustics and psychoacoustics. He explores in theme one, for example, "correlations between spectrum and pitch": Through a number of sonic examples in which pitched sounds derived from various instruments played in ascending and descending octaves are compared to the same pitches derived from pure sine waves, Schaeffer demonstrates that pitch exhibits a complicated relationship with timbre such that sine waves should not be considered as the measuring standard for pitch. He further demonstrates aural "deceptions" such as recordings of sounds that have their fundamental frequency physically filtered out yet still sound at the same pitch in terms of human perception. His purpose is to convince the listener that frequency and pitch do not necessarily constitute the same element. Comparing the unequal effects of filters on pure tones, white noise and complex sounds, he introduces the new notion of "sound mass":

> Whether it is tonal or complex, concise or diffuse, related to a harmonic or non-harmonic spectrum, whether it consists of a single or an unlimited number of frequencies, mass is a musical perception that accounts for the harmonic structure of a sound object.
>
> Any realistic theory capable of accommodating more comprehensive musical objects should therefore be based on a genuine relationship between the observer and the observed: the structures to which the ear refers depend on the mass of the object which is presented to it. (23; CD1:35)

A sound's *mass*, then, is the apparent or perceived height of a sound, as opposed to its physically measured frequency spectrum. Mass, because it can account for such complex sounds that occupy a broad interval in height, presents itself as a more generalized concept than that of pitch.

Schaeffer proceeds in this way through the next five "themes" of his *Solfège*, focusing his discussions on similar aural deceptions where, for certain types of sounds,

aural perception of a given property seems to contradict information provided by the physical measurement of that sound. If the purpose of theme one is understood as destabilizing the notion of pitch in favor of mass, theme two, "Duration and Information," destabilizes the notion of duration—as chronometric time—by demonstrating its dependency on dynamic shape (amplitude) and information content (spectrum) in the perceptual plane; theme three, "Time-Thresholds of the Ear," demonstrates the dependency of pitch perception on duration; while themes four, "Time Warping," and five, "Artificial Attacks and Secondary Attack-Characteristics of Sustained Sounds," demonstrate the interrelationship among duration and dynamics (amplitude) as factors in determining timbre. In theme six, "The Timbre of Sounds and the Concept of the Musical Instrument," he tackles the notion of timbre directly.

While Schaeffer's stated motivation here is a comparison between music and acoustics, these first six "themes" of his *Solfège* also serve to demonstrate the sonic results of common tape techniques such as doubled or halved playback speed, use of frequency band filters, tape splicing to isolate different sections of a sound envelope (attack vs. durational body), and the angle of the splice. In so doing, Schaeffer allows his experience with these techniques to be shared with less experienced students so that the latter may better predict the sonic results of these techniques—just as conventional solfège training helps composers better predict the sonic results of the notes they write on a musical staff.

Toward the end of this part of *Solfège*, in the course of exploring his sixth theme, "The Timbre of Sounds and the Concept of the Musical Instrument," he demonstrates how a recording of a sound produced by one musical instrument can be manipulated to

seem as though it were produced by a different instrument, such as a recording of an E5 played on the flute manipulated to sound as it were played on the piano. He does so not so much to compare the two instruments in question but to problematize the relationship between timbre and instrument and, by extension, the notion of causality; that is, he calls into question the convention of equating the timbre of a musical sound with the instrument on which the sound is played, which as a consequence limits timbral description to identifying the instrumental source or cause of the sound. Schaeffer expresses discomfort at this turn in his discussion:

> We have been straying further and further from our assigned field of study. As long as we were comparing band-widths or dynamic curves (components of physical objects) with the perception of timbre (a component of musical objects), we were still dealing with the relationships between music and acoustics. But as soon as one brings in the causality context, one enters into the psychology of hearing. At this stage, there will be a choice between two different focuses of hearing: either on sound as the clue to the cause which produced it, or as a sound object in the strict sense of the word. This "reduced hearing" enables us to grasp the object for what it is and to try and describe it by reference to other objects. Describing an object means speaking of its form; comparing it to other objects means defining its type. We are now on the threshold of morphology and typology. (53; CD2:65)

Thus, the first six themes of Schaeffer's *Solfège*, while laying a foundation in certain aspects of acoustics, are constructed in such a way to lead directly to this crisis point between hearing sound as a clue to a causal event or as an object of contemplation in itself—that is, between *écouter* and *entendre*, as discussed in the previous chapter. Schaeffer needs to present these two ways of hearing as mutually exclusive so that he is forced to choose one—*entendre*—over the other, and this choice becomes an axiomatic premise upon which he bases the heart of his theory—the typo-morphology of sound objects.

Theme seven deals with the "Morphology of the Sound Object." Here, Schaeffer lays out a number of distinctions, asserting that: "an electro-acoustic instrument is not in itself a musical instrument" (53; CD2:66); "the sound object must not be confused with the sounding body by which it is produced" (55; CD2:73); "the sound object is not identifiable with the recording" (57: CD2:77); and "a sound object is not to be confused with a musical object" (59:CD2:83). As in his discussion of theme six, he is very adamant in separating the concept of the sound object from any causal source, real or imagined. After demonstrating how a number of very different and distinct sounds can be made using the same physical material—in this case, a metal sheet—he concludes:

> Thus the feature of an object cannot be related to those of the instrument, and the fact that a sound is emitted by the vibrations of wood or brass, a string or a membrane is not sufficient to qualify it. The main point is to compare objects which have something in common, even if they are produced by different sounding bodies.
>
> If our aim is to forget about origins, the most effective tool will be anonymous magnetic tape, that musical version of Pythagoras' screen which [was] used to veil the speaker and hide his gestures from sight, allowing only the meaning to emerge. But magnetic tape conceals a new and more insidious trap. Falling into it would mean regarding the recording itself as an object or, again, using the same recording to set up new cause-and-effect relationships between hypothetical new causes and hypothetical new objects. (57; CD2:77)

Here, Schaeffer is once more dismissing the conventional way of categorizing musical sounds or "timbre" according to instrument family: woodwind, brass, string and percussion. By holding to such conventions, a listener ignores and therefore becomes deaf to nuance of sound that may cut across or contradict such categorizations—such as the group of contrasting sounds created by the same material source demonstrated here, or Schaeffer's earlier demonstration of the similarity in sound created by two contrasting material sources, namely the piano and flute in the E5 registral range. When he speaks of the trap of setting up a new cause-and-effect relationship for recorded sound, he not only

refers to such manipulations that make the recording of one musical instrument sound like another, but the myriad ways in which sound effects studios use various materials to create the aural illusion of hypothetical events.

Schaeffer then presents the same object repeatedly under different transformations, each of which is meant to emphasize a different aspect of the sound's content or structure, namely: shape, mass, grain, timbre, and motion. In this way, Schaeffer's demonstration is both an ear training exercise as well as a kind of acoustic model for different listening passes of the same object, each time focusing on a different aspect. All of this is meant to further support Schaeffer's position of offering the concept of the sound object as a replacement for that of the note (pitch + duration) as the basic musical unit in electroacoustic music, to be described and classified in terms of its intrinsic, structural properties rather than through what he sees as extrinsic references to real or hypothetical sound sources and events. Just as conventional solfège trains musicians to distinguish notes and describe them in parametric terms of pitches and rhythm, Schaeffer's solfège is intended to train musicians to distinguish sound objects and describe them in parametric terms such as dynamic shape, mass, grain, and so on.

Schaeffer's solfège, however, does not present any type of organizational hierarchy of sound objects comparable to the tonal and modal pitch-scales of conventional solfège that might explain, at least in part, the organization of sound objects in musical compositions in either a prescriptive or descriptive manner. Schaeffer views this as a shortcoming of his work and a consequence of the early stage of development of electroacoustic music at the time (1967); he seems confident that such a "syntax" will emerge once the "language" of electroacoustic music matures.

Why does Schaeffer feel a need to establish such a structuralist approach to composing musique concrète? Is this as a response to the rival camp of highly structured *elektronische Musik*? Perhaps so, considering that one of Schaeffer's harshest critics has been Pierre Boulez, the renowned serialist composer who worked briefly at the GRM studio. Boulez went so far as to tack on a "communication" at the end of Pierre Schaeffer's entry for "musique concrète" in the 1958 edition of the *Encyclopédie de la musique*, in which the young composer disparages Schaeffer's vision for *musique concrète* as naïve, lacking those qualities of a true musical art:

> The musical material, to lend itself to composition, must be sufficiently malleable, susceptible to transformation, and capable of engendering and supporting a dialectic. In refusing, or more precisely, in ignoring these essential processes, our "concrete musicians" have put together a heavy case against themselves. They bring upon themselves the complaint of producing sounds which, technically speaking and from the sole point of view of quality, are ugly. They are unable to provide the kind of rigorous explanation that must be developed in the midst of the new electro-acoustic domain. . . . Instead of carrying out an acoustic classification, they are content with such designations as "thick sound," "wind sound" and other whims of questionable humor. (Boulez 1958:577–78)[5]

Given such criticisms, it is no wonder that Schaeffer felt such a strong need to legitimize his work in structuralist terms, seeking some sort of rigorous system of classification that he hoped might one day lead to a proper "syntax" (similar in its conditions to Boulez's "dialectic"?) for explaining both his own compositions and those of others working out of the GRM studio.

Boulez later went on to found his own center of musical research: the Institut de Recherche et Coordination Acoustique/Musique (IRCAM) in Paris. Georgina Born describes the founding of IRCAM as being motivated in part by Boulez' rejection of Schaeffer's GRM, yet at the same time ironically influenced by it in the attention given to acoustics, psychoacoustics, and timbre in musical composition (Born 1995:75–77).

IRCAM's *10 jeux d'écoute*

In 2000, IRCAM produced an interactive CD-ROM entitled *10 jeux d'ecoute*. The authors describe the purpose of the games, in pedagogical terms, as being "to attain a balance of play and perception and to develop the mechanisms of listening, memorization, and recognition in a prudent and deliberate manner" (IRCAM 2000:05).[6] The ten games may be summarized as follows:

1. **Classification of Sounds**—goal: to classify sounds by family according to their timbre and origin (12).
2. **Graphic Representation of Sounds**—goal: to associate a sound to two graphic representations: amplitude envelope and sonogram (14).
3. **Identification of Sonic Events**—goal: name the events of a sound sequence (20).
4. **Sonic Morphing**—goal: order the stages of the transformation from one sound to another (22).
5. **Morphing a Musical Theme**—goal: to reconstruct the passage from one musical theme to another (24).
6. **Musical Puzzle**—goal: to reconstruct a sequence from its fragments, according to the principle of the puzzle (26).
7. **Acoustic Space**—goal: to recognize various acoustic spaces simulated by the computer (28).
8. **Localization of a Sound Source**—goal: to localize the origin of a sound source (34).
9. **Moving Sound Sources**—goal: to identify the movements of two sound sources mixed within a single sequence (36).
10. **Synchronization of Image to Sound**—goal: to find the correct synchronization between image and sound (38).

According to the booklet that accompanies the CD-ROM, the ten games can be grouped into four sections: the first three games are concerned with the identification of sounds; the next three (four through six) are concerned with the ordering of sounds; the next group of three (seven through nine) are concerned with placing sounds in space; and,

finally, the tenth and last game is alone in investigating the relationship between (moving) image and sound (6–7). In the following discussion, I will explore the first nine of these exercises in terms of how they serve as a kind of ear training for electroacoustic media, with attention to what these exercises might reveal in terms of underlying aesthetic ideals and theories for electroacoustic music.

Group I: Identification of Sounds

The first group of exercises purports to be concerned with the identification of sounds. How, exactly, do the authors expect sounds to be identified—what are their criteria for identification? In exercises nos.1 and 3, the participant is asked to identify sounds using verbal descriptors. The participant's first task in exercise no.1 is to distinguish between "percussive" and "non-percussive" sounds—a distinction that, judging from the results of a "correct" classification, is primarily concerned with the attack envelope of the sound, regardless of the length of resonance or inharmonicity of timbre. In the next step, using the same set of sounds, the participant is asked to classify the identity of each sound's source (without directly naming the source) into one of the following categories: natural, human, instrumental, and synthetic. There is a kind of "evolutionary" progression to these categories, and it's interesting to note that the authors do not consider "human" sounds to be "natural." Here, "human" sounds are those emitted directly from the mouth—a cry, kiss, cough, laughter and speech—and are thus differentiated from "instrumental" and "synthetic" sounds that nonetheless require the involvement of human bodies in their creation, especially considering that two of the "synthetic" sounds samples given in the exercise clearly involve processed voices. A new set of sounds is given for the third task, all "instrumental." Once again, the participant is asked to separate the "percussive" from

the "non-percussive" sounds; the sounds are then further grouped according to the traditional instrumental families of strings, winds, and percussion.

While one of the overall purposes of this exercise may have been to show how percussive sounds can be made by sources not usually thought of as percussion instruments, the overall manner of classifying sounds according to their material sources reinforces the conventional practice of identifying the timbre of a sound with the musical instrument with which it was produced—exactly that practice that Pierre Schaeffer makes pains to combat in his *Solfège*.[7]

In exercise no.2, the participant is asked to match a given sound to two different types of graphical representations: first, its corresponding amplitude envelope (the graphical representation most often encountered in sound editing software), which maps the sound's amplitude—or loudness—over time; and second, its corresponding sonogram, which maps the sound's frequency spectrum over time (see figure 4.1). As the accompanying booklet describes, the strategy for matching a sound to its corresponding amplitude envelope lies in the participant's ability to distinguish percussive from non-percussive sounds, as trained in exercise no.1. The strategy for matching a sound to its corresponding sonogram allegedly lies in the participant's ability to then distinguish harmonic from inharmonic timbres, although—given the sound selection for this exercise and because sonograms inherently contain amplitude information along with frequency information—the participant could in most cases easily match the sonogram image to its corresponding amplitude envelope image, without listening once more to the sound.

Figure 4.1: Listening exercise no. 2 from *Ateliers IRCAM: 10 jeux d'écoute*. When clicked, each of the buttons in the column at the left of the screen plays a given sound. A selection of sonogram images appears in the column at the far right of the screen; the column directly left of this contains a selection of images that represent sound amplitude envelope. In the game space in the middle of the screen, three sounds have been matched to their corresponding amplitude envelope and sonogram images.

While exercise no.2 relates to exercise no.1 in its emphasis on distinguishing so-called percussive from non-percussive sounds, exercise no.3 resembles exercise no.1 in its return to verbal description. Exercise no.3 might also be seen as related to exercise no.2 in that they both present models—of sorts—for transcription: here, the participant listens to a sequence of twelve "sonic events," then arranges a list of sources (verbal descriptors) for each event in the order heard. This is basically a memory and match game, although the memory aspect can be de-emphasized as the player has the option to play back the sequence from different starting points. The verbal descriptors are simple nouns that serve as identification for the sound samples used (for example, "airplane,"

"baby," "cymbals," "plucked string"). In level one, only one discrete sound sample is used for each node in the sequence; that is, there is a one-to-one correspondence between sonic event and verbal descriptor for each of the twelve events in the sequence. In levels two and three, two or three sounds might occur simultaneously within one "event" of the sequence, requiring more than one descriptor. This is presumably meant to develop a kind of polyphonic listening strategy.

All three exercises raise the question of what it means to *identify* a sound. In exercise no.1, identification is equated with verbal categorization; in exercise no.2, identification is equated with graphical transcription; and in exercise no.3, identification is equated, perhaps most conventionally, with naming the sound source. Another question to ask would be, what is the overall *purpose* of identification? That is, what is the underlying interest in developing listening strategies for such models of identification?

Group II: Ordering of Sounds

Although the accompanying booklet characterizes exercises nos. 4, 5 and 6 as concerned with ordering sounds, at least the first two of these three exercises might be more accurately characterized as being concerned with hearing *processes*. In exercise no.4, the participant is given an arrival sound, a departure sound, and five "intermediary" sounds in which the spectral information of the departure sound is imprinted (to use a visual metaphor) on that of the arrival sound at different gradations in strength.[8] Although the exercise is entitled "sonic morphing," the intermediary sounds would be more accurately described as representing stages or gradations of cross-synthesis. Ordering of the intermediary sounds is achieved by determining which of the two original sounds (arrival or departure sound) is more dominant in each of the intermediary sounds.

The idea behind the transformational process involved in exercise no.5 is closer to that of true morphing. Here, the notes of a "departure theme" are gradually shifted in pitch, with each iteration, toward those of an "arrival theme"; thus some of the pitches heard during the intermediary stages belong to neither the arrival nor the departure theme. The "themes" in each case are MIDI transcriptions of excerpts from keyboard works by Bach, Beethoven, Chopin, Boulez, and Baboni Schilingi.[9] A set of "intermediary themes" represent different stages in the (pitch) transformation from one theme to the other, and difficulty is increased by increasing the number of intermediary steps from the departure to the arrival themes. Ordering of the intermediary themes is achieved by determining how closely each one resembles either the arrival or departure themes in terms of pitch or pitch contour.

Reflecting for a moment on these two exercises, I wonder whether the ordering of the intermediary stages would be as easy to determine in the form of graphical transcription as they are aurally. Exercise no.5, because of its emphasis on discrete pitch sequences, could be readily transcribed into conventional musical notation, and the unidimensionality of transformation would, in my estimation, facilitate a similar success in the visual detection of the ordering of the intermediary stages as in the aural detection. This, combined with the significant number of music theorists concerned with theories of pitch transformation, would furthermore allow for an *explanation* of the ordering of the intermediary stages in a manner easily understood and acceptable to most music theorists today. In contrast, I'm not quite so sure whether graphical transcription of the intermediary steps in exercise no.4 would be quite as useful, over aural analysis, in

determining correct ordering. A fusion of exercises nos. 2 and 4 would be an interesting way to find out.[10]

I also wonder what kind of aural skills are ultimately being developed in exercises nos. 4 and 5. With this training, am I meant to have an increased sense of anticipation/resolution in electroacoustic and computer music, affirming the teleological nature of such music and thereby well rooting it in the tradition of Western art music? The "pedagogical pointer" given in the accompanying documentation for exercise no.4 leads in a different direction: To expand reflection on the theme of sound transformation in general, the teacher is advised to "use AudioSculpt with the students to realize other sonic transformations (inversed sounds, transpositions, filterings, etc.)" (23). Apart from the overt product placement, the underlying goal of this exercise may be to develop what Denis Smalley terms *technological hearing* (Smalley 1997:109), that is, the ability to hear the technique behind a "new" sound. Exercises nos. 4 and 5 also place an emphasis on the concept of hybridization[11]—suggesting a strong aesthetic leaning in compositional practices at IRCAM, which, as I have already mentioned, is notably different from those at the GRM.

In example no.6, the participant's attention is turned from hearing transformational processes to hearing the kinds of compositional processes that, ostensibly, create musical structure. Here, a short musical sequence (no more than one minute in length) is cut into seven fragments for the participant to rearrange in order. The participant has the option of listening to the original sequence in its entirety as well as her own arrangements of the seven fragments. There are three levels of difficulty to this exercise, and each level contains three different sequences: one excerpt from a "classical"

keyboard work (transcribed for MIDI),[12] one excerpt of "pop" music, and one sequence composed of noises. The latter two sequence types are composed by pedagogical assistants from IRCAM,[13] which may explain the conformity in structure among them, at least for the first two levels. In the first two "pop" music excerpts, structure (and therefore order) is created by the gradual addition of (mostly looped) instrumental tracks; in the first two "noise" excerpts, structure is created by the regular recurrence of a sonic event (a bird call in the first level, a door opening and closing in the second) while new sounds are heard during the intervals between each repetition. The structure of the noise sequences in levels two and three are also articulated in part by panning effects.

According to the accompanying documentation, the underlying purpose of exercise no.6 is to encourage the participant to reflect on the notion of the musical phrase. The authors state that the "musical fragments" presented in the exercise are "interchangeable" and the participant is encouraged to experiment with different orderings; in so doing, the participant is meant to get a taste for transformational processes and thereby gain an understanding of the concept of the musical phrase as a sequence of events that can be rearranged (arbitrarily?) through operations of permutation.[14] It is unclear, however, whether the authors consider all of the sound fragments presented in this exercise to be *musical* ones. Indeed, two of the three "noise" sequences present very clearly implied causal narratives: in level two, the original ordering of the "noise" fragments presents the sound of a door opening and closing on the right, the sound of someone walking on gritty pavement (?) from right to left, the sound of a different door opening and closing on the left, the sound of someone walking on a wood floor from left to right, the sound of yet another door opening and closing on the

right, the sound of someone walking on loose gravel (?) from right to left, followed by the sound of a final door opening and closing. The original ordering of the noise fragments presented in level three is even more definitive: the sound of a car engine starting up, the sound of cars racing (whizzing by from left to right), a continuation of the previous sound infused with an increasing frequency of the sounding of car horns, the sound of a car skidding on pavement (because of sudden braking?), and finally the sound of two hard surfaces impacting followed by smashing glass. Nevertheless, that the authors view at least the "classical" and "pop" music sequences as being subject to permutation allows insight once more into compositional practices at IRCAM.

Group III: Sounds in Space

The IRCAM software product Spat™—derived from the word "spatialization"—plays a dominant role in exercises nos. 7, 8 and 9. In exercise no.7, Spat™ is used to simulate the acoustic reverberations of five different enclosed architectural spaces: a "neutral," or non-reverberant, space; a small but highly reverberant space, represented as "salle de bains" (bathroom); a slightly larger but less reverberant space, represented as "salon" (sitting room); a large, moderately reverberant space, represented as "salle de concert" (concert hall); and a large, highly reverberant space, represented as "église" (Roman Catholic cathedral). The participant is given a sample sound and its representative transformations for each of the different spaces as a point of reference for categorizing the other sounds given in the exercise according to type of space they simulate. It should be noted that, while the authors have chosen culturally weighted names rather than generic descriptors (as I have attempted here) for each simulated architectural space, they intend the participant's matching of sound to simulated architectural space-type to have nothing to

do with any cultural associations that may exist between the identity of the simulated architectural space and the identity of the sound source.

In exercise no.8, Spat™ is used to simulate the localization of sound either to the left, to the right, in front of, or behind the listener (using headphones); in exercise no.9, the software is similarly used to simulate the movement of sound (panning) between left and right and between front and back in relation to the listener (again, the authors recommend the use of headphones). All three of these "sound space" exercises serve as much as software demonstrations as they do ear training exercises, as the participant's success in correctly completing these exercises is in many ways a measure of the software's success in simulating the various spatial effects.

The most problematic simulation is perhaps that of front/back localization and motion. Left/right localization and motion is simulated through inverse volume relationships between the left and right speakers; in a quadraphonic speaker system,[15] the simulation of front/back localization and motion operates on the same principle (with front and back speakers). Here, however, the authors are limited to a stereo system,[16] and thus a different method of front/back simulation must be employed. Such a simulation is difficult to achieve, and as a participant in these exercises, I did find the distinction between front/back less readily apparent than that between left/right. Also, the authors seem to have used a different method for simulating front/back in exercise no.8 than they do in exercise no.9. In exercise no.8, the "front" version of a given sound seems to have its upper frequencies boosted, while the respective "back" version sounds slightly muffled with an emphasis on the lower frequencies; this is probably an effort to simulate the filtering effect caused by the pinnae, which partially circumvent air flow from behind

the head to the ear's auditory canal.[17] In exercise no.9, however, motion toward the "back" seems to be characterized by decreased volume alongside increased reverberation (and the reverse for motion toward the front).

Although these nine exercises can be understood as exploring general aspects of listening not necessarily exclusive to musical contexts, they serve to demonstrate many aspects of listening that are exploited for artistic ends in electroacoustic music. The exercises present different methods or goals of listening, some of which are analogous to those presented by Schaeffer in his solfège (e.g., listening to discern a sound's amplitude envelope, frequency spectrum, and resonance); some of which Schaeffer might have been sympathetic toward (listening for the purpose of identifying a sound's point of origin or trajectory of motion in space; listening to identify a technical process or compositional strategy); and some of which Schaeffer would definitely not have favored (listening for the purpose of identifying a sound's source).

Schaeffer's *Solfège de l'objet sonore* may have served in part as inspiration for R. Murray Schafer's thinking about listening. In his book, *The Soundscape: Our Sonic Environment and the Tuning of the World*, the Canadian composer describes Schaeffer as having "made good use of" tape recorders (1994:129) and refers to Schaeffer's four-page table for classifying sound objects from the *Traité des objets musicaux* as a "dazzling performance of French complexity" (134). Although the latter comment has facetious undertones, Schafer—despite his own devotion to twelve-tone compositional techniques—makes it obliquely clear which side he would have stood on in the *musique concrète* versus *elektronische Musik* debate with his statement: "In the practices of

musique concrète it became possible to insert any sound from the environment into a composition with tape, while in electronic music the hard-edge sound of the tone generator may be indistinguishable from the police siren or the electric egg-beater" (111).

Schafer's *Ear Cleaning*

R. Murray Schafer's theory of *ear cleaning* is motivated from his belief that contemporary listening skills have been dulled by the constant roar and hum of electric technology, which has allowed for a general complacency toward noise pollution within modern society—indeed, he argues that "the modern soundscape has stimulated an appetite for noise" (1992:10). The ear cleaning he proposes as a remedy involves a listener's critical engagement with the sounding environment and culminates with a nearly meditative attention to silence. While he mentions "ear cleaning" in a number of his writings,[18] he presents a practical approach to the process in his book, *A Sound Education: 100 Exercises in Listening and Sound-Making* (1992).

According to Schafer, the first section of exercises "are concerned with aural perception and imagination" (12). Like the listening exercises mentioned above from the IRCAM CD, the first few exercises engage the participant with the identification of sound. In the first exercise, participants are asked to write down all the sounds they hear; Schafer does not specify, however, what method the participants should use and thus they are left to decide for themselves *how* they chooses to identify the respective sounds (whether to name the inferred sound source, describe the sonic structure, or otherwise).

Schafer is more specific in the second exercise, where he asks the participants to classify their lists of sounds into three categories: (1) sounds made by nature; (2) human sounds; and (3) technological (machine) sounds. These categories recall those from the

first listening exercise on the IRCAM CD, where the participant was asked to categorize the sounds as (1) natural, (2) human, or (4) synthetic. Missing here is the third category from the IRCAM CD, that of the conventional musical instrument. Would Schafer subsume instrumental sounds within one of these three categories? Or does he not expect the participant to be confronted with instrumental sounds outside of the concert hall?

In search of answers to these questions, I turn to Schafer's chapter on "Classification" in *The Tuning of the World* (1977:133–150). Here, he names six "catalogue headings" for classifying sounds: I. Natural Sounds; II. Human Sounds; III. Sounds and Society; IV. Mechanical Sounds; V. Quiet and Silence; and VI. Sounds and Indicators. Although Schafer admits that the catalogue headings are themselves arbitrary (137), it is interesting to note that headings I, II and IV correspond to the three categories given in the second exercise of *A Sound Education*, but any mention he makes of musical instruments falls either under headings III or VI—that is, "Sounds and Society" or "Sounds and Indicators," respectively; indeed, "music" is named both as a subcategory in itself as well as an item within the subcategory "Ceremonies and Festivals," both under the catalogue heading "Sounds and Society" (1977:142). This web of inter-nested categories recalls the previous discussion on terminology from chapter 2, and demonstrates that, once more, the headings chosen to classify sounds reveal at least as much about what the person performing the classification wishes to draw out of the sounds as they do about the inherent properties of the sounds themselves.[19]

Returning to the exercises in *A Sound Education*: Schafer notes that the exercises "in the middle deal with the making of sounds" (1992:12)—by which Schafer means primarily, although not exclusively, the *vocal imitation* of sounds. Already in exercise

no.10, Schafer asks the participants to locate and hum—that is, imitate—the pitch of a continuous tone, such as an electrical or ventilator hum (28). He advances this concept in exercise no.30 when he asks the participants to vocally imitate "the sound as I shovel into the following substances: coal, sand, gravel, snow" (50). Although Schafer also presents exercises that challenge participants to match sounds with pictorial representations (for example, exercises nos. 40–42; see figure 4.2), a greater part of his *ear cleaning* exercises are concerned with imitation as an extension or exploration of listening.

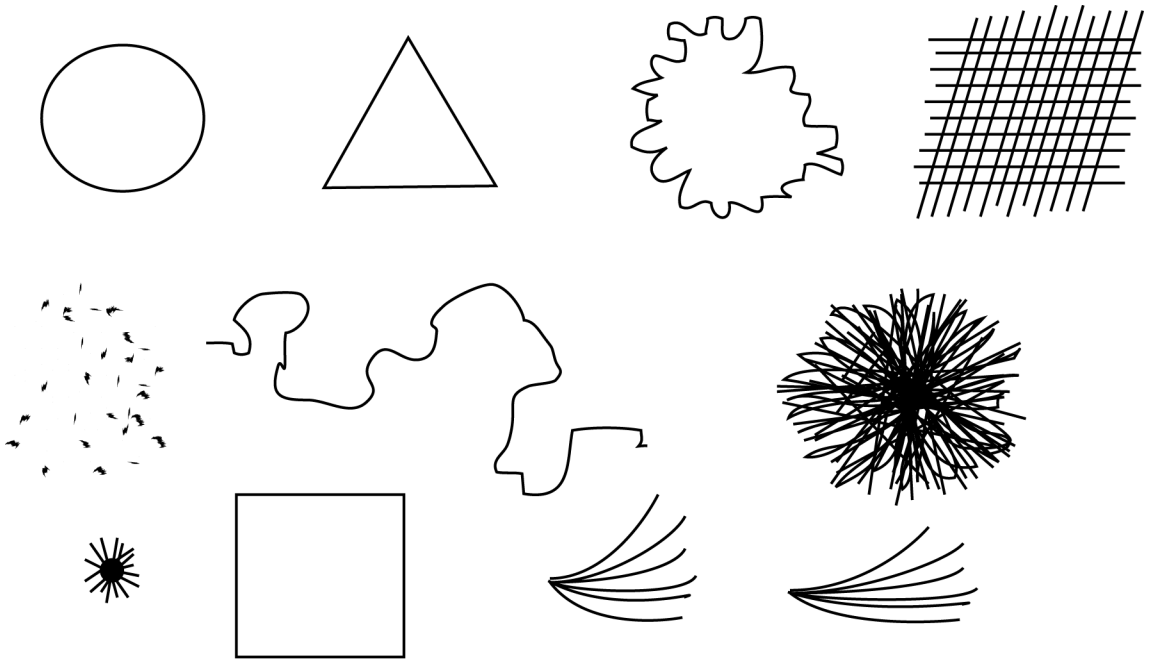

Figure 4.2: Images based on those given by R. Murray Schafer in his ear cleaning exercise no. 42, in which he asks "Try finding sounds to match the following shapes and textures" (1994:62).

He explains his philosophy in this regard in *The Tuning of the World*:

> To report one's impressions of sound one must employ sound; any other method will be spurious. Just as we accused acousticians of playing sound false by turning it into pictures, so we accuse psychologists of playing it false by turning it into stories. . . . The only way to check perceptions is to devise routines by which listeners can reproduce exactly what they hear. This is why the ear training exercises of music are so useful. (1977:153)

Schafer divides the act of perception into two parts: *impression* and *expression*, which are then united by *intelligence*. He then quotes from a personal communication with Dr. Otto Laske:

> Laske points out that sonological competence does not result from the mere reception of sensory information. "If that were so, (psycho)acoustic knowledge would be sufficient for design, but it isn't. The difference between psychoacoustic knowledge and sonological competence is exactly the difference between a 'knowledge of, or about' and a 'knowledge-to-do,' i.e., between a knowledge of sound properties and a capability for designing." (1977:153)

Schafer then posits that sonological competence may be in part culturally determined, noting that it seems to be greater among members of societies that value listening as a primary means of gathering information. He feels that people in Western society (at least, at the time of his writing in the 1970s) have a low sonological competence. Schafer turns to sound recording technology as a tool for remedying this deficiency:

> [I]n addition to our ears and voices we have today an instrument which can be used to assist in reclaiming the abilities of aural discrimination—I mean the tape recorder. With this device sounds can at last be suspended, dissected, intimately investigated. More than that, they can be synthesized and it is in this that the full potentiality of the tape recorder is revealed as an instrument uniting impression, imagination and expression. The tape recorder can synthesize sounds impossible for the voice. (1977:154)

Schafer's employment of tape recorders for the suspension, dissection and intimate investigation of sound bears similarity to Pierre Schaeffer's use of recording technology to isolate his concept of the sound object. Further comparisons can be drawn by taking a look at exercises nos. 66–69 in *A Sound Education* in which Schafer specifically calls upon participants to employ tape recorders. No.66, in which participants are asked "to record simple objects such as . . . a passing train" (1992:96), is a preliminary exercise in framing a sound. Exercise no.67, in which participants are asked to record "a sound that seems to be disappearing from the soundscape" while making note of accompanying

information such as date and location, demonstrates a concern with capturing and archiving sonic "endangered species" as a form of sound preservation. Exercise no.68, in which participants are asked to record variations of the same type of sound (such as "doors"), introduces sound recording as a way of investigating sound typo-morphology. Finally, exercise no.69 is meant "to illustrate the effect ambience has on a sound" by asking participants to "record the same voice speaking the same text in a dozen different environments and compare the results" (99). Schafer's exercise no.69 may be thought of as an inverted form of exercise no.7 on the IRCAM CD—both apparently calling upon the listener to pay close attention to sonic resonance, although Schafer's exercise begins with a knowledge of the sound and (real) acoustic spaces which are then recorded and compared, while the IRCAM exercise begins with the recordings which are then compared in order to guess the identity of the respective (simulated) acoustic space. Because Schafer's exercise requires participants to record the same primary sound source within various "real" acoustic environments, one might expect the characteristics of each environment to involve more than its resonating properties alone—that is, there may be other "ambient" sounds, besides the target vocal sound, that serve to characterize certain environments. For example, if I were to perform the exercise and chose a Vancouver pier as my first environment, I would expect to hear traces of wind, ocean, and gulls in the background along with the foregrounded reciting voice; if I chose a classroom as my second environment, I might expect to hear the sound of an air conditioner or heating vent, the hum of florescent lights, and perhaps the hum of computers or other electronic equipment in the background.[20] Given Schafer's emphasis on the importance of a sound's *context*, I would expect Schafer to embrace such aspects of a recording. However, his

instructions for proper recording technique within exercises nos. 66 and 69 contradict my expectations:

> If a camera puts a frame around a picture, the tape recorder can frame a sound. Just as we try to photograph the intended object clearly and centrally, we must try to record sound objects clearly and without interference . . . Avoid recording soundscape panoramas. Select specifics and try to record *only* the desired sound, without it becoming marred by unwanted noise.
> . . .
> Exercises with tape recorders should be made as specific as possible, and the results should be judged on the cleanness of the recorded sound. However, sound recording is a special discipline and to do it properly one requires a great deal of expensive equipment, not available to everyone. With cheap equipment, particularly microphones, one will experience more frustration than satisfaction . . . (1992:96, 99)

Here, Schafer's focus is on the *sound object*—he even borrows Schaeffer's term—going so far as to specifically warn the participant from attempting to record a "soundscape panorama." His aesthetic emphasis on the clarity and "cleanness" of recorded sound reflects his overall disparagement of "noise" in favor of silence and so-called *hi-fi* environments, as mentioned in the previous chapter.[21]

Like exercises nos. 7–9 of the IRCAM CD, many of Schafer's exercises deal with sounds in space, such as localizing a stationary sound or mapping the trajectory of a sound in motion. Schafer adds two spatial elements not considered on the IRCAM CD: namely, those of distance and dimension. How distant does a sound seem to be from the listener? Does a sound seem as though it is opening up a new acoustic space (such as the sound of a door opening) or perhaps reaching the listener through an opening to a new acoustic space (such as a sound from outside/inside reaching the listener through a doorway or window)? These are aspects of spatialization that IRCAM's Spat™ software—at least, in the version represented on this CD—is perhaps not designed to simulate, and therefore not under consideration among the *10 jeux d'écoute*. Schafer, of

course, is mainly concerned here with real world listening situations; this does not mean, however, that sonic impressions of distance and changes in acoustic dimension cannot be simulated on recorded media.

As I discussed in the previous chapter, the listener's aural impression of spatial distance and dimension are key factors in the distinction Schafer makes between "concentrated" and "immersed" listening. The different modes of listening presented by Schaeffer and Smalley, however, placed a greater emphasis on the varying degree to which the listener focused on the (nominal) identification of the material source of the sound (regardless of, or at least prior to, its spatial proximity to the listener). The three ear training models reviewed in this chapter present three varying treatments of the status of the sound *source*: the IRCAM listening games explicitly test the listener's ability to identify the sound source, and seem to present so-called environment sounds (as in exercise no. 6) primarily as sound-clues to the cause (material/event) which produced it; Schafer's ear cleaning exercises allows for the identification of the sound source, but more as a means to encourage the listener to pay closer attention to the sounds of the world around him or her in a conscious manner; Schaeffer, meanwhile, explicitly deters the listener from drawing cause-and-effect relationships between sounds and their sources as he wants to clearly distinguish his *musique concrète* from the kind of sound-effects sequences common to radio plays (and the "noise" sequences in exercise no. 6 from the IRCAM CD).

Schaeffer believes that the relationship between sound and (real-world) causal source must be suppressed in order to discover the "language"—that is, the syntactic

explanation of how sounds are organized—of acousmatic music. Boulez argues that the type of "environmental" sound sources employed by Schaeffer and others precluded any kind of musical dialectic, or structural logic. In contrast, R. Murray Schafer presents the imitation of environmental sounds as fundamental to music-making. In the next chapter, I will explore various notions of imitation, representation and mimesis as they have been applied to Western art music, as well as how they relate to structure and aesthetic ideals of music.

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[1] See the entries for "Solfeggio [solfège]" and "Solmization" in the New Groves Dictionary of Music (Jander 2005; Hughes 2005). Author: 'Article', *Grove Music Online* ed. L. Macy (Accessed [Day Month Year of access]), <http://www.grovemusic.com.arugula.cc.columbia.edu:2048>

[2] Or, at least, I should say I *presume* Schaeffer is quoting *E. T. A.* Hoffman—Schaeffer refers only to "Hoffman" and does not further specify the source of the quote.

[3] In the corresponding chapter of the *Traité*, Schaeffer cites the 1929 edition of A. Danhauser's *Théorie de la musique* (orig. 1872), in which Danhauser states that the ability to reduce the tonic chord C-E-G from the third and fifth harmonics of a tonic taken as fundamental is not a coincidence but "the result of the natural resonance of sounding bodies" ("cette disposition 'n'est pas l'effet du hasard . . . mais le résultat de la résonance naturelle des corps sonores'"; Schaeffer 1966:163).

[4] Here, and throughout *Solfège de l'objet sonore*, Schaeffer's use of the term "solfège" is translated in the accompanying booklet as "music theory" or, more simply, "theory."

[5] "Le matériau musical, pour se prêter à la composition, doit être suffisamment malléable, susceptible de transformation, capable d'engendrer et de supporter une dialectique. En refusant, ou plus exactement, en ignorant cette démarche primordiale, nos musiciens concrèts ont consitué un lourd dossier contre eux. Ils encourent le grief de produire des sons qui, techniquement parlant, du seul point de vue de la qualité, sont laids. Ils n'ont pu fournir l'explication qu'il aurait fallu développer avec une grande rigueur au sein du nouveau domaine électro-acoustique. . . . Au lieu de mener à bien une classification acoustique, on s'est borné avec des appellations du genre "son épais", "son éolien" et autres fantaisies d'humour douteux."

[6] Page numbers refer to those from the accompanying booklet. Translated from the original French: "pour atteindre un équilibre ludique et perceptif et développer à bon escient les mécanismes d'écoute, de mémorisation et de reconnaissance." All translations are my own except where otherwise indicated.

[7] In the accompanying booklet, the authors present supplementary activities for each game; for exercise no. 1, they do suggest that instructors ask their students to invent other possible ways of classifying sounds (notably all in the form of dichotomies) such as pleasant/unpleasant, long/short, sustained/unsustained (IRCAM 2000:13).

[8] The intermediary sounds are achieved through fast Fourier transform (FFT) analysis using IRCAM's AudioSculpt software. For more information on cross-synthesis, see Roads (1996:208, 420, 573–74). For an explanation of FFT and spectral analysis of sound, see Cook (1999:49–50) and Roads (1996:536–74).

[9] Each of the chosen themes is conveniently comprised of running sixteenth notes. While the first four composers in the list may be familiar to most readers, the last one may not. Jacopo Baboni Schilingi served

as a "composer in research" at IRCAM in the mid-1990s, and is listed in the credits for this CD-ROM under "conception/réalisation."

[10] This is directly possible with software like Ceres, Ceres2, Ceres3, etc., that can display spectral transformations graphically as a spectrogram in one application.

[11] In the "pistes pédagogiques" for exercise no.5, the authors suggest students try to compose their own hybrid melodies using two melodies that they know (IRCAM 2000:25).

[12] Level 1: J.S. Bach, Goldberg Variations, BWV 988; level 2: W.A. Mozart, Sonata for two pianos in D major, K.488; and level 3: F.P. Schubert, Fantasy for piano, four hands in F minor, D940. While the authors allow the Bach and Mozart excerpts to end with resolved cadences, the Schubert excerpt cuts off on a dominant-seventh chord on the verge of resolution—perhaps to add difficulty in determining the ending fragment?

[13] Jean Lochard created all three "pop" music excerpts and the first two "noise" sequences while Cyrille Brissot created the final "noise" sequence. Lochard also wrote the accompanying booklet to the IRCAM CD-ROM.

[14] I find the notion of "the musical phrase" to be moderately misleading in the presentation of the MIDI transcriptions of the "classical" keyboard works in both exercises nos.5 and 6; the so-called performances captured in these MIDI transcriptions are pedantic at best—treating the realization of the composer's score as a sequence of pitches with on/off points without nuance of dynamic or rhythmic inflection—and therefore insufficient as demonstrations for the concept of the "musical phrase" as an aesthetic concept in terms of performance practice.

[15] That is, a four-track system, each track representing one loudspeaker for each spatial position: front-right, front-left, back-right, back-left.

[16] That is, a two-track system with one track for the left speaker and one track for the right speaker.

[17] For an explanation of the function and effect of the pinnae and outer ear on hearing, see Cook (1999:4) and Handel (1991:465). As the size and shape of the pinnae as well as their angle from the head varies from individual, one might guess that their exact acoustic effect may vary as well, which would account for the difficulty in finding a generalized model that would be successfully simulate front/back localization for all listeners.

[18] For example, Schafer (1973:3) and (1977:181,208–113,222).

[19] At least Schafer admits that his catalogue headings are arbitrary and, presumably by extension, that the are no right or wrong ways to categorize sounds. This is not so with the IRCAM CD, as the participant is rewarded for the "correct" categorization of the given sounds. It is interesting to note further that the producers take a leap of faith in distinguishing sounds as "natural," "human" or "synthetic" in their exercise, as one could argue that, as mechanically reproduced sound recordings, none of the samples are "natural sounds," all have been manipulated by human hands and are all thereby synthetic.

[20] As well as noise from the street, if the classroom in question is in Dodge Hall at Columbia University.

[21] A high-fidelity recording—one true to the original acoustic signal—does not necessarily mean a "clean" quality of sound. Different microphones have different frequency response curves; some are designed to accentuate and/or de-accentuate certain frequency ranges, while others may have "flat" response curves that record a wide range of frequencies at equal strength. In turn, different loudspeakers also have different frequency response curves; therefore recorded sounds pass through two filters of sorts before being filtered again by our own ears.

Chapter 5: Mimesis, Gesture and Virtual Worlds

In the previous two chapters, a lot has been made of the ability for electroacoustic technology to remove a sound from its original source, to reproduce the sound in a new context without any visual clues as to its origins. R. Murray Schafer referred to this as an "aberration" of sorts, calling the separation of sound and causal source "schizophonia"—as if it were a kind of mental disorder in which what you hear does not match what you see. Denis Smalley and other graduates of the GRM prefer the term "acousmatic," which places emphasis on the acoustic over the visual, allegedly allowing the listener to listen with more concentration. The causal source of the sound becomes *immaterial*: not only is it not materially present, but—according to Smalley and others—it should be ignored.

In this chapter, I will explore the various ways in which sound—and, by extension, music—may be employed as an indicator of something other than what is commonly referred to as "the sound itself." In the last chapter, the ear training exercises I discussed from IRCAM (2000) and R. Murray Schafer (1992) asked listeners to employ the sound they heard as an indicator of a particular sounding body to various degrees of specification. For example, IRCAM's exercise no.1 asked listeners to identify whether the source of the sound might be classified within the general categories of "natural," "human," "instrumental," or "synthetic." In contrast, listeners were asked in exercise no.3 to answer the more specific question of "what would make this sound?" and provided a list of possible responses for what the implied source of the sound might be, such as "mosquito," "[human] voice," "flute," and "helicopter." Some of the name selections given for exercise no.3 were more descriptive in terms of the action involved, such as "[water] drops," "plucked string," "breaking glass," and "synthetic rumble"; others

required listeners to infer an action or otherwise fill in a conceptual gap between the sound they heard and one of the possible sources given in the list, such as in the case of "champagne cork" (action: pop!), "sword" (action: unsheathe!), and—perhaps the most curious among the selections—"cowboy" (?).

These examples display the varying degrees to which a sound may serve as an indicator for both a sounding body and an action; the distinctions this list also makes among the choices "voice," "laugh," and "cry" also implies that sound can also indicate an *emotional* relationship between bodies and actions—that is, understanding a sound as the product of a particular action being performed by a particular body as the result of a particular emotion. Bodies, actions and emotions—if source is immaterial, what do these have to do with electroacoustic music? This is what I now set out to investigate. I begin with a digression into origin myths of Western music.

Subjectivity/Objectivity: Irrational Pleasure versus Rational Order

R. Murray Schafer, in his essay "The Music of the Environment" (1973), introduces a set of polar oppositions for the essence of music, or what music "ought to be," by appealing to Greek mythology. Here, he is reacting against the romanticism of the nineteenth and twentieth centuries—particularly as represented in the music of virtuosic composers and performers such as Liszt, but also Wagner. Schafer presents the ancient Greek instruments of the aulos (a double-piped reed instrument) and lyre (a string instrument) as symbols for the irrational, subjective and emotional on the one hand—characteristics he identifies with the romantic artist—and the rational, objective and mathematical on the other:

> There are two basic ideas of what music is or ought to be. These may be seen clearly in two Greek myths dealing with the origin of music. Pindar's

> twelfth Pythian Ode tells how the art of aulos playing was invented by Athena on hearing the heart-rending cries of Medusa's sisters after Perseus had killed the Gorgon. In a Homeric hymn to Hermes an alternative origin is proposed. The lyre is said to have been invented by Hermes when he surmised that the shell of the turtle, if used as a body of resonance, could produce sound. (Schafer 1973:4)[1]

For Schafer, then, these two myths serve to differentiate between the idea that music arises from subjective human emotion (with the cries of Medusa's sisters) and the idea that music arises from the objective human exploration of the resonating properties of physical objects (here, a turtle shell). Schafer aligns the latter view to Pythagoras' "music of the spheres"—roughly, the belief that musical consonances are analogous, in terms of numeric ratios, to the proportional rotations of the planets in relation to the earth; this view shares its emphasis on objectivity and structure with that of the notion of absolute music.

These two myths, however, may be reinterpreted to support different claims about music. First of all, Hermes and others used the lyre to accompany songs that celebrated the lives and deeds of gods and heroes (hence the modern day employment of the word "lyrics" to denote the words of a song); in this way, the mythical music of the lyre bore more resemblance to the notion of program music than to that of absolute music. Secondly, the turtle shell was not a useful body of resonance as Hermes found it in nature; the god had to first cut off the hapless turtle's legs and scoop out its entrails (Evelyn-White 1914). This could be viewed as analogous to the sound editing technique of recording a sound found in nature, cutting its attack and decay points, and filtering certain internal frequencies of the remaining sound. Explained in these terms, both acts may seem more destructive toward the so-called natural world than means for tapping in to the secret of the "tuning of the world," as aspired to by Schafer.

Similarly, the aulos myth could be reinterpreted as the invention of musical imitation. Pindar explains that Athena invented the aulos because "with such [an] instrument she might repeat the shrill lament that reached her from Euryale's ravening jaws" (Myers 1904); thus, music as such did not arise from the emotional outbursts of Medusa's sisters, but from Athena's *imitation* of their cries. It is unclear from this brief passage whether it is the *emotion* that inspired Athena, or the sound produced as a by-product of that emotion; that is, it is unclear exactly what Athena's motivations may have been for seeking a means for imitating Euryale's cry. Indeed, Maria Rika Maniates suggests that by imitating the lamenting cries of Medusa's sisters using the artifice of the aulos, the virgin goddess Athena "neutralized the wail of women when giving birth and when keening the dead" (2000:148). In terms of the abstract sound alone, a reed instrument would be a reasonable and practical means for imitating what I could imagine as being a Gorgon's vocal cry—with its nasal tones and reliance on breathing. In this way, Athena's imitation of Euryale's cry, viewed as a neutralizing act by removing the sound from its original context, may be understood as analogous to Pierre Schaeffer's concept of reduced listening: repeating a sound until it loses its signification and becomes *music*—in its 'absolute' manifestation.

Through my reinterpretations of these ancient myths handed to me by Schafer, I have rewired their connections vis-à-vis the notions of objective/subjective, abstract, emotional and imitative music at least to the point of confusion. I hope this to serve as some sort of commentary on how I see the sixth-century notion of the "music of the spheres," nineteenth-century notion of "absolute music" and late-twentieth-century notion

of "abstract" acousmatic music as analogous in their hegemonic claims for objectivity, rationality and mathematics.

To underscore this point, I take one last trip into Greek mythology: other sources continue the origin myth for the aulos, telling how the goddess Athena discarded the instrument (because it distorted her face when she played it); the instrument was then picked up by the mortal satyr Marsyas. After achieving virtuosic skill in playing the aulos, Marsyas then challenged the god Apollo—a lyre player—to a musical duel. The Muses—hardly impartial—were among the judges, who ultimately favored Apollo. Apparently, Marsyas lost when the contestants were challenged to play their instruments upside-down—an easier feat for a lyrist than an aulete. As punishment for daring to challenge a god (and failing), Marsyas was skinned alive to die a tortuous death (Maniates 2000).

The Marsyas myth more fully reveals the weighted symbolism of the aulos and lyre passed down through Western culture. The aulos was created by a goddess, a virgin female, who then rejected the instrument so that it could be taken up by mortals—often those associated with hedonism, such as satyrs and female entertainer-prostitutes; servants who performed music for professional function. The lyre, meanwhile, was created by a god and remained in the hands of gods who played the instrument as a leisurely pastime. Combining the Marsyas myth with the two myths referenced above by Schafer, I find the aulos being used to symbolize, in various alternations, the feminine, low-class, hedonistic, libidinous, irrational, emotional, and imitative in music; meanwhile, the lyre is found to symbolize the masculine, high-class, serene, rational, heroic, and mathematical in music. Western music theory, of course, has historically reinforced the characteristics found in the latter.

Mimesis, Imitation and Representation

The concept of mimesis in music can be traced to Plato, for whom it did not so much describe—or at least was not limited to—the musical imitation of sounds from the natural world, but rather the capacity for music to express or represent moral character, or *ethos*. Mimesis was upheld as an aesthetic ideal that was best realized in the heroic songs—or *epos*—associated with the lyre, mentioned earlier in this chapter; in such music, however, it was not the tones of the lyre, but the words of the song, that carried mimetic meaning.[2] For Plato, then, music and art reached their highest aesthetic potential not through the crafting of internal structures (architectonics) but in their power to convey narratives. While the narratives favored by Plato often involved the gods, the concept of mimesis is usually understood today as involving the imitation or representation of the natural world.

Imitation and representation are not necessarily synonymous concepts in music (or elsewhere). Imitation is associated with a one-to-one replication or copying of a single sound—the imitation of a cry, of a birdcall, of a ticking clock. Representation requires a further level of abstraction, which means it can be simultaneously more vague and vast in its expression, as well as embracing concepts that would be impossible to convey (solely) through imitation—the fast or slow passage of time, the pastoral, the life of an artist. Some concepts—such as "the ocean"—may be conveyed in music through a combination of techniques for imitation and representation.

A clearer understanding of the difference between the concepts of "imitation" and "representation" might be gained by reflecting on Åke Parmerud's *Les Objets Obscurs* (1991). Each of the four movements represents a different object: a lock, a chair, a collection of marbles, the human voice/language. The sounds that compose each

movement are in each case derived solely from sample recordings of sounds made with the object in question. Much of the time, the source of the sounds is aurally obscured through various techniques of sound editing and processing; every now and then, however, *imitation* peeks through—the sound of a lock clicking open or closed, the sound of a chair scraping against the floor, the sound of a marble rolling on a hard surface, the sound of a voice uttering a word. With the four movements taken as a whole, the work represents a riddle whose answer is *music*.

A reader may be somewhat surprised at my use of the term "imitation" in the preceding paragraph. If Parmerud recorded a chair scraping against a floor, and then uses that recorded sound in his piece, isn't that *the sound* of a chair scraping against a floor, not the *imitation* of the sound of a chair scraping against the floor? The way I see it, no. First of all, the sound of a chair scraping against a floor ceases to be the sound of a chair scraping against a floor when the sound no longer comes from a chair being scraped against a floor but from a loudspeaker. Secondly, I cannot be completely sure if this sound that to me *sounds like* a chair being scraped against a floor is indeed the sound of a chair being scraped against a floor because I cannot see the chair in question actually being scraped against a floor.

Here I come back to the issue of source identification for acousmatic sound, as discussed in the listening and ear training exercises in the previous chapter. Of course, Parmerud tells me in his program notes for *Les Objets Obscurs* that the source of the sounds in the second movement are from a chair, so I may be predisposed in my listening experience to hearing the scraping, mid-range-pitched sound as that of a chair scraping against a floor. But perhaps Parmerud is playing a trick on me, the listener, telling me the

source of the sound is a chair but really it isn't, that he simulated the sound of a chair scraping against a floor using different (alternative) material sources and sound processing techniques. In such a case, a chair scraping against the floor would not be the *actual* source of the sound, but the *virtual*—or imagined—source. If, however, I hadn't read the program notes (or understood the French spoken-text at the beginning of each movement), I may have been inclined to hear the scraping sound as having a different source altogether, or maybe I wouldn't have been able to decide upon a possible real-world sound source.

The musical employment of sounds with obscured sources was not invented with electroacoustic technology; within Western art music, there seems to be a rather long practice of obscuring the source of a sound especially as a means to enhance the representational function of that sound. I alluded to such a practice in chapter 3, with respect to R. Murray Schafer's comment about how the reflective surfaces of stone cathedrals diffused the voices of Gregorian chant in such as way that the point of origin—that is, the bodies of the human sources—were obscured. I suggested that this suffusing of sound represented the omnipresence of a higher being in accordance to Christian religion. In chapter 1, I mentioned a similar liturgical practice among certain convents in fifteenth-century Italy, in which nuns would sing during church services from behind the convent walls so that they could be heard but not seen by the attending lay worshippers; by divorcing sound from source in the eyes and ears of the public, the nuns' voices could more readily represent those of angels descended from heaven (Monson 2004:122).

Many layers of representation and imitation are at work in the "Tuba Mirum" section of Verdi's *Requiem* (1874): here, four trumpeters stand together at some location offstage, obscured from the audience, and more or less mimic (or *imitate*) the calls of the four trumpeters onstage.[3] Collectively, these sounding trumpets represent the heraldic trumpets that announce the arrival of Judgment Day—the onstage trumpets perhaps representing calls from earth that are answered by the heavenly heralds represented by the trumpets offstage. In this way, the trumpets imitate each other, imitate the "sound of trumpets" as a concept, represent those *particular* trumpets that announce Judgment Day, and more generally represent heavenly forces and an expression of religious piety.

Mimesis and Gesture

The concept of musical gesture, as Rosemary Mountain notes, can refer to "stylised actions denoting something" (2004:19); this certainly seems to fit with the Verdi example above: the action of the trumpeters is stylized within Western culture to denote the beginning of a processional in which some sort of regal figure (like a king) is taking part. Thus I can talk about the trumpets in Verdi's "Tuba Mirum" in terms of mimesis as *imitating* the call of trumpets that announce such a procession in "real life" (in a supposed world beyond the concert hall) and *representing* the trumpets that announce the coming of Judgment Day, as well as in terms of musical *gesture*, that is, employing a stylized action to denote arrival of an important and powerful person or being. Mimesis and gesture, then, seem to be closely related as concepts.

From the "Tuba Mirum" example, the concept of mimesis would appear to have more to do with the imitation of the sound of something in "nature," while that of gesture seems to lay emphasis on some kind of action of "culture" rather than of "nature." Such

an understanding, however, may be oversimplifying the distinction. In the ear training examples discussed earlier, for example, I spoke in terms of mimesis when referring to a sound *representing* the action of a cork popping from a champagne bottle—surely this is an action of culture rather than nature? Indeed, Simon Emmerson uses the term mimesis "to denote the imitation not only of nature but also of aspects of human culture not usually associated directly with musical material" (1986:17). This definition is echoed by Denis Smalley, who describes musical mimesis as "the conscious and unconscious imitation or representation of aspects of nature and culture" (1996:84).

Perhaps gesture refers more to an associated behavior? This seems to be contradicted in the definitions for the two types of mimesis—"timbral" and "syntactic"—identified by Emmerson. He defines timbral mimesis as "direct imitation of the timbre ('colour') of the natural sound" and syntactic mimesis as the imitation of "the relationships between natural events" (1986:18). For Emmerson, then, mimesis—at least in his context of acousmatic music—seems to operate strictly in terms of imitation, either in terms of "timbre" or "syntax"; his concept of syntactical mimesis might equally be described as the imitation of behavior.

Smalley appears to consider gesture as a specific type of mimesis. Continuing the theme of "classification" that seems to permeate this study, Smalley identifies nine types of what he calls "indicative fields": gesture, utterance, behavior, energy, motion, object/substance, environment, vision, and space. According to Smalley, then, gesture is a kind of mimesis—one that describes the trajectory of energy and motion and is "bound up with proprioceptive (kinesthetic) perception of body tensions and therefore with effort and resistance" (1992:84).

Smalley's understanding of musical gesture seems to be quite different from the one suggested by Rosemary Mountain above. Mountain, however, recognizes that there are a number of different ways in which people talk about gesture with respect to music, noting that the term can equally refer to "the physical gesture used to perform some action" (2004:19)—perhaps it is from this more basic understanding of the term that the more "stylized" understanding, with its layers of cultural meaning, grew. In the thirteenth century, Roger Bacon posited a typology of *musica* in which he divided the concept into three parts: two audible (vocal and instrumental) and one visible (gesture). Thomas Adank explains Bacon's use of the term "gesture" (*gestus*) "as any proportional movement of the body or of just a part of the body (such as clapping)" (Marx 2004:305).[4]

Mountain continues her discussion of gesture to note that musicians especially are likely to associate the concept of musical gesture with "the aural result of a performance gesture" (2004:19). This seems to be the case with Andrew Mead, who writes that "music's path to the mind is through the body" (1999:15). Mead discusses the oft overlooked important role of the body—physical movement, muscular energy, breathing—in traditional music-making, and how tacit knowledge of the physicality of sound-making can play a large part—consciously or unconsciously—in a listener's understanding and appreciation of music (he acknowledges this to be the case in his own experience of music). Mead points to some ways in which this understanding of the physical effort required for sound-making can relay metaphorical meanings such as "control" and "restraint," "power" or "intensity." Similarly, he finds that rhythm and meter may be understood in terms of body rhythms; this leads him to speculate that the lack of metric pulse may "suggest weightlessness" (7). According to Mead, "We speak,

sometimes cavalierly, about 'musical gesture,' but we should never forget that there is some reality to the notion that much music is indeed produced through physical gesture. It doesn't seem unreasonable that we might index those physical gestures through the music they produce, and then imitate them. We want to feel in part what it feels like to make those sounds" (11). Mead refers to the feeling described in this last sentence as "kinesthetic empathy."

Mead's description of gesture as involving muscular energy and kinesthesis recalls Smalley's description of gesture in terms of "body tensions." In Smalley's typology of mimesis, however, he later posits vision—not proprioception—as "the very basis of the gesture-field," asserting that "the energy-motion trajectory is unimaginable without its visual correlations" (1992:90). Smalley's appeal to the visual as the foundation of all things gestural seems to echo Emmerson's claim that the composer of acousmatic music in a sense challenges the listener to imagine a visual image to accompany the music, stating that the music serves as aural clues, or data, for the construction of such an image (1986:18).

Gesture and Source Identification

This leads me to a contemplation of what Denis Smalley calls *gestural surrogacy*: "the process of increased remoteness of the sources and causes of sound making in relation to known, directly experienced physical gesture and sounding sources." In keeping with his empirical approach to theorizing about music, Smalley identifies four classifications of gestural surrogacy, which stand at increased degrees of remoteness from a so-called given *primal gesture*, that is, the physical (material/visual) gesture "on which sounding gesture is based" and which Smalley claims "occurs outside music in all proprioceptive

perception and its allied psychology" (1997:112). Taking my example Parmerud's *Objets Obscurs*, the primal gesture—if my understanding of Smalley's definition is correct—would be the physical movement and material of an actual chair scraping against a floor.[5] Primal gesture, for Smalley, is concerned with physical action and material, not sound.

Smalley defines *first-order surrogacy* as "project[ing] the primal level into sound" and "concerned with sonic object use in work and play prior to any 'instrumentalisation' or incorporation into a musical activity or structure." He further qualifies that "we can only award such sounds first-order status if we can recognise source (the type of material) and type of gestural cause" (112). Given this definition, is the sound of a chair scraping against a floor, as I hear it in the second movement of Parmerud's *Les Objets Obscurs*, an example of first-order surrogacy? For reasons given above, I'm pretty sure I'm right in recognizing and identifying the source as such. The only thing that gives me pause is the second clause in this definition about use of the sound being prior to any "musical activity." What I think he's saying here—and this becomes clearer in his definition of second-order surrogacy—is that he wants to distinguish the recording of a sound-making activity that isn't *traditionally* associated with music-making—like scraping a chair against a floor—from the recording of a sound-making activity that is more commonly associated with music-making—like scraping a bow against an open string on a violin. In this way, Smalley doesn't allow for physical gestures associated with traditional music making to be considered as primal gestures.

Indeed, Smalley says as much in his discussion of *second-order surrogacy*, which he defines as "traditional instrumental gesture . . . where recognisable performance skill has been used to develop an extensive registral [sic] articulatory play" (112). I understand

this as including sound-making for the sake of sound-making, that is, traditional music-making. I still find it nonetheless strange, this distinction Smalley makes between identifying the source of a recorded sound as a non-musical activity versus a musical activity. How would he classify the gestural surrogacy of the sounds heard in Pierre Henry's *Variations pour une porte et un soupir* (1963)? Henry composed this work from recordings he made while playing around with a particularly squeaky door he found in provincial France; the incredible range of sounds he was able to coax from the door certainly qualifies in my mind as "extensive registral articulatory play." Smalley, however, would perhaps relegate the sounds of Henry's work to the status of first-order surrogacy, as an example of a well-developed "gestural play purposely used as compositional material, a sort-of personalised, nascent 'instrument' which never achieves, or can never achieve full cultural, instrumental status."

Smalley's argument would presumably be that, while Henry may have been able to get the door to behave *like* a musical instrument, the cultural function of a door—even this particular door—will most likely remain as that of a thing that fills in a doorway. But is the sonic signification of the cultural function of a door not also dependent on the context of that sound within the piece? For example, Barry Truax observes that "[a]cousmatic composers . . . favour doors and their associated sounds as transitional cues, probably because they create the aural experience of a quickly changing acoustic perspective" (2002:8). In such a case, where the sound of a door is used to signify a structural function analogous to the function of a door in the material world—that is, as a passageway from one architecturally defined space to another—I might be tempted to agree with Smalley's distinction between first- and second-order surrogacy. However, in

Variations, Henry doesn't seem to be interested in the spaces on either side of the door; the cultural function of the door as a passageway does not seem to come into play.

Returning to the sound of a chair scraping against a floor: what order of surrogacy would this sound be granted if, as I conjected before, Parmerud had actually "tricked" me by using different materials and sound processing techniques to make me *believe* I was hearing the sound of a chair scraping against a floor (but actually wasn't)? Smalley writes that "music which uses simulation of instrumental sounds can also be regarded as second order since, although the instrument may not be real, it is perceived as the equivalent of the real" (1997:112). Smalley is referring to the use of commercial synthesizers, with their simulated "piano" and "flute" sounds; but does this also include simulations of other sounds, not of the traditional "musical" variety? What also of those fleeting moments in Henry's *Variations* when the sounds I had otherwise identified as a creaking door—the vibrations of wood and metal caused by friction—begin to sound deceivingly like a wailing saxophone—the vibrations of wood (reed) and metal caused by (among other things) blowing air? Smalley's definition for second-order surrogacy leaves me unsure at this point, and so I look for answers in the next level.

"*Third-order surrogacy*," according to Smalley's definition, "is where a gesture is inferred or imagined in the music." As an example, Smalley posits a sound that seems *as if* it were caused by a particular gesture, "even though we do not know exactly what the source might be because its sound-quality is unfamiliar, or because the resonance behaves in an unexpected way (uncertain/unknown source)" (112). I think of this level as enveloping moderately vague notions such as "sounds like something scraping against a corrugated surface" or "sounds like two hard objects smashing together." I'm not sure,

however, whether it also includes the kind of deceptive cases I described in the previous paragraph.

Smalley calls his final category of gestural surrogacy "remote surrogacy." This he defines as being "concerned with gestural vestiges. Source and cause become unknown and unknowable as any human action behind the sound disappears." This description makes me think of many of the sounds in Smalley's own work *Vortex*: sounds from which I can infer particular kinds of physical movements—such as vortical motions—but not in such a way that suggests real-world objects or events in terms of material substances or laws of gravity. Indeed, Smalley states that acousmatic music is "at its most adventurous" when it "extends into third-order ambiguity and beyond" (112)—a value statement that is in keeping with his remark, made with Emmerson, about the "abstract" approach to acousmatic music being possibly superior to the "anecdotal" approach.

I may still, however, be able to guess at possible sources for these "remote surrogacy" sounds in terms of electronic equipment or synthetic processes (like frequency modulation). This last point also makes me wonder about what effect the increased human interaction with electronic sources of sound might have on Smalley's classifications of gestural surrogacy as it relates to the listener's ability to identify sound sources. For example, certain types of broad-spectrum noise may invoke images in my mind of an air-conditioner, or a fan, or a television turned to a channel with no signal. I recall the popularity of the sampling of dial-up modems in many student pieces I heard around the turn of the twenty-first century—the source of this sound is immediately identifiable to most listeners at the time, yet I'm not sure to what extent it invokes a sense of human agency or gesture.

I am still left wondering what to do with the case of "I know it's the sound of a door but it also kind of sounds like a saxophone" from Henry's *Variations*. Do I need to make it fit into a single category, or does this case represent some sort of dissonance between first-order and third-order surrogacy, straddling second-order "simulation" surrogacy in the process? Does the same go for my hypothetical "deceptive" situation, where I-the-listener am led to believe that the so-called non-musical sound source is real, but in "actuality" it's a simulation? Smalley doesn't give the reader anything in the way of practical examples from the existent acousmatic repertoire to illustrate the differences among his different orders of classification. In focusing on a theory of acousmatic music built around the classification of "sound objects" abstracted from their original contexts, Smalley doesn't seem to want to talk about how a listener's understanding of these sound objects can also be affected by their musical contexts. Like his predecessor Pierre Schaeffer, Smalley bases his theories on his experience working with pre-compositional sounds, that is, sounds that have been collected through audio recordings but that have not yet been incorporated into any musical composition. Smalley's discussion of gesture seems to be scaled only to the local, moment-to-moment sense a listener may have of the immediate physical effort, "energy to motion trajectory" of individual sounds and therefore remains at a similar scale to the notion of "imitation" I discussed earlier.

The Human Body

The descriptions of musical gesture given above—whether by Roger Bacon in the twelfth century or Denis Smalley in the twentieth—seem to come back to the human body. I found Andrew Mead going so far as to suggest that listeners understand music in terms of

their bodies. While Mead was chiefly referring to the physical effort made by performers playing instruments, Barry Truax expands this concept to all sounds:

> It is clear that listeners use human sounds as a norm and are quick to ascribe human characteristics even to inanimate sounds whose patterns (of pitch contour, timber or rhythm) closely resemble those of the human repertoire. Conversely, people immediately feel "alienated" by machine sounds, which bear no resemblance as auditory images to human sounds, unless a suitable analogy can be found (e.g., the "iron horse," whose pantings and wheezings resembled familiar patterns, and whose corresponding image still provokes nostalgia in people, who associate it with a "more human" era). (Truax 2001:63)

Truax's observation raises the issue of how a sound may seem "natural" or "artificial" to a listener depending on how that sound may relate to the human body. The Muslim philosopher al-Fārābī, writing in the tenth century, used the terms "natural music" and "artificial music" to distinguish between music made by voices and that made by instruments, respectively;[6] writings attributed to Theodoricus de Campo in the fourteenth employ the term "artificial music" (*musica artificialis*) to include both instrumental music and "vocal music with a section of rhythmic declamation."[7] Interestingly, the Benedictine monk Regino von Prüm, pre-dating al-Fārābī by about half a century, distinguished between *musica naturalis* and *musica artificialis* in such a way that the former denoted music that was thought to have been created directly by the Hand of God—movements of the heavens, human voices and voices of animals (thereby subsuming Boethius's *musica mundana* and *musica humana*)—while the latter denoted music created by means of human invention, that is, instrumental music (Boethius's *musica instrumentalis*) (Wolf 2004:297–99).

This dichotomy made by scholars in medieval Europe between "natural" and "artificial" music underscores two related issues that have come to the fore in the previous chapter, namely the impulse to classify music according to perceived sound

source, and the need to distinguish between sound that is perceived as "natural" and sound that is perceived as "artificial." In any discussion of electroacoustic music—especially one that involves the recording and manipulation of acoustic sounds—the issue of distinguishing between the "natural" and "artificial" invariably arises.

We have already seen evidence of this in the sample ear training exercises from the previous chapter. In the IRCAM exercise for classifying sound, the four categories given seemed to progress from those most "natural"—beginning with the so-called "sounds of nature" like wind and bird-calls—to the most "artificial"—epitomized by "metallic" digitally processed sounds. Interestingly, the median categories between these two extremes were "human"—mostly vocal—sounds and sounds made by musical instruments; that is, those sounds that would have constituted the distinction between "natural" and "artificial" music for certain scholars in medieval Europe. Similarly, R Murray Schafer, in his second ear cleaning exercise, presented three categories for classifying sounds by source: sounds made by nature, which are presumably "natural"; human sounds, which *might* be "natural"(?); and technological (machine) sounds, which are presumably artificial.

With respect to the question of whether human sounds are natural, Schafer lists a number of examples for "human sounds" in his book, *The Tuning of the World*, and foremost among these are "sounds of the voice"—the source of "natural" music as discussed above—followed by "sounds of the body" and, curiously, "sounds of clothing" (1994:141). Moreover, Schafer argues that the first step in understanding a sound, or, put more colloquially, the first step in *getting inside of* a sound, is through vocal imitation. Vocal imitation, extrapolating from Schafer's argument, internalizes a sound for the

listener, making the sound the listener's own. As I noted in the previous chapter, Schafer posits vocal imitation as the primary—most natural?—form of musical mimesis, followed by imitation using other parts of the body; a third level of imitation involves secondary materials (such as paper, etc.), which ultimately behave as musical instruments; and, finally, the act of imitation is transformed into replication using sound recording technology.

Absolute/Program and Absolute/Anecdotal

Based on the assumption that recording and playing back a sound is an act of mimesis, Simon Emmerson and Denis Smalley, as I mentioned in chapter 2, draw parallels between the nineteenth-century debates between "absolute" and "program" music and the distinction they make between "abstract" and "anecdotal" approaches to acousmatic music. To review the former distinction, proponents of program music, exemplified in the symphonies of Hector Berlioz (most notably *Symphonie fantastique*) or the symphonic poems of Franz Liszt, allow the idea that music can convey—or perhaps *should* convey—a narrative sequence of events or poetic character and that a listener's ability to recognize this "higher" meaning is necessary for a full understanding of the music—that is, the musical composition and organization is in essence in service of the narrative or poetic meaning. In contrast, proponents of the ideal of absolute music believe that, in order for music to be a truly high form of art, it should be structured solely in terms of itself, purified of external references and representations. The notion of absolute music, then, is the choice for those who prefer to understand music in terms of form and structure (devoid of content?), while program music is more appealing for those who prefer to seek meaning and representation in music.[8]

For Emmerson and Smalley, the so-called abstract approach to acousmatic music composition, like the ideal of absolute music, lays emphasis on objectivity and structure. Here, we have the full fruition of Schaeffer's notion of the sound object—a recorded sound removed from its original, referential context and defined solely in terms of its physical properties, that is, its inner structure: timbre, attack envelope, frequency spectrum, pitch, and so on. Sounds are then combined and organized according to structural principles, avoiding combinations that might be construed as referencing or representing sequences of real-world events and thereby denying any definitive narrative or poetic meaning. An abstract approach to acousmatic composition may be exemplified in the works of Denis Smalley, such as *Vortex* and *Wind Chimes*, despite their representational titles.

The anecdotal approach to acousmatic music composition is epitomized in the mature works of Luc Ferrari, such as his series of works bearing the title *Presque Rien* . . . (for example, *Presque Rien No.1*, *Presque Rien avec Filles*, etc.). Ferrari was in the practice of gathering his sound materials by hanging a sound recorder around his neck and having it record while he wandered the streets of various cities and rural areas; in his compositions, he would often present long passages of seemingly unedited and unprocessed sound, treating the recorded sounds not as abstract objects organized by some internal structure but as referential sounds of life events and the external, social world. For this reason, Emmerson and Smalley align the anecdotal approach—its name alone implying the presence of an underlying narrative—to the nineteenth-century principles of program music (although the question remains as to whether such "anecdotal" works are necessarily organized around a poetic subject).

While the debates between program and absolute music were highly polarized, however, Emmerson and Smalley claim that the distinction between the so-called abstract and anecdotal approaches to acousmatic music should be thought of more as opposite ends of a continuum. Nevertheless, the spaces between the opposing poles in either case are filled with differing notions of what constitutes external reference, and these notions are themselves closely mingled with issues of representation, mimesis and expression,[9] as I have discussed above. The notion of expression—as I found in my brief exploration of Greek mythology—presents particularly sticky issues of the irrational and rational in music—connected to a dominant Western ideology of intellectual "purity" that (re)emerged in the twentieth century as a reaction against the excesses of nineteenth-century romanticism—and their relationship to Emmerson and Smalley's hegemonic claims of the "superiority" of the abstract approach to acousmatic music over the anecdotal.

Soundscape and Virtual Worlds

While composers of acousmatic music may use recordings of mundane sounds as raw material, through the act of isolated recording coupled with the compositional process they necessarily remove these sounds from their "natural" contexts in the real world and thereby invent new contexts for these sounds in an artificial or "virtual" world. Denis Smalley considers this process of re-contextualization to be a distinguishing factor in electroacoustic—and particularly acousmatic—composition:

> [T]his invisibility with electroacoustic music and not seeing the sources allows, I think, a new world of imagination to open up and one can create all sorts of sound worlds that the listener has no idea what they are or where they come from. It conjures up all sorts of images and connotations in the imagination and I think a very exciting world for the listener as long

> as they are comfortable with the fact that they don't know where the sounds come from. . . .
>
> That one is able to create—I was going to say simulate spaces, but of course they're not exact simulations; as soon as you put things between loudspeakers it's not a simulation of a real space, it becomes a particular kind of sonic and musical space. But because of the techniques available one is able to create impressions of space, take listeners into spaces or bring sounds from other spaces into listeners. And actually change the spaces, change one's impressions of dimensions of space, move or give the listener the impression that one is moving from indoors to outdoors or through different indoor spaces depending—it's not a question of just adding reverberation or making sounds whiz around, it's a question of the actual sound and the sound world and how they're put together as well. But that is one of the possibilities that is opened up by the acousmatic medium that is not possible or available in other musical media. (Cox 2000)

Smalley touches on two different factors here: the first is concerned with the range of sounds available to a composer, and what that range of sounds tells the listener in terms of identifying the sources for those sounds. For example, a listener might have a certain expectation of the range of sounds to be expected within certain musical genres of the classical Western-European repertoire to the extent to which these are often defined by their instrumentation: string quartets, symphonies, Pierrot-ensemble, even *Lieder* (implied voice and piano). When a composer is writing for one of these genres, she knows the "soundworld" which that instrumentation inhabits—thus you could speak of a "string quartet soundworld" or a "symphonic soundworld." This is perhaps why Smalley—and he is likely not alone in this—speaks of wanting to discover and create new soundworlds: in working with a new medium, he finds it inappropriate to restrict himself to the sound-palette of instrumental music—indeed, he finds it imperative to work with sounds beyond that palette.

The second factor in Smalley's construction of a new "sound-world" is concerned with the diffusion of sound, how this diffusion informs the listener about the properties

and dimensions of an actual or simulated space. A kind of dissonance can occur between the listeners' expectations regarding the acoustic properties of the architectural space they are physically inhabiting (in the real world) and the artificial space simulated within an acousmatic work. While in the above quotation Smalley is most likely referring to sound diffusion within a concert space, the dissonance caused by simulated space can be most striking in earphone listening, as I found in my discussion of simulated spaces (IRCAM 2000) in the previous chapter.

Simulating spatial dimensions are not the only means of creating dissonance between the listener's real-world location (whether it is a concert hall or living room) and the virtual world of a musical work. Although Denis Smalley prefers to compose with sounds that he feels have no real-world connotations—existing only in an imaginary, alien soundworld—other composers who do not shy away from elements of the "programmatic" or "anecdotal" may have the power to play with notions of *place* within their works. Francis Dhomont's *Espace/Escape* (1989), for example, juxtaposes (and at times superimposes) sounds with clearly identifiable sources and associated locations (often related to travel, hence "escape") with more "alien" sounds, while also constantly shifting the listener's sense of spatial dimension ("espace"). While the listener's sense of "place" is constantly mutating in Dhomont's piece, more unified impressions of place are the aim of so-called soundscape compositions, which involve the limited use of materials by restricting source sounds to those collected within a specific place, thus the exploration of the "new sound-world" is in essence an exploration of the sounds of an existing place in the real world. This relates to the claim that R. Murray Schafer makes with respect to program music, that "a descriptive piece of music turns the walls of the

concert hall into windows, exposed to the country. By means of this metaphorical fenestration we break out of the confinements of the city to the free *paysage* beyond" (1977:104).

Barry Truax posits three normative models for structural approaches to soundscape composition in terms of the spatial perspective of the listener in traveling through the respective soundworld:

> These models (which roughly correspond to each of the three *Presque Rien* works by Luc Ferrari) may be distinguished by the type of aural perspective on which they are based, namely:
> (1) fixed spatial perspective emphasising the flow of time, or a discrete series of fixed perspectives;
> (2) moving spatial perspective or journey emphasising a smoothly connected space/time flow;
> (3) variable spatial perspective emphasising a discontinuous space/time flow. (2002:8)

Truax's three models, which emphasize the interdependence of a listener's impression of both space and time, may also be applied to other acousmatic works that for other reasons might not necessarily be considered soundscape compositions, depending on the strictness of latter's definition. Dhomont's *Espace/Escape*, mentioned above, would be an obvious second example of the "variable spatial perspective." One of the "noise" sequences presented in exercise no.6 from IRCAM's *10 jeux d'écoute* (2000), which I discussed in chapter 4, follows the "moving spatial perspective" model. Judy Klein's *The Wolves of Bays Mountain* (1998), which I discuss in the next chapter, may be understood in terms of Truax's "fixed spatial perspective" model.

What exactly distinguishes a "soundscape" composition from an "anecdotal" work of acousmatic music? The answer to this—as I found in my investigation of other typologies in chapter 2—depends on whom you ask. The term is most strongly associated with a group of composers working out of Simon Fraser University (SFU) in Vancouver,

Canada, beginning on the 1970s and headed by R. Murray Schafer. One of these composers, Barry Truax, defines soundscape composition in contrasting terms to Schaeffer's *musique concrète* (here represented by Smalley's "classic acousmatic theory"), replacing Schaeffer's abstracted "sound object" with a more culturally embedded "sound event":

> In classic acousmatic theory, the sound object is abstracted from its source as an object for perception that must be totally detached from the recognition and associations of its source (Smalley 1992). In classic soundscape theory, the sound event can only be completely understood in relation to its full social, psychological and environmental context which supports a network of meanings that habituated listeners have learned to interpret" (Truax 1996:14).

There is both an aesthetic and political agenda attached to the soundscape composition, one that follows the aesthetic ideas expounded by R. Murray Schaeffer in his book *The Tuning of the World* (1977). Hildegard Westerkamp, another composer affiliated with Schafer's program at SFU, is appalled when fellow soundscape composer Michael Rüsenberg suggests "Let's face it: soundscape composition very often means bringing the noise into the concert hall."—To which she replies, "why and for what purpose?" (Westerkamp 2002:54). Rüsenberg's comment arose from a discussion about a piece he composed using recordings of motorcycles passing through an underpass near his home in Germany—a noise some of his neighbors complained about but which he wanted to explore for its musical potential (poetic beauty?). Westerkamp's reply reveals a belief that this sort of noise is not worthy of glorification as material for a soundscape composition. Soundscape composition, then, favors to promote awareness of only those sounds that may be identified with the "hi-fi environment"—as I discussed in chapter 3—those "natural," pellucid, pre-industrial sounds praised by R. Murray Schafer.

The question remains, however, of how much any of these distinctions—whether made by the composer or an aesthetician in the name of the composer—matter to listeners. In the next chapter, I seek to uncover whether there need to be decidedly different methods of analysis depending on where a piece may be placed on the so-called continuum between abstract and anecdotal approaches to acousmatic music. To this end, I will examine my listening experiences of Denis Smalley's *Wind Chimes* (1987), a piece that presumably represents the extreme "abstract" end; Hildegard Westerkamp's *Cricket Voice* (1987), a "soundscape" piece that perhaps lies at a median point between abstract and anecdotal in the treatment of its materials; and Judy Klein's *The Wolves of Bays Mountain* (1998), which may be considered "anecdotal" because of the long spans of more-or-less unprocessed sound material, or a "soundscape" piece because the sources of its sound material all relate to the same real-world environment.

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[1] Schafer presents the same passage, slightly reworded and expanded, in his book *The Tuning of the World* (1994:6).

[2] Thomas J. Mathiesen: "Mimesis," *Grove Music Online* (Accessed 20 November 2005), <http://www.grovemusic.com.arugula.cc.columbia.edu:2048/shared/views/article.html?section=music.18722>

[3] All three "early" vocal and instrumental examples mentioned here—Gregorian Chant, fifteenth-century convent singing, and the "Tuba Mirum" section of Verdi's *Requiem*—additionally serve to demonstrate that consideration of spatial placement, direction and diffusion were hardly born with electroacoustic technology; indeed, for acoustic music, any separated and hidden source also immediately raises the issue of location.

[4] "Gestus ist sehr allgemein gefaßt: jede proportionierte Bewegung des Körpers oder auch nur eines Körperteils (etwa Klatschen)." Marx is quoting Adank, "Roger Bacons Auffassung der Musica," *Archiv für Musikwissenschaft* 35 (1978):53. According to Marx, Bacon's inclusion of "gesture" in his typology for music implies that Bacon subsumes dance and stage-acting within his concept of music.

[5] Or, to paint a fuller picture, the primal gesture may be that of a person getting up from a chair and in so doing inadvertently nudging the chair she was sitting in so that it scrapes against the floor creating a sound; or, that of a person sitting on the floor with one hand holding a microphone and the other grasping a chair which the person obsessively scrapes back and forth on the floor until it makes exactly the kind of sound the person wants to capture in his recording.

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[6] "Musica" in *The Harvard Dictionary of Music*, Fourth Edition, edited by Don Michael Randel. Cambridge, MA: The Belknap Press of Harvard University (2003).

[7] Bruno Nettl: "Music §III: The concept in scholarship, 6. Classification," *Grove Music Online* ed. L. Macy (Accessed 16 November 2005), <http://www.grovemusic.com.arugula.cc.columbia.edu:2048>

[8] Roger Scruton: "Absolute music" and "Programme music," *Groves Online*.

[9] Not to mention to what extent these contrasting approaches to composition actually bear out in the reception of these works from the listener's standpoint.

Chapter 6: Analysis: A Search for Structure and Meaning

What is the purpose of music analysis? For some, it is to uncover "musical systems" for use by composers; this is the case of musical analysis that seeks to uncover, for example, theories of modes and scales, or rules of counterpoint or harmonic progression. An analyst may have either student composers or performers in mind when seeking to discover, for example, how a composer solved problems of counterpoint, developed motivic cells, or implemented thematic or serial transformations in a given work of music.

Analysis is also a means for placing value on a particular work or group of works—musicologists and theorists usually only spend time analyzing works that they value, serving to create a particular canon of works worthy of scholarly attention. Analytical methods also serve to demonstrate *how* these works may be of value: for their innovation, for their logical-proportionate structure, or for their displays of craftsmanship (hence the concept of the "masterpiece"). Heinrich Schenker, for example, developed his analytical methods for the purpose of aesthetic appraisal: the more closely a given work of music adheres to the axioms of his theory (that is, the more readily the work can be "explained" as an "organic" elaboration of his *Urlinie*), the higher value attributed to it as a "masterwork."[1]

The lack of attention provided electroacoustic music within mainstream musicological and music-theoretical communities (journal, conference papers, etc.) might imply that most musicologists and theorists do not see such works as worthy of their attention; more charitable excuses range from a discomfort with electronic and computing technology to a lack of skills in dealing with musical works that have no notated score. As I discussed in chapter 1, when electroacoustic music first emerged in

the mid-twentieth century (ca. 1950s–1960s), music theorists *had* made an effort both to come to grips with the technology involved and, later, to attempt to devise new methods of notation for this music. In this chapter, I discuss my own efforts to analyze three works: Denis Smalley's *Wind Chimes* (1987), Hildegard Westerkamp's *Cricket Voice* (1987), and Judy Klein's *The Wolves of Bays Mountain* (1998). I will discuss my reasons for choosing these three pieces for analysis later.

Analytical Method

My primary method of analysis is repeated listening. Most of my listening sessions have been carried out in solitude—that is, not in the company of other listeners—using stereo headphones, although occasionally I have listened to the works over the loudspeakers of a home stereo system. In the case of Judy Klein's piece, *The Wolves of Bays Mountain*, my very first experience of the work was over professional-grade loudspeakers within the space of a small recording studio, in the company of a handful of fellow listeners; a few years later, I was lucky enough to experience the work diffused quadraphonically by the composer at a public computer music concert. These hearings are etched in my memory and I'm sure have had an impact on subsequent headphone experiences of the work. My conscious analysis of the piece, however, draws mainly from notes made while listening to the work over headphones.

My focus in studying these works is uncovering and articulating what *I* find particularly interesting or captivating about each piece, especially with respect to how I understand each piece as exploiting the acoustic medium in its own way. I try to stay away from issues of compositional method or intent, although I admit that my listening

experience is invariably affected by my knowledge of the composer's methods or declared intentions as expressed in program notes or other writings.

My analytic procedure is also dependent on aural memory, as I reflect *back* on my listening experience of the piece. In my experiences as a practicing musician, I never felt I truly "knew" a piece until I had committed it to memory, such that I could perform the work without reliance on the score. Similarly, I have listened to the six works under investigation here on repeated occasions, sometimes over and over in the same sitting, until a complete aural impression of the work took form in my mind, such that I could conjure up an aural "image" from memory of different segments of the work, if not the work in its entirety. In this way, my approach to analyzing Westerkamp's *Cricket Voice* differs from that of Andra McCartney (1999; 2002b), who drew on accounts of different listeners after their initial hearings of the work.

In my attempts to map out my listening experience of each piece, I also made use of a sound editor[2] in order to make note of attack points, etc., of specific events—as measured in chronometric time—as well as track down and listen repeatedly to different segments within each piece. All pitch references were determined by my ear, as opposed to any kind of spectral analysis program; as I am not in possession of perfect pitch, I used a combination of the following tools in this process: vocal imitation, tuning fork,[3] synthesizer keyboard.[4]

I say that my primary method of analysis is *listening* although two of my analyses are accompanied by a graphic representation or detailed verbal description of the work under examination. These should not be mistaken as any attempt at a codified form of notation (especially in graphic form). Rather, like Norman (2004), I prefer to refer to

these as my personal listening maps, attempts not designed to account for every sound heard, but to highlight those things that have drawn my attention in my repeated listening experiences of the piece.

In some instances, I may adopt Luke Windsor's (1995) method of speaking in terms of event perception, that is, describing how such-and such a sound may afford a particular understanding in terms of a particular real-world context, reference or significance according to the listener's experience. An acousmatic work may draw on the interplay between sound and sign in a listener's understanding of sonic phenomena; such an interplay may be inferred from Barry Truax's observation, quoted in the previous chapter, that acousmatic composers like to use sounds of doors to denote transitions because such sounds give the impression of a swift change in what Truax terms "acoustic perspective"—that is, particular sonic information in an acousmatic work may afford the action of doors opening or closing, which may in turn be perceived by a listener as movement from one room or space to another. Although I do not wish to adopt the authoritative voice that Truax assumes by speaking in terms of compositional intent, I do believe that this interplay between sound and (perceived) source, as well as the relative clarity or ambiguity with which I may perceive such relationships, are important elements in my understanding of this music.

Taking lessons learned in the previous discussions on modes of listening and new ways of thinking about ear training, I allow myself within my analyses to explore different modes of listening; rather than breaking music down into parameters (pitch, rhythm, dynamics, timbre) and completely focusing on one over the others, I recognize

that all of these elements interplay within my listening experience, and are constantly in flux between my foreground and background attention.

As I learned in my investigation of Schaeffer's theories, his invention of the concept of the sound object was an attempt to get away from the concentration on pitch—or, rather, to find an new structural replacement for pitch. But I find that turning then to a concentration on the description and classification of the sound object betrays an attempt at a new form of notation—one that is precise enough to act as a substitute for listening. I claim here, however, that in the case of music, there is no substitute for listening; I see in all attempts for a singular precise method of description a futile search for a substitute for listening. I say futile because I understand each listening experience as unique even within the same listener, and the ability—and tendency—for a listener's focus to shift from moment to moment, from one thing to another, as well as in and out of attention through boredom, surprise, etc., at least in part because of what happens—or doesn't happen—over the course of a work. I acknowledge that there are moments when I find myself falling in and out of attention—that at certain moments a piece may allow my mind to wander, then jar me back.

Scores, Graphs and Other Images of Music

In Chapter 1, I mentioned some of the ways in which some analysts have sought to compensate for the lack of a conventional score for electroacoustic music. These included the shorthand notation developed by Brian Fennelly (1967) to describe the specific timbres and amplitude envelopes of individual sounds within a work, Robert Cogan's (1984) use of spectral photographs to denote large-scale impressions of frequency and amplitude contents of given works, and Pierre Couprie's (2004) iconic approach to

visually represent both the "shapes" of individual sound-objects as well as more large-scale impressions of a work's organization.

Judy Lochhead, in her article "Visualizing the Musical Object," seeks to devise a form of "visual access" to electronic (sic) and other non-notated music; she argues that "visual representation of musical sound constitutes an understanding of that sound" and is therefore necessary for a full engagement and understanding of music "in more formal terms." She supports her argument by alluding to limitations of human cognition, asserting that "without a visual representation musician-scholars must rely on their memory of occurrences and there is no simple way to refer to a particular occurrence in context" (2005:12). What exactly does she mean by this? Surely, it is possible to refer to a specific moment within a piece by providing the reader with a chronometric timepoint coupled with a verbal description of what is happening; saying that something occurred at 4:28 is no more artificial to the listening experience of a work than saying something occurred in measure 63—even in instrumental works with strong metric pulses, it is unlikely that a listener (without a score) counts off measures as the piece goes along.

In contrast, Luke Windsor argues that analysts should be cautious when working with visual representations of acousmatic (sic) music; he observes that scholars are often tempted to treat such representations—rather than the musical work as aural phenomenon—as the object of analysis, mistaking them for "neutral" texts in terms of Jean-Jacques Nattiez's semiological approach to music analysis. As Windsor states:

> Descriptions based upon the notion that a score is the final arbiter of aural experience relegate auditory perception, the only experience of the acousmatic work itself, to a position secondary to some visual representation or analysis. Perception is here mistrusted and hence requires verification: it is to be compared to the intentions of the composer, or to some notatable aspect of the piece. (1995:42)

Windsor posits a perceptual approach to the analysis of acousmatic music, based on psychologist James Gibson's "ecological approach" to perception and eschewing any graphical form of notation for acousmatic works.[5] Indeed, both Lochhead and Windsor recognize,[6] a visual representation of an electroacoustic work is itself a form of analysis, the product of an interpretation on the part of the person who devised it. This realization shifts the object of representation: rather than referring to such a visual image as a representation of a given musical work, it should more accurately be recognized as a representation of an *interpretation* (or analysis) of that work.

When I talk about issues of large scale structure—which I feel compelled to do in order to gain an "understanding" of any piece, perhaps because of my training in traditional Western music theory—I do find it useful to create some sort of visual aid to *supplement* my discussion. The visual diagrams I have created for two of the works under examination are quantitative along the x-axis (showing the passage of time measured in minutes and seconds) and qualitative along the y-axis (providing qualitative verbal descriptions of key events in the piece).

Analysis No. 1: Denis Smalley's *Wind Chimes* (1987)

What strikes me most about the beginning of the piece is Smalley's use of silence—it's a digital silence, too, which for me creates an isolating effect, like a vacuum, especially when I'm listening to the piece over headphones. Experientially, silence seems to last so much longer than its chronometric duration, leaving me waiting with heightened attention for sound to break out. I find, however, that my experience of this silence is quite different when I "read" along with the music when playing it through a sound editor. For example, Figure 6.1 shows the stereo amplitude waveform of the first fourteen seconds of

Smalley's *Wind Chimes*, including the ten seconds of silence between the initial attack (high, inharmonic single chime strike) and the second attack (chime strike in a lower register), as it appears in the sound-editing program WaveLab (Steinberg). As I play the soundfile in this editor, a vertical bar passes from left to right, thus allowing me to watch the passage of time and more accurately anticipate the entry of the second attack, that is, the end of the silence. The silence seems much longer to me when I'm not watching the bar, causing the entry of the second attack to have much more of a jolting effect on me than if I had been watching the vertical bar scroll through the soundfile.

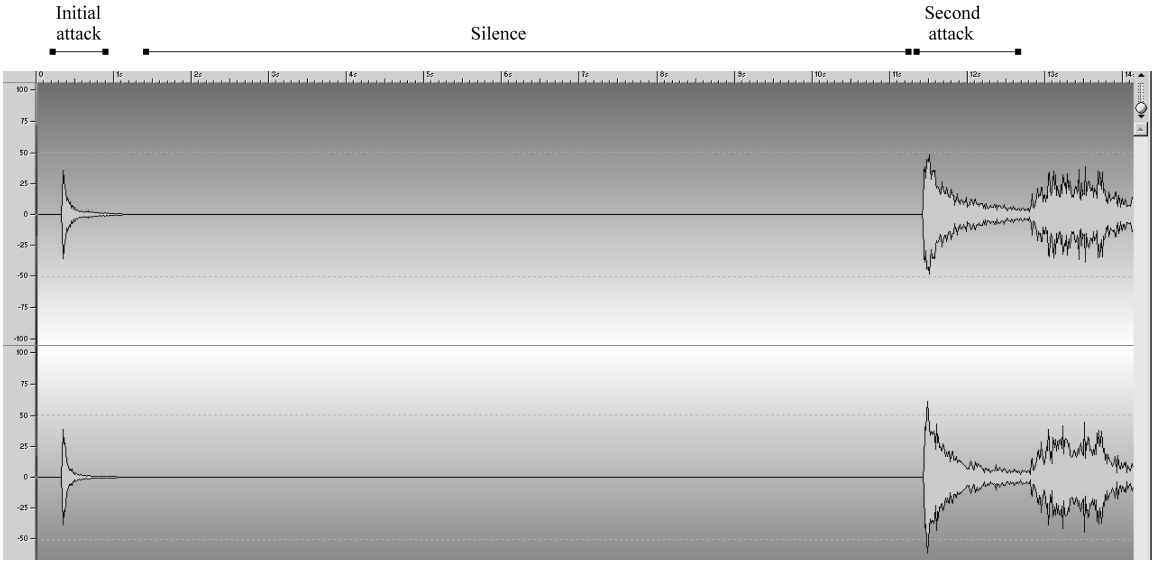

Figure 6.1: Stereo amplitude waveform of the first fourteen seconds of Smalley's *Wind Chimes* (Steinberg WaveLab 4.0)

Similarly, if I pan out the view in the sound editor so that I can see, at a smaller resolution, the first fifty-five seconds of the soundfile, I can watch the vertical bar pass through the peaks and valleys of the glob of sound that follows the second attack—seeing where it's been and where it's going, anticipating the second fall into silence and the third "initializing" attack.

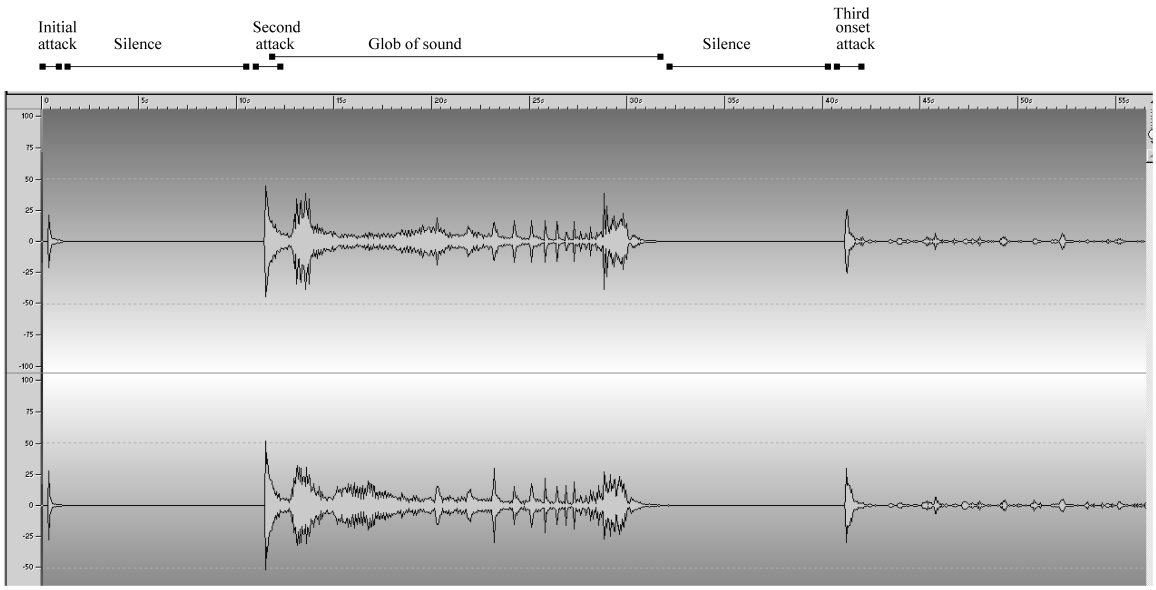

Figure 6.2: Stereo amplitude waveform of the first fifty-five seconds of Smalley's *Wind Chimes* (Steinberg WaveLab 4.0)

I mention this to underscore the risk of relying too heavily on visual representations, of being seduced by them without recognizing or acknowledging the difference reading along with such a visual representation makes to the listening experience. Before discussing how I hear these moments of silence as having structural consequences later in the work, I turn to reflect on aspects of Smalley's theoretical writings discussed earlier.

In the previous chapters, I referred quite a bit to Denis Smalley's writings *about* acousmatic music: the way in which he problematizes the relationship between sound and source, his ready adoption of Schaeffer's concept of the "sound object" and his invention of related concepts such as "gestural surrogacy"; his preference for what he calls an "abstract" approach over an "anecdotal" approach to composing acousmatic music. This leads me to anticipate that similar concepts, at least in the ears of the composer, might be at play in his acousmatic work, *Wind Chimes*. He describes a framework for understanding the work in the following liner notes:

> *Wind Chimes* is based on the chance find of a set of ceramic wind chimes in a New Zealand pottery during a visit in 1984. The pattern of their harmonies was immediately attractive, but certain detailed qualities of the struck or scraped pipe were more enticing: the rough but closely-knit grain of the sound, the brilliance of high harmonics, and the appearance of a complex internal harmonic structure. Recording and slowing down the sounds revealed even more, suggesting such possibilities as deriving complex, sustained textures by stretching out the sounds in time. . . . [Further materials] mainly include recognizable sounds which are used as recorded or else transposed: a bass drum; high, metallic, Japanese wind chimes; resonant metal bars; interior piano attacks, resonances, timbral and pitch distortions created by sliding a glass over the piano strings. There are also some digitally synthesized sounds.
>
> The piece begins by using the wind chimes as they might behave normally, building them into larger complexes and transforming them so that they approach wooden, skin and metallic sounds. Developments based around sustained contours and textures follow. Many of them give the impression of spinning or rotating at various rates, or of being bowed, creating high, resonant spin-offs. There is a strong contrast between attacks of high energy and intensity, and the more spacious, haunting textures reaching out towards the end of the piece. I regard *Wind Chimes* as a strongly expressive narrative built around energies and gestures, materials made up of different substances, and different types of motions in space.

I find myself comparing the qualities that struck me most in listening to the piece to the remarks Smalley makes above. I can confirm that, after a stop-and-go opening, I do hear a lot of what sounds like wind chimes behaving like wind chimes in the first few minutes of the piece; in some scrap notes I made during one of my listenings, I mention hearing "shimmering" and "tinkling" sounds toward the beginning of the piece, as well as at least one instance of what I called a "splashing attack" (1:08) that I initially described as sounding like something between splashing water and breaking glass, but then decided (maybe after reflecting on the title of the work) that it sounded like someone running his or her hands through a mass of wind chimes.

The isolation of the initial sound object—a metallic attack, a frozen dollop of sound—draws my attention to it, makes it important to me and I therefore carry the

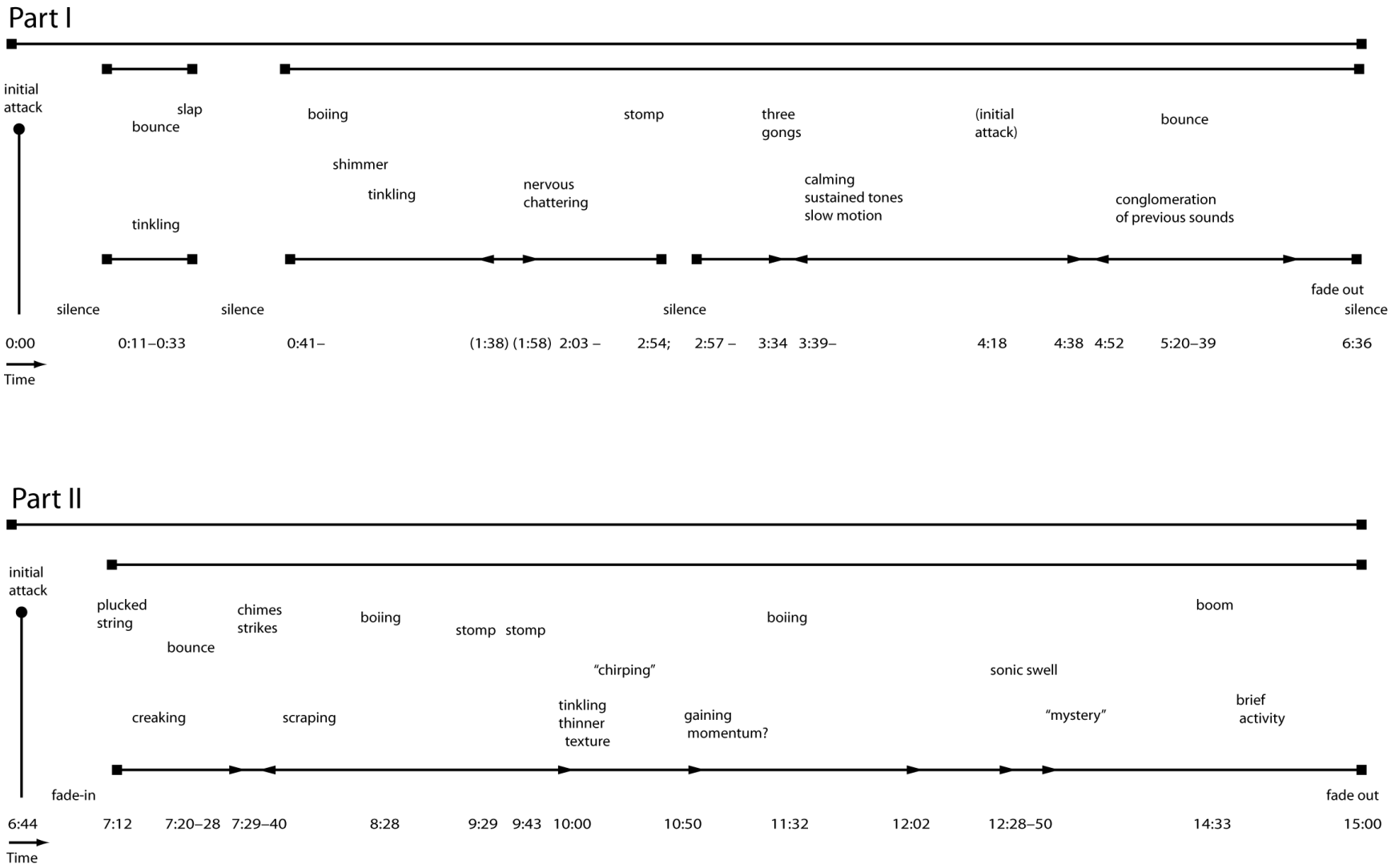

Figure 6.3: Map of Smalley's *Wind Chimes*

memory of that initial sounding moment with me as I travel through the piece. These two sounds—digital silence interrupted by a sharp sonic attack—combine to form what Smalley might call a gesture that, for me in the experience of this piece, signals the beginning of something. When I hear the same sound repeated about halfway through the piece, I feel like I've somehow returned to the beginning. Based on this premise, I've drawn a brief map of what I consider to be an outline of the large-scale structure of the piece as shown in Figure 6.3.

The isolating effect of silence that I hear at the opening of the piece also helps to establish a few other sound objects as part of a "cast of characters" that for me serve as structural markers in my listening experience—sounds that I retain as distinct "objects" in my memory and thereby carry a kind of personalized "meaning" as I recognize them returning at different moments in the piece. One of these is a "sound object" I call "bounce"; it's the third sound (0:13)—other than silence—that I hear at the opening of the piece, and the first one without a sharp attack. I call it "bounce" because when I hear it again after its initial entry, it's immediately repeated about twenty times[7] (0:20–29) with an ever decreasing interval of time between each repetition in a manner that seems to mimic that of, say, the bounce of a ping-pong ball that has dropped to the floor.[8] The sound of each bounce, however, is too sluggishly amorphous and resonant to be that of a ping-pong ball. The frequency range is too low, and the attack envelope too dull, as if the "source" of the sound were rubbing slightly with each impact against whatever surface it might be bouncing on.

These repetitions of "bounce" are cut off by "slap" (0:29), which is followed by a second interval of silence. In this way, I come to associate "slap" as a signal for the

interruption or ending of something. I consider it to be directly related to the sound object I call "stomp," introduced a little later in the piece (2:54). Similar to the way "slap" cuts off the repetition of "bounce" and is then followed by a moment of silence, "stomp" serves to briefly interrupt a sequence of sound objects that I characterize as "nervous chattering": with the entrance of "stomp," the more texturally-functioning "nervous chattering" is briefly silenced, behaving like a bunch of chattering people who gawk at each other in silence after hearing a sudden loud noise, then fall back into chattering once they've established they're not under any immediate threat. I feel like "stomp" is trying to effect a similar reaction among the textural sound objects resonating in what I call "Part II" of the piece, but the other sound objects aren't paying attention to it this time (9:29), which is why it feels the need to try again (9:43), but again without success.[9]

The different sectional divisions I've mapped out for the large-scale structure of the piece are informed in part by such "opening" and "ending" gestures. They also denote, however, changes in rates of activity among the sound objects—what I suspect Smalley means with his characterization of contrasts "between attacks of high energy and intensity, and the more spacious, haunting textures." An example of this would be what I have mapped out as the contrast between a passage of "nervous chattering" and "calming sustained tones / slow motion" in Part I.

In a discussion of his earlier work *Vortex* (1982), Smalley describes aspects of that work—as an example of his general style—that I find to be equally applicable to *Wind Chimes*:

> There are certain things in the piece which are typical of my music . . . One thing is the using of striking, usually attacking events to generate movement forwards in the piece. They act as almost the structural pillars—points that one is leading towards or else impact events that

> initiate movement forward and these are quite prevalent in my music. In other words, the music has a sort of narrative forward motion in a traditional Western music sense even though the sound world is obviously not the same as instrumental music. . . . I'm also concerned with creating unified sound, let's say sound objects, particularly very compact single events of which attacking events are one type as opposed to those events which have a more internal texture, are more texturally designed so there's a contrast between those solid events which are filled in and other events which are more scattered in terms of their distribution through pitch space, are more texturally conceived. I'm obviously concerned in all my pieces with the idea of motion and movement; . . . contrasting and combining those two attitudes towards making sound objects is at the heart of being able to create the textures and contours and the idea of particles and unified objects that are almost, I think, in some cases like . . . real objects, visual objects moving through space. . . . So these moving energies: the climaxes, the scattering of textures, the scattering of sounds through space and the velocities of sounds through space . . . are an important part both of my style and of this piece. And finally I think I'm very interested in sounds which have a certain resonance like metallic gongs and things . . . although they don't necessarily sound like real live metallic sound they nevertheless have some of these qualities about them: the ringing and maybe the brightness of their internal tone have some echoes of large resonant objects. (Cox 2000)

I certainly do hear a distinction in this work between what might be called "textural objects" and "attacking objects": the labels I used in Figure 6.1 such as "bounce," "slap," "boiing" and "stomp" refer to attacking objects, while "nervous chattering," "tinkling," "shimmering," and "scraping," for example, refer to textural objects.

What I find most captivating about this piece, however, are the "darker" textural elements; for this reason, the piece doesn't really seem to get underway for me until about three-and-a-half minutes in, after the event which I have labeled as "three gongs" in figure 6.3. The "attacking objects" are more distractions for me, serving to help me locate where I am in the piece during repeated listening but not necessarily the sustained focus of my listening (of course, they can't hold my sustained focus because they're not themselves

sustained). At the same time, however, the longer stretches of "darker" texture, with relatively few interruptions of attacking objects, are also the moments that are most likely to have what might be characterized as a morphine effect on my listening, lulling me into a kind of half sleep, especially if I'm already a little tired. In figure 6.3, I've characterized one such moment—the one between 3:39 and 5:20—as "calming," "sustained tones," "slow motion": in this way, I recognize a change of energy from a sonic environment with high rates of change and activity ("nervous") to one with a slower rate of change ("calming").

Toward the end of the piece, I have labeled another one of these textural moments as "mystery" (12:50 to the end). Here, it is specifically the metallic-sounding octave leaps among high C's and A's that capture my attention, juxtaposed at times to create either descending minor thirds or ascending major sixths. The higher octave pitches tend to go a bit flat at the end of their decays, which perhaps contributes to name I have given to this segment of the work. The bubbling activity that superimposes itself on this texture serves as a closing gesture, a kind of rush to the end, although the gradual fade-out of these high-pitched ebbing tones also make me feel somewhat like I am retreating from them rather than they are ceasing to be.

Analysis No. 2: Hildegard Westerkamp's *Cricket Voice* (1987)

As I discussed in chapter 5, acousmatic works are experienced in part as the interplay of sound-objects and space—both the movement within space, and the opening up and closing in of space. Along with sound-objects and space, soundscape composers add another element of play in their works: that of *place*. The word "soundscape" itself is

understood as the aural counterpart to the visual imagery of a place when speaking in terms of its landscape. Westerkamp's colleague Barry Truax, for example, explores different elements of the Vancouver soundscape in each of the four movements of his work *Pacific* (1990), using different sound sources recorded in a specific location (Vancouver, Canada) and utilizing their associative relationships as a means of establishing and exploring a sense of place for the listener. Although the experience of the work may be enhanced for listeners who themselves have experienced the sounds of Vancouver firsthand, the exploration of place in soundscape compositions does not necessarily require knowledge on behalf of the listener of the specific place in mind by the composer. Any listener who has visited a coastal community, who knows the sound of the ebbing ocean, waves crashing on the shore (*I. Ocean*), harbor boats blowing their horns (*II. Fog*), or seagulls circling above (*III. Harbour*)—whether on the Pacific or other ocean—can appreciate the sense of place in Truax's work. The sound of firecrackers and hand cymbals that accompany the dragon dance in celebration of the Chinese New Year (*IV. Dragon*), however, situates the otherwise generic coastal sounds explicitly along the Pacific Rim.

It would, however, be misleading for me to speak of Smalley's *Wind Chimes* as having "no place"; the listener may have a sense of being transported to a new place, but the place of these works is abstract and other-worldly (although some of the individual sounds may evoke earth-bound experiences)—as I mentioned in chapter 5, the composer himself expresses interest is in constructing and exploring *new* soundworlds, placing the listener in an acoustic environment that she would presumably not associate with any actual place in the real world (outside of a sound studio) but may still well imagine as

being some*where*. Soundscape compositions, as well, often take their listeners in and out of abstract soundworlds; indeed, the juxtaposing of the "other-worldly" and "earth-bound" sense of place often becomes an important element in the experience of these works. Such is the case with Hildegard Westerkamp's *Cricket Voice*.

Westerkamp recorded the sound sources that she eventually used in the composition of *Cricket Voice* while participating in a month-long artist retreat in a specific geographic area (namely, the Zone of Silence in Mexico); the retreat was a rather intense experience for the composer, such that she did not feel comfortable using the recordings for the purpose of musical composition until two years later (McCartney 2000). It is impossible for anyone—save, perhaps, for a few of her retreat companions—to share the same distinct sense of place as experienced by the composer when listening to *Cricket Voice*. I hear, however, a more generalized sense of place in the work, one that moves in and out of association with an earth-bound environment and an other-worldly one that plays an important role in the experience of large-scale structure in the work.

Guided by this sense of place, I hear *Cricket Voice* as structurally dividing into five sections, a kind of arched form:

I. Opening section (dur. – about 2 minutes): a sense of being in the out-of-doors, a natural earth-bound environment, with blowing wind (or ebbing waves).
II. A (dur. – a little over 3 minutes): looped whipping/scraping sounds mark the transition as the wind is replaced by the pervasiveness of long, low sustained tones/rumblings; the sense of place turns from earth-bound to otherworldly.
III. Middle section (dur. – about 1 ½ minutes): the space becomes enclosed, the only sounds heard seem close in proximity with little sense of spatial depth.

IV. A' (dur. – about 2 minutes): a return to the vast, otherworldly space as the deep-rumbling tones returns.

V. Closing section (dur. – a little under 2 minutes): reverberating clapping/stomping foretell a return to earth-bound space; gradual fade-out of otherworldly material until only a cricket remains.

While I have laid out broad distinctions between sections of earth-bound/otherworldly senses of place, ambiguities do pervade the surface material among the different sections. For example, the pulsating tones that enter in the opening section do not necessarily seem to "belong" within the kind of environment presented by the wind; that is, they cannot be identified as sounds of a natural environment, but have rather an artificial quality to them reinforced by the way they move toward (fade in) and away (fade out) from the listener. Similarly, the unprocessed cricket sound continues through the "otherworldly" sections, anchoring the listener to the memory of the natural environment. Andra McCartney (2002) interprets the varying sense of otherworldliness throughout the work as a kind of critical commentary on how the contemporary urban dweller experiences untamed nature as alien and a cause for anxiety. However an individual listener may interpret this interplay between varying senses of place, there is no denying its important role in the structure and experience of the work.

With respect to pitch-relationships in the work, there is an overall Eb-ness (or thereabouts) throughout. After the first gust of wind establishes a sense of place in the opening seconds of the work, a pulsating tone enters from the distant left (0:04), gradually drawing nearer, steady in pitch (Eb3) and pulse (ca. 85bpm) like a low-level warning signal. As this tone continues pulsating, keeping to the left, it is answered to the

right by another tone (0:11) about a fifth higher in pitch (Bb3) and at a quicker rate of pulse. A momentary increase in intensity occurs as a buzzing tone rises in the center (0:21), a semitone or so above the lower pulse on the left and therefore creating a sense of dissonance. Shortly thereafter, a third pulsating tone rises in the center (0:34), at the same pitch as the buzzing tone before but duller in timbre. The pulsating tone on the right fades out (0:27–0:32); when it returns (0:36), it is initially about a minor third higher than before (Db4), then shifting a pitch up or down by a semitone each time and thus presenting a kind of short melody (Db-Db-C-Db-Dn-Dn-Db-C-C-C-C). Meanwhile, the pulsating E/Eb of the original "bass pulse" grows louder while a new sound enters: that of a chirping cricket. More pulsating tones arise and fill the air (a G at 104 bpm's beginning at 0:51, which then goes a quarter- or semi-tone flat); my attention is especially drawn at one point towards the end of the opening section to a tympanic-*Also-Sprach-Zarathustra* moment between the original pulse tone and one a fourth below it (Eb3 to Bb2 beginning around 1:09). I hear this tympanic moment, as the work progresses, to have been a foreshadowing of the deep rumbling/throbbing pulses that hover around a low Eb (with microtonal adjustments) and fill the background space of sections A and A'.

In section A, the focus of my attention turns to the percussive wooden/knocking sounds (beginning at 2:23). These percussive sounds dominate the surface activity until the end of the Middle section, when the original pulsating tone returns (6:33), again to the left, signaling the transition to section A' and followed shortly thereafter by the deep rumbling tones. It is in this fourth section that the pulsating tones really have their fun. New pulsating tones appear, sounding at one moment like an ambulance alarm (Eb=D#-B, 7:30–7:42), then devolving into randomized "computer bleeps" (7:42–7:55) before

tightening closer together into a kind of microtonal trilling gesture (7:55–8:27), at times rising and falling.

At some point, it becomes clear to the listener that these pulsating pitches are in some way related to the cricket sound. Indeed, the cricket sound itself is a high, pulsating tone. Again, the listener may be struck by the similarities between the sound of nature represented by the cricket sound on the one hand, and the sound of urban life represented by these pulsating tones—as warning signals, tympanis, ambulance alarms and computer bleeps—on the other.[10]

The overriding "Eb-ness" does not seem to me as an arbitrary abstract pitch choice in the way that keys are chosen for instrumental music in traditional Western art music; while I find the pitch content to be part of the surface level play, it does not carry the primary a role in my sense of the overall composition, structure, and aesthetic effect of the work. Rather, the pitch content may be understood as a kind of by-product of a concrete source: the original song of a lone cricket. The high-pitched, rapidly pulsating sound made by the cricket is maintained—within the unaltered instances presented in this work—in the vicinity of a high Eb.[11] Furthermore, this sound is produced not by vocal chords but by the cricket scraping its wings together. Thus all of the sounds Westerkamp explores in this work relate back to the cricket "voice" as pitched and percussive pulsations and scrapings; the former are produced through electronic processing of the original cricket sampling, the latter are sounds associated with scraping a stick or similar object over corrugated surfaces (just as the crickets rub their wings). The wooden-like sounds are produced for the most part not from the cricket sample itself, but from recordings of the composer knocking on various types of cacti located in the cricket's

habitat. Thus the main sound sources are those of wind, cricket and cacti—an aural fantasy on the Mexican desert.

Analysis No. 3: Judy Klein – The Wolves of Bays Mountain

Unlike the works I discuss here by Smalley or even Westerkamp, Klein's piece cannot be understood in terms of the sound-object concept. The recorded sounds Klein uses in this piece have for the most part very obvious implied sources and the sounds are chosen because of a particular connection among their sources. The sounds of bird calls, train whistles and crickets together with the sounds of the wolves interact to provide the listener with a very vivid impression of a particular virtual space and location—one that can be identified according to the listener's experience in the real world. The sounds of wolves running, panting, huffing, and drinking water provide an impression of the wolves' bodies—physical presence, energy, etc.—beyond their howls; these body sounds, together with the supporting sounds of birds, trains and crickets, might be thought of as a kind of recitative that links the various howl-arias, as it were. Yet there is still a play between the abstract and programmatic going on here that is set up in the opening section.

As the composer describes in her program notes, this piece can be divided into three sections—opening, middle, and closing—with the middle section further partitioned into two sections, representing morning and night:

> The piece opens with sounds derived from the recording of a winter chorus howl. Over time, the voices of the wolves become distinct. Two wolves bring the howling to an end with a sequence of short, antiphonal calls. In the middle sections, the recordings are virtually unedited. It's nearly spring. The wolves are heard in their environment, first in the early morning and then in the still of the late night. The howling in the final section is again from winter, the mating season. It ends with the love song of Kashtin, the alpha female of the pack, and her majestic mate, Navarro, who died the following year and in whose memory the piece was written. (Klein 2005)

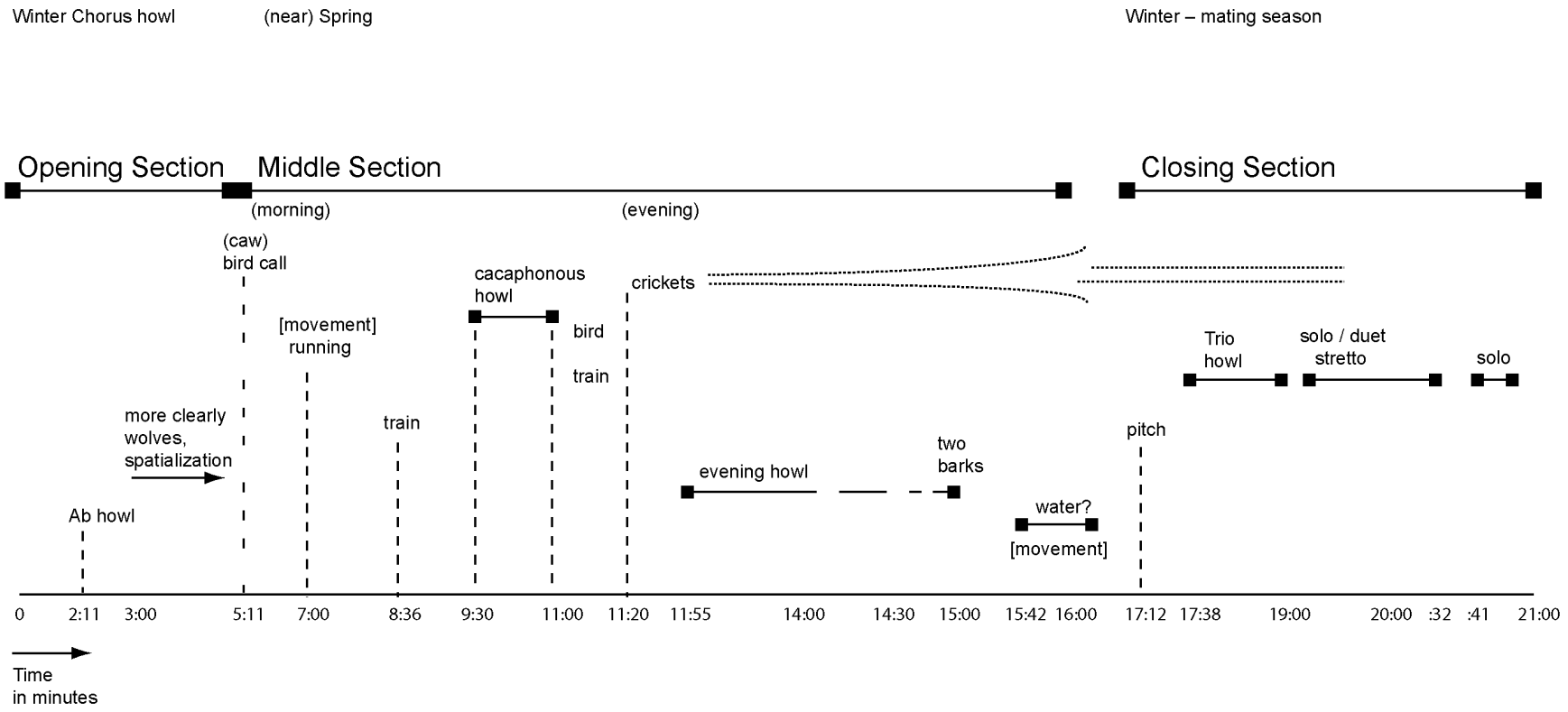

Figure 6.4: Map of Klein's *The Wolves of Bays Mountain*

I have mapped out my hearing of the structural divisions of this work in figure 6.4. I define the opening and closing sections according to the presence of processed sounds—that is to say, sounds whose sources have been disguised or obscured through digital processing. Following this definition, the opening section may be understood as spanning roughly the first five minutes of the work, and the closing section roughly the last four minutes of the work; the middle section has the greatest span of approximately twelve minutes, thereby accounting for more than half the total duration of the 21-minute work as measured chronometrically. The listener's experience of time in this work is another matter, but before I attempt to address this issue I will provide a verbal description of my hearing of the opening section of the work.

> *The opening section begins slowly and quietly, with sustained, highly resonant, crystalline sounds—water glasses? —presenting clear pitches. These sounds afford in my mind an impression of abstract music, concert space; because of this, I find myself drawn to listening for pitch relationships, which I find: a Bb jumps up a tritone to E, then returns to Bb. The Bb is repeated more loudly, accompanied by an E below; the Bb leaps again to E and returns to Bb, while the "bass" E rises to Gb and then slides down a semitone to F. Actually, I had heard that F faintly at the very beginning, in a melodically outlined second inversion Bb minor triad (F-Bb-Db). Indeed, Bb seems to be functioning as a kind of anchor pitch here, around which E, Db and F form pitch-constellations: tritone, minor third and perfect fourth. My use of the word "constellation" is not mere whimsy; time seems to move at a celestial pace, almost hypnotic or*

dream-like (or, at least, like certain swoony dreams). My overall impression here is of a slow, gradual motion, not only with respect to the duration of the pitches but also of the amplitude envelopes of each sound—there are no sharp attacks or sudden impacts. This slow motion coupled with the prevalence of tritones (Bb-E) and minor thirds (Bb-Db) stirs within me a kind of melancholia. Despite my use of metaphorical and emotional references in describing my listening experience, however, I'm still hearing these sounds as "abstract"—rather than programmatic—music.

The rhythmic motion slowly accelerates, accompanied by an increase in pitch variation and dynamic intensity. Here and there, sounds peek into my aural landscape (or soundscape) that don't quite fit the image that had been building in my mind of a water-glass music box. I ignore the doubt that accompanies my subconscious mind asking, "What was that?"—But then, a new focal pitch is suddenly introduced to shake me from complacency (2:11): Ab leaping to Cb+ (a quarter tone sharp?); was that a wolf's howl, or an imitation thereof? This melody of sorts then settles on Eb, hanging there for a while then meandering down to D-C-D before anchoring itself to C. Here, the melodic motivic leaps to the tritone and falling minor third return, now using C as the base pitch. Increasingly from here, the sounds conveying these pitches do not afford the impression of celestial chimes, harps or water glasses, but the howls of wolves. As each wolf drops its musical mask, I am gradually able to locate them

individually to the right, to the front, to the left (they have me surrounded); this sense of spatial positioning gets stronger as the resonating "celestial" sounds fade and the "actual" wolf voices become more foregrounded. Is this still abstract music? Do the wolves care what pitches they sing? That is to say, do the pitch relationships still have the same significance to me now that I hear them to be sung by wolves, as opposed to being performed on an imagined musical instrument? I hear a single howl coming from my left (3:52), centered around G, then going flat. Another follows shortly thereafter (4:02), again from the left, sounds like G leaping to B then falling to F#; and another (4:11), more centrally located in its spatial position, roughly comprising of Ab-G-F#, immediately succeeded by a short reply from the right that peaks on Eb. A series of howls follow, emanating from the virtual wolf to my left and, on two occasions, answered by a different virtual wolf sitting a little closer to me on the right. All the while, the "celestial" sounds burn themselves out over the falling third motive in the background, behaving more like crackling embers sprinkled with pixie dust, emitting their final sparks at the end of a bonfire, fading to silence.

A new, unaccompanied sound comes from somewhere to my right, signaling a shift in the soundscape (5:11): my virtual transportation from concert space to an open field (?) somewhere in the countryside is now complete. It sounds like perhaps the caw of a crow (?), followed by another, a little closer and to my left. There must be trees or telephone

> *poles nearby. Apart from the birds, there is relative quiet. The way their calls resonate, I think the air might be a little damp; that, coupled with the quiet, makes me think it is morning—besides, my experience has been that birds are noisiest at dawn.*

From my description above, a moment arrives part way through the opening section when my attention is drawn away from pitch structure to spatialization; in this case, it happens around the same time that I become aware that the sounds I had been listening to were those of wolves howling. My experience at the beginning of the piece, in evaluating the what I hear initially as "abstract" music, demonstrates that such a notion is itself culturally learned and does not preempt any "extra-musical" significations that the listener may associate with the sounds—such as the various impressions of celestial motion, slumbering dreams, and melancholia that the music evoked in my imagination.

The Spoken Word

Before I conclude my analytic experiments here of specific acousmatic works, I would like to comment on the analysis of Yves Daoust's *Mi Bémol* (1990) that Luke Windsor presents as an example of his perceptual approach to acousmatic music (1995:122–49). Windsor makes many useful observations regarding the way in which the juxtaposition of "natural" and "artificial" sounds and how they serve as linking structures within the piece; however, I take issue with two—perhaps minor—aspects of his analysis: first, the inexplicable need he seemed to have to force the large-scale structure of the piece into the mold of sonata-form (138); and, second, his cursory treatment of the speech events foregrounded in the work, especially those related to what Windsor characterized as "Amerindian land rights" (136).

In fairness to Windsor, he does explicitly state near the outset of his analysis that he would not attempt "to interpret the 'meaning' of these speech events" (133). However, I believe that a closer attention to these speech events and how they serve to locate a specific time and place—more specifically than Windsor's identification of "a relatively recent event which occurred in Canada" (135)—that may serve to build a more satisfying interpretation of the large scale structure than Windsor's suggestion that it behaves like sonata form because the opening material returns at the end.

There are three separate "speech events" that occur in this work. The first sounds like a large group of people chanting—"[something something] Québecois!" (0:58–1:03); much like what one would hear at a political rally in Montreal, perhaps? Windsor makes passing reference to this speech event only inasmuch as it is preceded by what he calls an "instrumental" event that serves to reinforce what he considers to be the "overall virtual environment" of the piece, while the speech event constitutes a "sub-environment" (1995:129).

A short while later, after an occurrence of what Windsor calls a "falling gesture" (1:03–1:07), a second speech event occurs. As Windsor rightly points out, this speech event has a definite "broadcast" feel to it, as if it were recorded from a news report on the radio. Windsor observes that there are three speakers involved, although only two are intelligible. In keeping with his perceptual approach, Windsor notes that the two intelligible speakers are "distinguished by gender" (first speaker male, second speaker female) and that the geographical location can be placed in North America because of the "accents of the speakers" and the "unfamiliar language [!] employed to refer to events" (133). What Windsor fails to mention is that these two intelligible speakers are talking in

English, while the unintelligible speaker—a female voice—is talking in French (recognizable from the overall flow of her speech, even though individual words are for the most part unintelligible). The Francophone broadcast is obscured by being mixed into the background at low volume simultaneous to the foregrounded Anglophone broadcast.

Windsor identifies the first intelligible speaker of the Anglophone broadcast as a radio journalist and the second speaker as an interviewee. Although he provides no transcription of the speech event, Windsor alludes to the reported events alternatively as having to do with "some violent disturbance [that] happened 'over a golf course'" (135), "Amerindian land rights" or a "minority group" who burns "'tobacco' at sacred ceremonies" (136). He admits to having used external knowledge about the reported event that he gleaned from a British television program in his interpretation of this speech event.

I offer the following transcription (or attempt thereof) of this speech event as a supplement to Windsor's discussion:

> Radio announcer (male): " . . . accomplishing much today . . . occupying the town . . . with a guard of honor for their dead comrade, where Mohawks have been [stuck?] in now for six days. But their main spokeswoman said the police, known here as the SQ [Sûreté de Québec], brought the death upon themselves";
>
> Interviewee (female): "All of us know that the SQ had no right to come in the way they did and disturb one of our sacred, uh, ceremonies where we're burning our tobacco. This is happening over a golf course!"
>
> [Echo: "This is happening over a golf course!"]

As a Canadian who happened to have been living in Montreal in 1990, I am able to identify the historical event to which this "speech event" refers much more specifically than Windsor. This event, commonly referred to in Canadian history as "The Oka Crisis," took place just outside of Montreal over the summer of 1990 and involved racial and

political tensions between the Mohawk people and their white neighbors, with acts of violence (as well as peaceful protest) on both sides. In brief: A white-owned development company was planning an expansion of a local golf course onto land claimed by the Mohawk Nation, including an ancient burial site. Mohawk protesters set up barricades blocking the development plans; when white police officers stormed the barricades, a group of Warriors decided to barricade the Mercier bridge—thus cutting off easy access to the city and enraging local white commuters. A gun battle on July 11 resulted in the death of one police officer, the "dead comrade" mentioned by the radio announcer.[12]

Given the specific event represented by the second speech event, I find myself speculating on what the specific source of the first speech event might be. Could it be a recording of chanting crowds at the annual St.-Jean Baptiste parade, which marks the Quebec national day of celebration in June and often stirs up separatist sentiment? Or, more overtly political, could the source of the chanting have been a rally for the *Bloc Québecois*, a political party founded in 1990—with their first member of parliament elected to office in August of that year—as a federal analog to the separatist *Parti Québecois*?

The third speech event comprises of a number of individual voices, mostly male and mostly unintelligible, among sounds of a fireworks display (1:51–2:07). Windsor transcribes some of the more intelligible voices as saying "'fire', '…there's a double one' and 'O wow, look at…'" (132). As the first two speech events have served to place me, the listener, into some kind of virtual "Montreal 1990" setting, I identify these sounds with the international fireworks competition that takes place in Montreal every summer. This is a musical-pyrotechnics competition in which the fireworks are set to musical

accompaniment; a large segment of the city's population, however, prefers to watch the fireworks for free from atop apartment buildings or the Jacques-Cartier bridge rather than purchase tickets for admission to the "official" location at La Ronde on Île-Sainte-Hélène.

By locating the "speech events" collectively to a specific location and time—Montreal, summer of 1990—I find myself reinterpreting the work as a whole according to a new narrative structure, one that I find more satisfying than Windsor's "sonata-form" (138). I reinterpret the distinction Windsor makes "between 'musical' and 'everyday' environments" (130) as representing a constant fluctuation of individual human existence between the personal and public sphere, between the internal world of personal obsessions (represented by what the composer himself refers to as "fetish objects")[13] and the external world of parks, politics, weather and cows.

Barry Truax might characterize this work as demonstrating his "variable spatial perspective" model for structuring soundscape composition (2002:8), although Daoust would probably not consider *Mi bémol* as a soundscape piece. I understand it as a kind of musical essay along the lines of "How I Spent My Summer Vacation" or, perhaps less charitably "A Portrait of the Self-Absorbed Artist in Montreal: Summer of 1990":

> *We find the artist at home, doodling with "fetish objects"; pan to the artist, now in the park watching his daughter on the swings, still thinking about those objects; a political rally, stirring up nationalist emotions, briefly calls his full attention, but his mind soon wanders back to those objects; a news report is on the radio—the artist is only half paying attention while he doodles, click-clack, with his fetish objects . . . what did she just say? . . . back in the park, a lonely ride on the swings; the artist, with a*

little ditty in his head, stands in a crowd—here come the fireworks! . . . or thunder and rain; raindrops, like little pizzicato plucks of a string, clears the air—a good day for a trip to the countryside; return home, still thinking about those objects . . .

While the "sub-environments" that represent real-world events may stir a variety of memories and, be extension, emotions, I hear the "fetish objects'—bouncing metallic balls, descending fifth on the marimba (?), etc.—as serving a kind of neutralizing function. Whether I want my memories and feelings about these events to be "neutralized" is another question; two of the speech events have such strong political associations I can't help wondering why the composer used them as sound material. There are other aspects of the speech events that leave me wondering about the balance of language (French/English) and gender; why, for instance, is the Francophone female broadcaster drowned out by the Anglophone male broadcaster?

I included this discussion to demonstrate the added layer of complexity that the spoken word brings to the analysis of acousmatic music—compounding the already complex issue of sound and source. For this reason, I have avoided works that contain the spoken word in my previous three analyses, although one might see a kind of progression toward the spoken word in the order in which I presented these works: from wind chimes, to cricket chirps, to wolf howls, to human speech.

Some common "sound objects" have also emerged among these works: both Smalley's *Wind Chimes* and Daoust's *Mi bémol* made use of what might be characterized as a "bouncing ball gesture"—although Daoust's bounces were crisper. Both Westerkamp's *Cricket Voice* and Klein's *The Wolves of Bays Mountain* made use of the

sound of crickets, although Westerkamp used a lone cricket while Klein used a cricket choir. Both works by Klein and Daoust contained the same type of birdcall—the caw of a crow—panned and resonant at a distance. Additionally, I have found elsewhere—in Francis Dhomont's *Espace/Escape*, not analyzed here—a similar sound to the rolling, panned grating wood sound featured in Westerkamp's *Cricket Voice*. Could these reappearances of similar "sound objects" in different works by different composers signal an emerging communal musical language? That is, what Mathew Adkins calls "acoustic chains": the grouping of similar sound objects from various works into a set of "chains" such that an instance of one version of the sound object from one group "is supposed to evoke the other contexts of the set. Thus a new acousmatic work acquires 'meaning' by reference to previous such works" (Monro 2000).

Although I don't rule out the possibility of the existence of such "chains" within the works of a single composer or composer collective, I do not believe that such linking are at work here among this particular selection of composers—in listening to Dhomont's *Espace/Escape* (1989), for example, I don't get the sense that Westerkamp's *Cricket Voice* (1987) is in any way being evoked, even if I find a similarity between two sound objects, as I don't believe that a lack of familiarity with Westerkamp's piece would somehow inhibit a full understanding of the Dhomont piece (but I could be wrong). In the conclusion chapter that follows, address such issues of "musical language"—and the Schaefferian pursuit of a syntax for acousmatic music—within the context of a discussion of the organization and presentation of musical ideas.

[1] The circular and overtly nationalistic nature of this particular part of Schenker's argument, however, has caused many otherwise avid fans of his theory to shy away from any explicit discussion of music aesthetics and criticism.

[2] Steinberg's Wavelab.

[3] Tuned to A 440 Hz.

[4] Native Instruments FM7.

[5] See, for example, James J. Gibson: *The Ecological Approach to Visual Perceptio*n. Hillsdale, NJ: Lawrence Erlbaum Associates, 1979. Windsor, following Gibson, explains his non-use of graphical representation for acousmatic music by stating "[w]ithin an ecological approach knowledge is not denied, but it is not explained as the storage or manipulation of representations" (Windsor 1995:60).

[6] However, when Lochhead characterizes Cogan's spectral photographs as "objective," she fails to acknowledge the subjective choices that created these photos: what aspects of the data to map and what to discard; to use fast Fourier transform (FFT) as a means of analyzing the data; what window size to use for the FFT analysis; what resolution to present the resulting photo; and so on. In her attempts to find correlations between Paul Lansky's *Idle Chatter* and a supposed "map" of the piece drawn by her student, Makiko Hirai, Lochhead fails to recognize that her student's drawing is in fact a baroque outline of the face of Bart Simpson—a character created by cartoonist Matt Groening and popularized through the animated television series, *The Simpsons* (Fox network).

[7] I count fifteen repetitions before the intervals between the repetitions get too close for me to distinguish each one clearly.

[8] I hear the same gesture toward the end (5:20–39) of what I call Part I of the piece as well as to too far in (7:20–28) to the beginning of Part II.

[9] Actually, the "resonating" sound object proximate to "stomp" at this moment in the piece seems to pause after each stomp, but the scraping sounds do not.

[10] As I mentioned before, McCartney asserts that it is the sound of the cricket (representing nature) that causes the sense of anxiety many urban listeners experience in this work—she draws on Marlon Brando's line from *On the Waterfront* to substantiate her claim: "I don't like the country, the crickets make me nervous" (McCartney 2002:46). My interpretation of this work, however, seems to imply an argument in the opposite direction: namely, it may be the sounds that I associate with non-nature (warning signals, ambulance alarms, etc.) that are the source of anxiety for some listener; or, perhaps, it is the juxtaposing of nature *with* non-nature, as represented through sounds, that causes such distress?

[11] Actually, it might be more accurate to way the cricket's chirp occupies a space between Db6-Eb6.

[12] For a more detailed account, see <http://www.firstnationsdrum.com/fall2000/hist_oka.htm>

[13] From the program notes for *Mi bémol*: "Around a small tonal object (E flat, Mi bémol in French) developed into a drone used as a thread in this piece, I have brought together some of my 'fetish' sounds. A stereotypical form emerged, a hyper-condensation of my style, of my articulation and construction processes: confrontation of widely different sound elements, a preference for the anecdotal, the crossfading of textures, oscillation between the musical discourse and the documentary approach. Mixtures of levels, polyphony of sounds and of meanings. A pastiche where I attempt to imitate myself…" <http://www.soundtravels.ca/soundtravels/Performances.html> (Accessed 12/05/05).

Chapter 7: Conclusion

Many of the issues I have discussed in the preceding chapters reflect the writings of Pierre Schaeffer: the obsession with systems of classification, the exploration of the concept of listening, the complication of the relationship between sound and source and how this affects notions of mimesis and gesture. Schaeffer hoped that his research project into musical objects would eventually lead to the development (or discovery) of a new musical language with an associated syntax.

Such a syntax for acousmatic music has, to my knowledge, yet to surface. This is perhaps for the better, as it allows for continuing flexibility in the realization of individual works. In any case, caution should be taken in the search for a systematic "language" or grammar of music: The "language" metaphor applies only superficially to music; those who invoke it often overemphasize its usefulness, ignoring the fact that linguistic grammars—like musical scales—are artificial constructs that oversimplify the richness of living, ever changing spoken languages.

Nonetheless, Schaeffer was adamant that a proper syntax for acousmatic works should be drawn out of the concrete materials—that is, the sound objects—rather than imposed from a pre-determined abstract construct, such as the numerological constructs of serialism. He demonstrates his objection to the latter in his *Solfège de l'objet sonore* with an example of a recording of a dog's bark that then has a pre-formulated pitch and rhythmic structure imposed on it, creating a virtual dog that "sings" the theme to "Ode to Joy" (1998:55; CD2:69–71). Thus, in the analyses presented in the previous chapter, I explored the pitch structures of Westerkamp's *Cricket Voice* and Klein's *The Wolves of Bays Mountain* from the perspective of how these structures could be explained as being

drawn from concrete sound materials (chirping cricket and baying wolves) rather than being imposed upon them.

Analysis usually seeks to find out how a particular work is organized in terms of structure, in this way perhaps uncovering some form of compositional technique. This extrapolates to the question: "why is the piece organized this way" (or "why *might* the piece be organized this way")? Once again, behind this question is the search for what might be called a musical system or, as it is often framed in linguistic terms, a musical syntax (what Boulez called "dialectic")—some sort of abstract structure from which "rules" for composing individual works might be extrapolated. But in asking, "why is the piece organized this way," the analyst ventures into the murky waters of compositional intent. I prefer to re-phrase this question into "why do I prefer to hear the piece as being structured in this way?" I hereby take the position that before I can begin to understand something (the world?) in terms of someone else—the inner workings of the composer's mind, the composer's motivations—I must first try to understand the world from my own perspective: trying to uncover the inner workings of my own mind, my own motivations. The structures I uncover in my listening of a piece may reveal as much (or perhaps more) about how my thought processes are organized as they do about what the composer may have been thinking in organizing the work.

I am not the first person to draw a connection between musical organization and the workings of the mind. Barry Truax, with a nod to Marvin Minsky, writes that "music communicates on the basis of its organization of sound, which is the product of human thought processes" (2001:51). Here, the "human thought processes" are presumably those of the composer, if the composer is understood as having the largest hand in organizing

the sound of a musical work. Truax may, however, be referring also to a larger sort of "group think" as he mentions that there are "styles" of music that have stricter "syntactical rules" of organization than others, citing Gregorian chant and classical fugue as examples of such strict systems; composers are (usually) also listeners, and are most likely influenced in their musical ideas by those passed to them through the music of others. Truax fails to point out that the stricter rules of musical presentation may in turn reflect more general "cultural" rules for the organization of public forms of communication—assimilated in the minds of both sender and receiver alike—such as rules of rhetoric.

Indeed, the rhetorical theories inspired by Quintilian that dominated Germanic principles of oration—the proper order for the presentation of ideas and arguments—permeated into German musical culture as well, as reflected in the work of Joachim Burmeister at the turn of the seventeenth century.[1] It is possible that both fugal technique and so-called sonata form evolved from this rhetorical tradition. Rhetoric should not be confused with syntax. For example, I recall having been explicitly taught, about midway through grade school, the "proper" procedure for writing an essay which, in retrospect, closely resembled the thesis-antithesis-synthesis model of late nineteenth-century German *Rhetorik*. With this "thought-model" ingrained in my subconscious at an early age, I find that—despite having a relatively equal level of fluency in both languages—I usually find it easier to follow the thread of an argument in essays written by native speakers in German than in French. This has very little to do with the grammatical structure of the language, as oftentimes, at the sentence level, word order in French more

closely resembles that of English than does German. I am speaking here, rather, of culturally determined models for the "logical" presentation of ideas.

My recognition of the possibility for cultural differences concerning what constitutes a "logical" procedure of presenting ideas causes me to be skeptical of theories that purport "universal" cognitive models for music. Moreover, such models tend to borrow heavily from cognitive linguistics, speaking in terms of "syntax" and listener "competence"—linguistic models that focus on the level of phonetics and grammatical syntax (e.g., Lerdahl and Jackendoff). Meanwhile, I find similar dissatisfaction with other models for musical analysis that, borrowing from the linguistic sub-fields of semiotics and semiology, operate at a level analogous to the linguistic "word"; such theories are most common among music scholars in France, as well as among certain scholars in England and Quebec with ties to French research institutes such as the GRM.[2]

The "anything goes" attitude or "state of flux" that Truax attributes to contemporary Western art music has perhaps less to do with shifts away from modal or tonal systems of pitch organization (as Truax implies; 2001:51) and more with increased plurality and experimentation with respect to models governing the organization and presentation of ideas. More apt analogies may be found within the field of literature—rather than linguistics—such as the "stream of consciousness" writing associated with James Joyce's *Ulysses* (1922) and William Burroughs's description of "cut-up and fold-in techniques" in "The Future of the Novel" (1964). That such more flexible "thought-models" gained general cultural credence by the mid-twentieth century is evident in Vannevar Bush's statement that "[t]he human mind . . . operates by association" from his essay "As We May Think" (1945)—an article that many scholars have cited as foretelling

the advent of "hypertext," the style of writing popularized through the internet that thrives on non-linear thought. I believe it is this type of attitude—rather than one that seeks remnants of classical forms, such as Luke Windsor's retreat to sonata form mentioned in the previous chapter—that listeners and scholars should use when seeking to understand, analyze or explain acousmatic works.

On the remaining pages, I comment upon two possible areas of further research evolving from this study.

Aims and Audience of Music Theory

Music theory—although this might seem ironic to scholars in many fields outside of music—is often closely associated with the practical side of music research and instruction, such as disseminating rules of counterpoint and harmony for the better "understanding" and practice of music by performers and composers. This has been the case at least since the eighteenth century, when the so-called figured bass theorists—C. P. E. Bach among them—were writing mainly for keyboardists, advising them on the various (and best?) ways to realize the seemingly cryptic notation for continuo parts, which consisted of a bass-line in staff notation accompanied by "figures": stacked numeric values that denote the intervallic content of the proper "harmony" that the given bass note is meant to support. Similarly, Heinrich Schenker's theory of tonal music—heavily indebted to the figured bass theorists—was motivated from his own practice as a keyboardist and piano teacher.

The way in which these theorists *thought* about music was arguably influenced by their use of technology—in this case, the piano keyboard and staff notation. Many later

theory texts—written by both German and American theorists—follow in the tradition of the figured bass theorists not only in their rules of harmony, but also in the way they conveyed musical concepts through the timbrally and registrally constricted "grand staff" of the piano keyboard or the similarly constricted condensed SATB "chorale" notation. Twentieth-century examples of such practices include not only Schenker's voluminous output, but also Arnold Schoenberg's *Harmonielehre* (1911). As Schenker was himself a keyboardist, it is perhaps not surprising that the vast majority of the works he cites are those for the keyboard; even when he does refer to orchestral works, he reduces them to "keyboard" size (one or two staves). A slightly more recent example of music-theory scholarship, Fred Lerdahl and Ray Jackendoff's *A Generative Theory of Tonal Music* (1983)—itself greatly indebted to Schenker's theory—similarly displays a predilection for keyboard music, and reduces non-keyboard music to the keyboard staff.

Understandably, the most commonly available means of reconstructing the aural phenomena of orchestral music during the nineteenth and most of the twentieth century was through piano reductions. Nowadays, however, more people are likely to have some sort of audio playback system than a piano in their home, just as for the general public today it is at least if not more common to experience music through sound recordings as through live "acoustic" performance. The piano keyboard is the quintessential symbol of sonic homogeneity and equal temperament, thereby supporting the hierarchic supremacy of discretely defined pitch structures as the organizing principle in music. Electroacoustic sound serves to break down this principle—increasing the range of musical sound (however defined) readily available to the general public.

Electroacoustic music challenges the music theorist to find ways of thinking about music other than through pitch structures. In so doing, we can also use such lessons learned from studying electroacoustic music to reflect on other music—instrumental music of both the present and the past. The relationship might seem more obvious when dealing with composers who have composed both electroacoustic and instrumental works, such as Iannis Xenakis; however, it is equally valid as a means for reflecting on works by composers who work chiefly in the instrumental domain. For example, how does the music of Helmut Lachenmann explore new relationships between sound and source? How exactly does Messian play with "the distinction between reality and representation, as Paul Griffiths asserts,[3] in his use of birdsong? Also, how might certain symphonic works, especially of the late-nineteenth and early-twentieth centuries, be conceived in terms of sound masses and contrasting textures rather than pitch collections?

The Guiding Hand of Technology

In chapter 2, I mentioned a few of the ways in which different scholars distinguish among electroacoustic, electronic, and computer music and how aesthetic communities have evolved around these distinctions. However, just as certain types of electronic music may be associated aesthetically with the specific electronic instrument employed (Buchla, Moog, Theremin, etc.), as much electroacoustic, electronic and computer music comes to be composed using personal computers, the software product employed has—for many composers, at least—become a new factor in defining aesthetics.

I have already mentioned two such communities over the course of the present study, namely those affiliated with the GRM and IRCAM. Both research institutes have developed their own set of software products, which they market—more or less—to the

public at large. The "GRM Tools"—as the GRM software products are called—place emphasis on the digital manipulation of sound samples in a way that simulates classic tape techniques with the addition of some more advanced digital techniques.[4] The user-interface for these tools generally allow for more "ear-driven" user interaction, in contrast to IRCAM's "scientific" approach. Also, while IRCAM software consists of "stand-alone" products, the GRM tools are marketed mainly as "plug-ins"—that is, auxiliary software than can be plugged into most general sound editing and sequencing programs, such as ProTools (Digidesign), Cubase (Steinberg), or Sonar (Cakewalk). I find it interesting that, although Smalley's *Wind Chimes*—dating from the late 1980s—was most likely composed using analog equipment, there is something about his emphasis on the structural importance of "attacking events" that seems to imply a way of thinking about music that would be readily reflected in the layout of most digital sequencers—not to mention sound editors.

Spectral music, closely identified with IRCAM, takes more of a Pythagorean approach, placing faith in the scientific measurement of the acoustic properties of sound as the basis of musical composition. This is actually typical of the IRCAM aesthetic as communicated through the software package developed at the center: AudioSculpt, one of the IRCAM software products featured on the CD-ROM discussed in chapter 4, performs an FFT analysis of a given soundfile for the purpose of revealing the spectral content (in frequencies) of that sound. This spectral information can then be imported as pitch data to OpenMusic—a virtual "calculation pad"—where it can be manipulated and transformed through various mathematical operations.

Meanwhile, other programs exist in which the composer interfaces with the computer in perhaps more traditional terms of "instruments" and "scores." These include those based on Max Matthew's MusicN programs, such as Csound (initiated by Barry Vercoe at the MIT Media Lab) and CMIX (initiated by composer Paul Lansky at Princeton). There is a tendency for these programs to encourage compositional strategies involving pitch relationships, although it is not necessarily the case that all works composed with the assistance of these programs place emphasis on such relationships. It is worth reflecting, however, whether the foregrounding of pitch-relationships heard at times in Judy Klein's *The Wolves of Bays Mountains* could have been influenced by the fact that the piece was composed using Csound.

The works of certain individual composers (and their students) may be associated not only with certain software programs, but also with specific techniques available through those programs. For example, Paul Lansky's music is associated at least as much with his development of CMIX—as mentioned above—as with the sub-routine he created within the CMIX environment for the implementation of Linear Predictive Coding (LPC)—a method of subtractive analysis and resynthesis (Roads 1996:200). Similarly, Barry Truax's music is closely associated with the PODX system he developed explicitly for the application of granular synthesis techniques.

I have only scratched the surface here with regard to considerations of the influence of rhetoric techniques, postmodern narrative innovations, or software user interfaces on music composition. While the issue of devising narratives to accommodate the organization of acousmatic works could well be developed from either a listener's or

composer's perspective, the issue of the influence of software on composition returns to the perspective of the composer—although in a manner that can avoid delving into the question of compositional intent. Any future investigation of any of this issue, however, should be framed more in terms of compositional *techniques* or *strategies*, rather than musical *systems* and *syntax*.

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[1] James Haar: "Humanism §5: Humanism and musical composition," *Grove Music Online* (Accessed 21 November, 2005), <http://www.grovemusic.com.arugula.cc.columbia.edu:2048/shared/views/article.html?section=music.40601.5>

[2] Pierre Schaeffer, Jean-Jacques Nattiez, Stéphane Roy (2003)

[3] Paul Griffiths: "Messiaen, Olivier, §5: Works after 1950," *Grove Music Online* (Accessed 3 December 2005), <http://www.grovemusic.com.arugula.cc.columbia.edu:2048/shared/views/article.html?section=music.18497.5>

[4] The available sound manipulation techniques include reverse playback, speed variation, looping, transposition, delays, and filtering. See <http://www.grmtools.org>.

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Appendix A

Early articles on electronic/electroacoustic/computer music published in music theory journals

Journal of Music Theory (founded 1957)

Enthusiasm for electronic music seemed strong through the 1960s, but dwindled into the 1970s, reduced to book reviews in the 1980s, and more or less disappeared by the 1990s.

1950s–60s

Helm 1959. Review of *Die Reihe* v.1 Electronic Music and v.2 Anton Webern. 3(1):155–60.

Within *Die Reihe*, where "electronic" and "serial" music are synonymous, Webern's music is considered the starting point for both—hence, also, the emphasis on timbre or "Klangfarbenmelodie" in early theoretical approaches to electronic/electroacoustic music;

Westergaard 1959. Review of Hiller and Isaacson *Experimental Music: Composition with an Electronic Computer*. 3(2):302–6.

Book concerned with musical experiments employing the ILLIAC computer; (see Hiller 1963);

Hiller, Lejaren A. 1963. Electronic Music and the University of Illinois. 7(1): 99–126.

ILLIAC - computer generated music (style modeling); physical/acoustic properties of sound and sound synthesis (with mathematical equations) – under the rubric of "logical basis of equipment design"; descriptions of equipment; overview of course offerings.

LeCaine, Hugh. 1963. A Tape Recorder for Use in Electronic Music Studios and Related Equipment. 7(1): 83–97

Encourage the use of "mechanical logic" in compositional design; description of equipment (circuit diagrams);

Schaeffer, Myron. 1963. The Electronic Music Studio at the University of Toronto. 7(1): 73–81.

Description of equipment designed at the center and their applications.

Tenney, James. 1963. Sound Generation by Means of a Digital Computer. 7(1): 24–70.

Description of a computer program for sound production—as opposed to composition or analysis; however, the use of automation in composition is mentioned; circuit diagrams for sound generators; emphasis, as with the others, is on the amount of precision of control over sound parameters;

Winkel, Fritz. 1963. The Psycho-Acoustical Analysis of Structures as Applied to Electronic Music. 7(2): 194–246.

Examines "the acoustical or electro-acoustical source . . . as well as the perceptual ability of the acoustical receiver" (194); general principles of sound generation; sound spectrum and Fletcher-Munson curve; ear physiology; timbre and vowels; time – energetic, psychological and intellectual (Gestalt) factors; hints at the art of diffusion;

Luening, Otto. 1964. Some Random Remarks about Electronic Music. 8(1): 89–98.

Instrument building for interests in automation, microtonality, serial techniques; more of a historical overview;

Meyers, Roger G. 1964–67. Technical Bases of Electronic Music. 8(1): 2–52; 10(2): 216–74; 11(2): 222–76.

Part I: Mathematics; Part II: Physics; Part II: Engineering and Technology. Intended as a crash course for musicians with very little background in "the sciences."

Slawson, Wayne. 1969. A Speech-oriented Synthesizer of Computer Music

———. Review of Mathews et al., *The Technology of Computer Music*

Weinland, John David. 1969. An Electronic Music Primer. 13(2): 250–75.

I. Preliminary Cautions: how not to do damage to your ears, equipment maintenance; II. The equipment: overview of types, operation, applications; III. Preliminary Exercises in Composition: tape handling and splicing techniques, "Imitation of an electronic piece will refine the critical ear necessary for the duplication of the most subtle nuances of timbre, articulation and so forth" (266); realization of short excerpts of traditional notated music (Mozart); IV. Compositional Techniques: realization of an "aural" score by Bülent Arel: "the student should prepare a very brief contrapuntal piece . . . incorporating pitch, noise, different timbres, a full scale of short and long durational values, reverberation, and different envelopes" (272); the use of loops;

1970s

Wells, Thomas. 1971. Review of Strange *Electronic Music: Systems Techniques and Controls*. 15(1/2): 274–81.

Wells characterizes the book as "a source of practical information for the electronic music composer" (274); he criticizes the author for presenting

technical terminology and concepts in an oversimplified and, in some cases, erroneous fashion. When the Strange implies that sound generation using "modern" electronic instruments is superior to "classic" tape techniques, Well counters by stating, "in the opinion of this reviewer, synthesizer pieces often suffer from (among other things) a lack of timbral interest, manifested in plagues of electronic kazoos and sequencer-produced ostenati, to mention only a few noxious characteristics" (277); Wells also finds exception to Strange's statement: "Some of the more technically-oriented composers are even so familiar with the visual representation of souncs that they often produce compositions relying entirely on scopes and meters and do not use audio monitoring at all" (280);

Truax 1976. For Otto Laske: A Communicational Approach to Computer Sound Programs. 20(2): 227–300.

Characterizes a music theorist as "an *observer of musical activity*" rather than one who makes "various kinds of statements about musical structure," that is, someone trying "to *explicate* the behaviour of certain subject matter through hypothesis, experiment, and analysis" thus shifting focus "from analysis of structure to explication of process" (227);

Tenney and Polansky 1980. Temporal Gestalt Perception in Music. 24(2): 205–41.

Computer analysis program;

1980s

Morris 1982. Review of Wells *The Technique of Electroacoustic Music*, and Keane *Tape Music*

Lansky 1989. Review of *Sound Color* by Wayne Slawson

Review of Schaffer, Wittlich and Babb, *Microcomputers and Music* (1986)

Review of Roads and Strawn, *Foundations of Computer Music* (1985)

1990s

McNamee 1994. Review of Schwanauer and Levitt, *Machine Models of Music*

Roeder 1995. A Calculus of Accent.

Music Theory Spectrum (founded 1979)

While numerous articles can be found on computer assisted analysis and instruction (especially for aural skills), there seems to be little specific discussion of computer music (or electronic/electroacoustic music). Exceptions:

Slawson 1981. The Color of Sound: A Theoretical Study in Musical Timbre

Like Winckel (1963), draws a correlation between sound color and vowels (formets); focuses on the notion of "sound color" which he understands as a subset of timbre; introduces three dimensions of sound color: openness, acuteness and laxness;

Smith 1985. Review of Cook, *Music, Cognition and Computerized Sound*

Sobaskie 2002. Review of Truax, *Acoustic Communication*

Perspectives of New Music (founded 1962)

Being less of a journal of music theory than a journal of open discussion on contemporary music, it publishes a strong base of articles written by or about living composers; it's editorial board is chiefly made up of composers and composer-theorists, with a few "pure" theorists added to the mix. This increases the likeliness of finding

articles on electronic music, although they are not necessarily about the *theory and analysis* of this music.

1960s

Backus 1962. *Die Reihe* – A Scientific Evaluation.

Hiller and Baker 1964. Computer Cantata: A Study in Compositional Method.

Randall, J.K. 1965. A Report from Princeton. 3(2): 84–92.

Howe 1966. Music and Electronics: A Report

Chadabe, Joel. 1967. New Approaches to Analog Studio Design. 6(1): 107–13.

Fennelly, Brian. 1967. A Descriptive Language for the Analysis of Electronic Music. 6(1): 79–95. Posits a shorthand for mapping a reading guide for electronic works

Ghent, Emmanuel. 1967. Programmed Signals to Performers: A New Compositional Resource. 6(1): 96–106.

Le Caine, Hugh and Gustav Ciamaga. 1967. A Preliminary Report on the Serial Sound Structure Generator. 6(1): 114–18.

Mathews, Max and Lawrence Rosler. 1967. Graphical Language for the Scores of Computer-Generated Sounds. 6(2): 92–118.

Cross, Lowell. 1968. Electronic Music, 1948–53. 7(1): 32–65.

Appleton, Jon H. 1969. Reevaluating the Principle of Expectations in Electronic Music. 8(1): 106–11.

Draws on "theories of perception, information assimilation, learning, and social behavior" both to explain why audiences seem to have more difficulty with the reception of electronic music, concluding that this

perceived problem has less to do with any aesthetic deficiency inherent to the music than discordance between this music and cultural values held by certain portions of the public. Discusses Berio's *Thema* (*Omaggio a Joyce*) and *Visage*.

Howe 1969. Recent Recordings of Electronic Music: Review of Carlos *Switched-On Bach*; Beaver and Krause *The Nonesuch Guide to Electronic Music*. 7(2): 178–81.

Zaripov, Rudolf. 1969. Cybernetics and Music. 7(2): 115–54.

Surveys Soviet and non-Soviet literature devoted to computer-aided composition and musical analysis. Describes the principles of algorithms and computer simulation of the functions of the composer and musicologist.

1970s

Clough, John. 1970. TEMPO: A Composer's Programming Language. 9(1): 113–25.

Howe, Hubert S. 1970. Review of Foerster and Beauchamp, eds.: *Music By Computers*. 8(2): 151–57.

Slawson, Wayne. 1970. Review of Backus: *The Acoustical Foundations of Music* (1969);

Beauchamp 1971. Review of Risset: *An Introductory Catelogue of Computer Synthesized Sounds*.

Howe, Hubert S. 1972. Compositional Limitations of Electronic Synthesizers.

Maconie, Robin. 1972. Stockhausen's *Mikrophonie I*: Perception in Action. 10(2): 92–101.

Ogdon, Will. 1972. Conversation with Ernst Krenek. 10(2): 102–10.

Howe, Hubert S. 1973. Review of Strange: *Electronic Music: Systems, Techniques and Controls*. 11(2):249–52.

Smith, Irwin Stuart. 1973. Communications. 11(2): 269–77.

Describes the difficulties in implementing Xenakis's proposed new method of computer sound synthesis and sketches one possible realization of this method in a computer program.

Howe, Hubert S. 1973–74. Review of Schwartz: *Electronic Music: A Listener's Guide*. 12(1/2): 379–85.

Presents Schwartz's book as not so much one about electronic music, but one that discusses the differences between serialist ("organized") and aleatory ("disorganized") music. Strangely, "serialist" later becomes "serious" and "aleatory" becomes "irrational"; from Howe's description, it doesn't really seem like Schwartz says all that much about electronic music (except as serialist music) other than the final chapter where he talks about "do-it-yourself" tape techniques.

Vercoe, Barry. 1974. Music Computation Conference: A Report and Summary. 13(1): 234–38.

McCarty, Frank. 1975. Electronic Music Systems: Structure, Control, Product. 13(2): 98–125.

Felder 1977. An Interview with Karlheinz Stockhausen.

Howe, Hubert S. 1977. Electronic Music and Microcomputers. 16(1): 70–84.

McLean, Priscilla. 1977. Fire and Ice: A Query. 16(1): 205–11.

Formal organization of electronic music as regards the type of sound employed: traditional, environmental, or abstracts sounds derived from recognizable sources; formal interrelationships using imago-abstract sounds.

1980s

Loy, D. Gareth. 1980–81. The Composer Seduced into Programming. 19: 184–98.

Moore, F. Richard. 1980–81. The Futures of Music. 19: 212–26.

Cummings and Hicks. 1981. Computer Music Conference in New York, 1980.

Brown 1982. The Noise Instruments of Luigi Russolo.

Dickson 1982. On Electronic Strings in Live Performance: The Design and Construction of an Electroacoustic Monochord. 20(1–2): 623–39.

Neubert, David. 1982–83. Electronic Bowed String Works: Some Observations on Trends and Developments in the Instrumental/Electronic Medium. 21(1–2): 540–66.

Bayly 1982–83. Ussachevsky on Varèse: An Interview

Duisberg 1984. On the Role of Affect in Artificial Intelligence and Music.

Austin. 1985. Report from Vancouver: 1985 Computer Music Conference

Blakely 1985. Review of Roads: *Foundations of Computer Music*.

Boulanger 1986. Toward a New Age of Performance: Reading the *Book of Dreams* with the Mathews Electronic Violin.

1990s

Desain, Peter. 1990. LISP as a Second Language: Functional Aspects. 28(1): 192–222.

Burk, Phil et al. HMSL (Hierarchical Music Specification Language): A Theoretical Overview. 28(2): 136–78.

Boros, James. 1991. A Conversation with Donald Martino. 29(2): 212–78.

Francois, Jean-Charles. 1992. Writing Without Representation, and Unreadable Notation. 30(1): 6–21.

Marino, Gerard. 1993. The UPIC System: Origins and Innovations. 31(1): 258–69.

Stockhausen, Karlheinz. 1993. Octophony: Electronic Music from *Tuesday from Light*. 31(2): 150–71. Translated by Jerome Kohl.

Burt, Warren. 1995. Listening to Ten Tape Pieces by Kenneth Gaburo. 33(1–2): 148–61. Burt's listening experiences emphasize attempts to uncover compositional intent as well as techniques employed (from a technological perspective).

Di Scipio, Agostino. 1995. On Different Approaches to Computer Music as Different Models of Compositional Design. 33(1–2): 360–402.

Jaffe, David A. 1995. Impossible Animals: Notes on Birds and Musical Style. 33(1–2): 604–13.

Polansky, Larry. 1996. Bedhaya Guthrie/Bedhaya Sadra for Voices, Kemanak, Melody Instruments, and Accompanimental Javanese Gamelan (Computer generated work). 34(1):28–55.

Stockhausen, Karlheinz. 1996. Electroacoustic Performance Practice. 34(1):74–105. Translated by Jerome Kohl.

Perry, Jeffrey. 1996. The Inner Voices of Simple Things: A Conversation with Paul Lansky. 34(2): 40–60.

Morris, Robert D. 1997. Listening to Milton Babbitt's Electronic Music: The Medium and the Message. 35(2): 85–99.

Clarke, Michael. 1998. Extending Contacts: The Concept of Unity in Computer Music. 36(1): 221–46.

Decroupet, Pascal and Elena Ungeheuer. 1998. Through the Sensory Looking-Glass: The Aesthetic and Serial Foundations of *Gesang der Jünglinge*. Translated by Jerome Kohl. 36(2): 97–142.

Di Scipio, Agostino. 1998. Compositional Models in Xenakis's Electroacoustic Music. 36(2): 201–43.

2000s

Solomos, Makis. 2001. The Unity of Xenakis's Instrumental and Electroacoustic Music: The Case for "Brownian Movements". 39(1): 244–54.

Carabell 2002. Photography, Phonography and Lost Objects.

Hamman, Michael. 2002. From Technical to Technological: The Imperative of Technology in Experimental Music. 40(1): 92–120.

Reynolds, Roger. 2003. Xenakis: . . . tireless renewal at every instant, at every death. 41(1): 4–64.