Preface

What we call music in our everyday language is only a miniature, which our intelligence has grasped from that music or harmony of the whole universe which is working behind everything, and which is the source and origin of nature.

—Hazrat Pir-O Murshid Inayat Khan (1882–1927)

I began writing this book because I needed a text to use in my undergraduate musical composition classes at the School of the Art Institute of Chicago. Few of my students were trained musicians, and there was little available on the subject that did not require a knowledge of music theory and notation. Wanting to talk about music from a somewhat less Eurocentric perspective, I went outside music theory, to the discipline of cognitive psychology. Here I found at least tentative answers to many of the “why” questions my students would ask as they grappled with the mechanics of music (Why are there phrases? Why is downward movement often closural? and so on).

When the book began to circulate outside of my class in manuscript form, I realized that music and memory was a subject of interest to a wider audience than I first imagined. Other artists who dealt with time, in film and video, for example, were also interested in memory and its effects on the construction of sequences of information.

The idea for the form of this book came from reading Robin Maconie’s compilation of lectures and interviews of the German composer Karlheinz Stockhausen (1989). It struck me that a distinction Stockhausen made about levels of musical structure might be related to the nervous system’s ability to process information. I felt that there was a relationship between a fairly standard three-part model of memory and a three-level description of musical structure. (Things turned out to not be quite that simple, as we shall see.) Delineating the three types of memory
and then exploring the structural features of music that are related to each of these types seemed like an interesting way to proceed. Hence the book’s two-part form, with the psychological ideas introduced in part I linked to their musical manifestations in part II.

Because the book directly reflects the way my class is taught, I have left out several topics that might otherwise be expected to appear. There is, for instance, no section on harmony. Many of my students use monophonic instruments, and at present there is no component of the course that deals directly with harmony. (It is also worth pointing out that the theory and use of harmony, especially as it relates to modulation between different harmonic centers, is primarily a European phenomenon.) There is also no detailed treatment of timbre here, partly because timbre is still only a partly understood parameter, and partly because exploring what is known about timbre in detail presumes a considerable knowledge of acoustics, which is outside the scope of my course. Also, I have not used standard music notation (with one exception) because many of my students are not familiar with it and because many of the sounds that they produce on their own improvised instruments have only approximate pitch anyway. I consider only very generalized types of melodic contours, and for this, I think that my nonspecific pitch notation is adequate. More detailed works with many specific notated examples are cited throughout the text and notes. (I have also avoided using certain “standard” plural forms, preferring “schemas” and “tempos” to “schemata” and “tempi.”)

Another subject not dealt with here is emotion. Although an important factor, one that can interact with the type of phenomena described in this book, emotion is simply too big a subject to include within the limits of an introductory book.

The chapter on metaphor also grows directly out of my class. My students, who for the most part do not have much musical training, nonetheless enjoy music, and find meaning in it. Their explanation of what a particular piece of music means to them is often couched in terms of some personal metaphor (see Sibley, 1993). These metaphorical explanations sometimes have common features (see Guck, 1981). It is often useful to explore the metaphors, and to discuss other cultures’ metaphorical systems for describing musical experience and structure. It also encourages students to consider the idea that composition can be approached as a metaphorical transformation of their own experience into sound.

A number of ideas in this book are taken from cognitive linguistics. Since the publication of Stephen Handel’s book Listening (1989), I have come to see music and language as more closely related. Moreover, recent work in cognitive semantics—specifically the idea of perceptual representations in memory—may shed light
on some types of musical meaning. Perceptual representations may be a basic form of thought that precedes and forms part of the meaning of both language and music. The indeterminacy of the relations between these representations and language might explain why subjective accounts of the meaning of music can be so variable. The ideas of Stevan Harnad (1993) and Lawrence Barsalou (1993) have strongly influenced me in this regard. The work of Mark Johnson (1987), and George Lakoff (1987) on image schemas has also been important to the ideas presented here.

This book provides an overview of predominant theories in a field that is quickly evolving. I am well aware that presenting information about a field such as cognitive psychology entails taking theoretical positions, and that many of the ideas current in the field are hypothetical to varying degrees and have not been completely established empirically. For example, models of how human cognition works, and especially how it is implemented neurologically, are still in early formative stages. Even basic phenomena such as the operation of neurons are by no means understood completely. Nevertheless, I have included some basic theoretical ideas from contemporary neuroscience in a few chapters. These ideas are speculative at this point, and exactly how the musical processes mentioned in the book are implemented neurologically is not yet clear. What I have given is a brief description of some general kinds of theoretical models that seem appropriate for the processing of music.

One of the features of cognitive psychology is that most of its constructs are theoretical—their existence is inferred indirectly through experiment. No one has ever seen an echoic memory or a schema; rather, these theoretical constructs have been created to explain and predict aspects of people’s behavior. They are what Ronald Langacker has called “convenient reifications” (Langacker, 1987: 100). As such, there are different theoretical perspectives on these entities, and even on what the relevant entities are. Readers interested in empirical data on these issues may consult the references in the text and notes.

It seems to me that there is a conflict in cognitive psychology between two paradigms. One is an older “classical” information-processing paradigm, which grows out of metaphors from serial digital computing and information theory. The second is a newer connectionist paradigm, which comes from models of the nervous system based more on parallel computing. This text presents ideas from both lines of thought. While I am sympathetic to the newer view, many of the classical concepts have some explanatory power. Indeed, what is referred to as psychological “theory” is a constantly shifting perspective, and, as John Jahnke and Ronald Nowaczyk
(1998: 13) point out in their recent cognitive psychology textbook, “All [such] theories should be taken with a grain of salt. They all contain many elements of truth regarding cognition, although none may tell the whole story.”

Cognitive structure creates constraints on possibilities for musical structure, and these ideas can be useful for both understanding and formulating compositional strategies. In summarizing important recent ideas in music cognition, cognitive psychology, and cognitive linguistics, I have tried to make them comprehensible to my students. Many of the important books and papers in these fields were virtually unreadable to my students. To make these materials more comprehensible, I have had to generalize; no doubt at least minor exceptions could be raised to many statements in this book. Some of these generalizations may offend experts in the fields involved, and for this I apologize in advance. I have made abundant use of parenthetic references and endnotes—to guide interested readers wishing to explore the subjects dealt with in this book in greater depth; to show the scholarly basis for particular theoretical ideas; and to explain my use of particular terms, as well to present alternative terms.

Whether there are any such things as psychological musical universals is debatable, and I would be the last to deny that music exists within a cultural context. Nevertheless, it seems clear that the human nervous system is subject to universal cognitive constraints, some of which impinge on possibilities for musical structure. This book takes a position between the extremes of autonomous music perception, unaffected by cultural construction, on the one hand, and purely cultural construction of all levels of musical order, on the other. I believe there are bottom-up (perceptual) effects that, while not completely autonomous from top-down (cognitive) influences like culture, are relatively predictable, and that these processes are necessary for the perception of patterns in the first place, especially unfamiliar patterns (Bregman, 1990: 403–405).

As one begins to look at “higher-level” musical structure, especially in relation to memory, the influence of an individual’s personal and cultural knowledge becomes greater. That music perception (especially at higher levels) is not totally autonomous from culture does not mean, however, that absolutely any possible kind of musical structure is comprehensible. Certainly, cultural constructs will be constrained by bottom-up factors. The question is, to what extent? The answer will hinge on much more research into the musical conceptual systems of other cultures, and how these systems affect the experience of listeners in those cultures. However, the experiments that could determine the effects of cultural construction are diffi-
cult to design, and are full of contextual effects so carefully eliminated in many music psychology experiments.

While the concepts introduced in this book are clearly Western, it is my belief that they also can be applied to the music of other cultures. Many of the phenomena mentioned here can be found in much music of different cultures, and the list of listening examples in the appendix reflects this. Whether the music is conceptualized in this way by the people who make it is another matter entirely.

Clearly, one of the most complex problems at this stage in the development of the cognitive sciences is understanding the conceptual systems of other cultures, and how this affects perception and memory. How far “down” do “top-down” factors extend? Thus, many of the effects described in this book are probabilistic to varying degrees. I make no pretense in this book to having a complete understanding of how other cultures conceptualize their music. Music cognition studies have not yet tended to go very far into an ethnomusicological perspective.

Nonetheless, my own experience has led me to believe that there are certainly levels on which cross-cultural enjoyment and even understanding of music are possible. The structure of our bodies and to some extent our minds are what we all have in common (Langacker, 1997). We all use the same tools to understand music and the world. Today’s musicians have the music of the whole world to draw on. What needs to be done is to construct theoretical tools to deal with that diversity.

**Structure of the Book**

Readers who would rather not read through the detailed review of cognitive ideas in part I may read “Auditory Memory: An Overview” (chapter 1), and then skip to part II, returning to look up unfamiliar ideas whenever necessary. All readers should note that measurements of time and frequency or tempo are approximate unless otherwise stated.

Part I presents basic ideas about memory and perception from cognitive psychology and, to some extent, from cognitive linguistics. Central to the introductory chapter on memory is a full-page modular diagram that attempts to illustrate some functional aspects of memory, in the tradition of Broadbent (1958) and of Atkinson and Schiffrin (1968).

As Nelson Cowan (1995) points out, however, it is hard for such a diagram to clarify both the cognitive processes involved in memory and the temporal sequence
of memory processing because the processes are almost certainly used recursively. This means that there are many loops where information actually travels backward and affects processes it has already passed through. Another problem is that a modular diagram may suggest that these processes are mechanistic and determinate, whereas in reality they are highly fluid. I am also aware that using rectangular imagery is reminiscent of flow diagrams and the information-processing mindset in general. Unfortunately, although I needed the third dimension to get in all of the information I wanted to include, my graphic skills were such that I could not produce convincing blobs in three dimensions, although they might have been more appropriate. Especially difficult to depict are the different memory states. Thus, for graphic clarity, short-term memory is diagrammed as a separate box, although described in the text as a probable subset of long-term memory.

Moreover, students of memory will notice that I lean toward “proceduralism” in describing memory, locating memories where the relevant processing occurs, rather than in some other generalized “place,” thus implying thousands of “locations” for memory. There is probably no way of making a simple diagram that represents this view of memory. Thus, in order to indicate a rough time sequence for the different memory processes, I have used essentially a nonprocedural diagram, noting in the text, however, that what the diagram really represents are processes, not places.

Many issues about exactly what happens in echoic memory and the early stages of processing have not been settled. Chapter 2 presents my own take on such consensus as exists in the field at this time. As it explores grouping, the basic organization of perception into units, which influences memory a great deal (especially in relation to the phenomenon of “chunking”), chapter 3 considers the perceptual results of early processing.

Chapter 4 deals with short-term memory, whose limitations form many important constraints on perception and memory. These constraints in turn determine some aspects of music. Chapter 5 discusses closure, one way humans have attempted to overcome short-term memory limitations by forming various kinds of links between memory “chunks.”

Chapter 6 summarizes recent thinking about types and structures of long-term memory, while chapter 7 deals with category structure, particularly important for understanding many of the limitations long-term memory places on basic musical materials such as tuning systems and systems of durational proportions.
Chapter 8 considers schemas, larger abstract memory representations that allow us to have expectations about the progress of musical events and about many other aspects of musical organization. Much of listeners’ schematic organization of musical memory constitutes what could be called their “musical culture.” Chapter 9, the final chapter of part I, deals with another cognitive construct, metaphor. Much of the language used to describe the structures and processes of music is metaphorical, although this is not always acknowledged in books on music. Recent work in cognitive semantics suggests that our descriptions of many abstract aspects of our experience may be based on image schemas, cognitive structures that are thought to form a basis for metaphors (Johnson, 1987). While I am well aware that there is a great deal of debate about the actual cognitive operation of metaphor, by including material on image schemas, this book suggests one way music might be related to the rest of our cognitive structure and our everyday experience.

Part II shows, in detail, how the concepts of part I are exemplified in music, proceeding through the three levels of musical experience: (1) event fusion (chapter 10); melody and rhythm (chapters 11 and 12); and (3) form (chapter 13). In each of these four chapters, memory distinctions and cognitive concepts are used to explain the possible origins of some kinds of basic musical structures.

Chapter 10, on event fusion—the formation of single musical events from acoustical vibrations on a timescale too small to consider rhythm—introduces the basic musical concepts of pitch and interval (with special attention to the octave).

Chapter 11, on melody, defines other basic musical concepts such as tuning system, scale, and tonality, and relates these to cognitive concepts from part I, which are shown to often impose constraints on musical materials. It points out that many aspects of musical structure create centers or landmarks that allow us to have some sense of “where we are” in the music, and ends with a discussion of melodic schemas, a kind of melodic archetype.

Chapter 12, on rhythm, defines beat, pulse, tempo, accent, meter, and the like, relating these structural concepts to our sense of orientation in music, and touching on more complex kinds of rhythmic organization, such as polyrhythm, and freer kinds of rhythmic organization not organized in relation to a regular pulse.

Chapter 13, the final chapter, deals with the psychological conditions necessary for making large-scale (i.e., formal) boundaries clear in music, rather than with particular traditional musical “forms.” It discusses parameters, the basic variables used
to define higher-level musical “shapes,” and linearity, the construction of large-scale continuity and progression in music, as well as ways musicians can structure music to elude memory through various uses of time scale and the creation of memory interference effects.

Included at the end of the book are a glossary of important terms and an appendix of listening examples available on compact disc, taken from the materials I use in my class and meant to exemplify the concepts presented in the book.

Acknowledgments

First of all, I would like to thank Robert Gjerdingen, who gave the manuscript a very thorough reading, and whose thoughtful suggestions resulted in important changes to the book. My thanks also to Lawrence Barsalou, Fred Lerdahl, Stephen McAdams and John Corbett, and three anonymous readers for MIT Press for their helpful comments; to Amy Brand, Carolyn Gray Anderson, and Katherine Almeida of MIT Press for answering my many questions, and for seeing the book through to publication; to Jeanine Mellinger for helping me solve my problems with fonts, graphics, and printing; to Robb Drinkwater for his help with all sorts of computer problems; to my students, especially Scott Alan Godoy, Mike Moses, Shanna Linn, Melissa Levin, Petra Klusmeyer, Olivia Block, Danielle Smith and Mike Filimowicz for asking such provocative and productive questions; and to my former students Don Meckley and Robert Mazrim for their help with an earlier draft. Finally, I want to thank my friend and companion Sara Livingston, who read many parts of the manuscript countless times, and who was always helpful and encouraging.