

Part Two, *Electronic Music in Practice*, comprises six chapters (chapters 5–10) each dipping into a different conceptual stream of contemporary work. “Interactivity and Live Computer Music” by Sergi Jordà covers the computer as instrument, the composer as instrument builder, and catalogs various means of performance interface and their inherent possibilities/limitations.

Karlheinz Essl’s “Algorithmic Composition” presents a useful overview of the field linking pre-computer process musics that involved style rules, serialism, and chance operations to ongoing real-time experimentation. Chapter 7, “Live Audiovisuals,” co-authored by Amy Alexander and Nick Collins, examines the complex history of multimedia performance.

Julian Rohrer’s chapter on “Network Music” “covers a broad range from collaborative composition environments to sound installations and improvised music ensembles” (p. 140), giving special attention to the history and significance of communications technology in art.

Julio d’Escriván’s chapter, “Sound and the Moving Image,” addresses electronic music for film, television, and video games. Among other points of interest it contains a favorable reappraisal of the importance of Raymond Scott’s innovative commercial music and studio techniques during the 1950s and 1960s and closes with a provocative section entitled “Future Media:” The final chapter of Part Two is Nick Collins’s “Musical Robots and Listening Machines.” A subsection entitled “Four Interactive Improvisation Systems” gives detailed profiles of selected composers’ strategies. Other subsections include material on machine listening and accompaniment.

Part Three, *Analysis and Synthesis*, contains three chapters. In

the first, “Computer Generation and Manipulation of Sounds,” Stefania Serafin provides a well-organized overview of the categories of synthesis techniques and their origins ending with an exploration of future possibilities. In the second, Petri Toiviainen reviews “The Psychology of Electronic Music,” explaining “some of the important aspects of perception and cognition that can be regarded as useful for gaining better understanding of the perception of electronic music” (p. 231).

Natasha Barrett’s substantial finale entitled “Trends in Electroacoustic Music,” “identifies these trends and their compositional and aesthetic circumstances, forming a springboard for a new composer to the genre” (p. 232).

The main body of text of *Electronic Music* is preceded by a detailed timeline (beginning with Pythagoras and ending with contemporary video games) that highlights many foundational contributions to and developments in electronic music. Curious readers will welcome the selected discographies and suggestions for further reading that follow many of the chapters, as well as additional notes and a lengthy reference list at the end of the book.

The diversity of topics, accessible format, careful referencing, and the high quality of the contributions to *The Cambridge Companion to Electronic Music* guarantee that it will be of some interest to nearly every reader of *Computer Music Journal*.

**Charles O. Nussbaum: The Musical Representation: Meaning, Ontology, and Emotion**

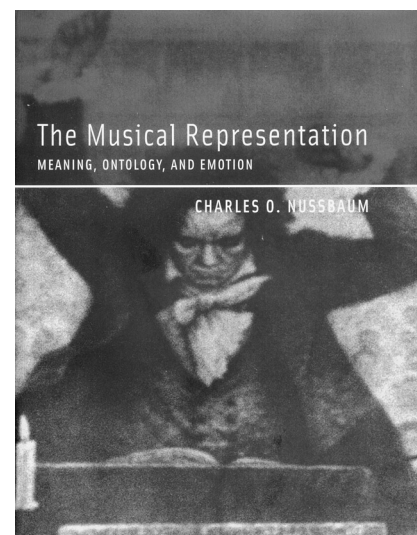
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*Reviewed by Ian Whalley  
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The publicity blurb for this book notes that “how human musical experience emerges from the audition of organized tones is a riddle of long standing.” The solution posed by Charles Nussbaum is founded on philosophical naturalism, that music relies on “collusion” between its representation, the physics of sound, and the organization of the human mind–brain. This leads him to account for its representational, affective, and somatic attributes.

With its driftnet title, the book grabs attention. It is certainly an epic undertaking covering a panorama of research, and the argument made is audacious. The list of references is extensive, and each chapter is something of an introduction to the diverse fields that the book attempts to integrate. One discovers as the text progresses, however, that Mr. Nussbaum’s thesis relates largely to Western instrumental tonal art music



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since 1650, rather than “music” generally, and John Blacking’s conclusions in *How Musical Is Man?* (1973) then spring to mind: “that we shall learn more about music and human musicality if we look for basic rules of musical behaviours that are biologically, as well as culturally, conditioned and species-specific” (p. 100). While the book’s title then promises much, the socio-cultural context and associated institutions and practices that make Western instrumental tonal art music unique is passed over, raising concerns over the generality of the argument.

That concern aside, in brief, the case advanced is that music is a representational system and as a symbolic system it carries extramusical content. To unpack this, Mr. Nussbaum first outlines the principles of musical representation, which takes into account how competent listeners experience music. After three modes of musical representation have been explained, the means by which extramusical meaning is facilitated is explored. This is followed by an analysis of how musical performances are best understood as tokens or replicas. The mechanics of musical affect are then illustrated, and finally, the means by which states of consciousness that music evokes having characteristic similar to religious experience are explained.

The book divides into six chapters, each beginning with an overview of the material covered within, and ending with a short summary of outcomes covered. This format is essential, because there will be few readers who have the breadth of knowledge that the text demands. Given this, clarity of argument and simplicity of explanation would seem essential if the book is to find a broad academic readership, or engage an educated laity beyond this. However, the writing style used is often unnecessarily

complex and long-winded, and the method of argument with constant close placement in other academic literature often detracts from the flow of the main points being made. There are also extensive supporting notes at the back of the book for those who wish to go into further detail, making the book difficult to navigate at times. This being said, the text will be richly rewarding for those readers who endure.

The preface sets out the mystery of music to be explained, largely made up of several contradictory roles that it can simultaneously fulfill. Mr. Nussbaum’s argument systematically draws on work from the fields of biology, psychology, and philosophy. It is built on the notion that the mind-brain takes part in an external world, but also needs to monitor and regulate the body. Further, based on evolutionary theory, the mind-brain is seen as being structurally organized through the evolutionary process where linguistic abilities come last in human development, but is built on a sense of music that precedes it. Accordingly, understanding music representation is then seen as a means to explain something about the current human condition by shedding light on an aspect of human development. From the outset then, the assumptions Mr. Nussbaum makes are staggering. For example, apart from accepting evolutionary theory as given, there are many theoretical variants and debates within it to explain why we have music based on what it was for in evolutionary terms, and the sequence by which it arrives in relationship to spoken language.

The introductory first chapter elaborates on the naturalist approach used for the investigation, putting forward the ontological, metaphysical, and epistemological theses that must be adhered to as part of the methodology. The limitations here

in relationship to Blacking’s perspective quickly become apparent. The chapter then introduces generative theories of tonal music and its associated language as a way of understanding musical grammar, the contention being that any theory of musical representation must include both the descriptive and interpretive modes of meta-representation. One can imagine that defining what counts as music partly in terms of western tonal pitch/duration paradigms will lose some readers here.

The second chapter is titled “The Musical Affordance: Three Varieties of Musical Representation.” Of these, the external mode describes the musical structured symbolic surface that people hear. The two internal modes are also used by listeners: the hierarchical plan of the goal-directed structure, and the mental models constructed of these plans in imaginary musical space. Together, musical representation is then defined as a combination of internal and external modes: a product of the physical nature of sound, the way people hear, and the motor system(s) of the human body/brain. The account here is cohesive, but perhaps different readers will have an additional sense of how music is experienced, and one is left to ponder how the theory would account for music that is a part of other dynamic systems such as dance, or where one might participate in improvisation based on the feedback of fellow performers or audience with little predefined structure.

Having established the previous mechanism, chapter 3 focuses on “The Musical Utterance: How Music Means.” The thesis here is that musical meaning relies on how external and internal representations combine, as music is both informationally structured and also produced and used to carry this information. A performance of a musical work is then

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seen as a representational token or gestural utterance. Extrinsic musical meaning is a result of the relationship between the musical mental models that the listener makes, and the world of human experience. Mr. Nussbaum suggests that there are two modes through which this modeling of meaning happens: the musical surface that models the structure of lexical semantic fields, that he refers to as extramusical form; and the layouts/scenarios in virtual musical space through which listeners move about in their imagination—this he calls extramusical content. Moreover, because human motor experience is an integral part of musical understanding, drawing from the work of George Lakoff and Mark Johnson, extramusical content is based on body-in-the-mind metaphorical transference. The chapter covers significant terrain, then, drawing together diverse threads. Again, the cultural “filters” that make this possible are largely left to be pondered by the reader.

Chapter 4, “The Musical Work,” compares musical pieces to biological species, viewing them as reproductively established families of tokens viewed here as performances. In contrast to biological species, however, musical works are seen as creations rather than inventions, in that they occupy a relatively isolated position in a large but limited set of probabilities. This is seen as being in contrast to biological traits that are understood to be inventions of undirected natural design, because they are somewhat accessible in the space of possible designs at specific historical junctures. Although the approach is interesting, one must bear in mind that musical history, including the development of style, is replete with examples that rely on cultural junctures that bring diverse contributing forces critically together, apart from the efforts of great composers.

“From Musical Representation to Musical Emotion” is covered in the fifth chapter. The difficulty of mapping music to emotion is acknowledged here, and a weak form of it accepted. The conceptual link set out is that because internal musical representations have the structure of plans and activate the human motor system “off-line,” musical experiences also set in motion the human motivational–emotional system. This link gives rise to emotions and affective feelings. Further, due to being non-conceptual, the musical experience dissolves the epistemological and metaphysical relationship between object and subject, for which people compensate. Owing to the “touch-like” qualities of musical sound and human emotional evaluative perceptions, a musical environment then seems directly affective and intimate. The argument here, despite the limitations of the scope of music used to support it, is an eloquent one, drawing on much recent literature in the field.

The final chapter has the imposing title “Nausea and Contingency: Musical Emotion and Religious Emotion,” which draws the argument back to the evolutionary starting point of the book. Having established how music functions in previous chapters, this chapter partly covers what music does. Here, the thesis is that the emotional features of musical experience are viewed as meeting human needs that have religious qualities. The notion of religion is bound to provoke many here, seen as (in part) an attempt to come to terms with life as a cosmic accident and deal with the possibility that human existence is pointless to anyone except us. Music, however, due to its pre-linguistic and ritual origins in the Upper Paleolithic Magdalenian era, induces moods that seem religious—the reward for people who find themselves suspended

temporarily in a beneficial virtual environment, where the drudgery, superficiality, and demands of material existence are forgotten and order happens as it ideally should. The problems with the argument here are multiple, as it presupposes that “music” is profoundly harmonically integrated and structurally controlled and resolved. Moreover, many may take exception to music being thought of as a type of opiate for significance-seeking creatures seeking cures for their bewilderment through idealism.

With its grand approach then, many readers of the book are likely to leave with an equal amount of questions as answers as they weave through the labyrinth of byways each chapter presents. Equally, there are many who may take exception to the various assumptions made, the definition of what music is, and the concentration on particular musical elements at the expense of others such as rhythm, style, and timbre. A main concern is that the argument, which partly addresses why we use music or why we tell stories generally, is backed into such a small set of possibilities in contrast to its multiple and varied use in everyday life. Partly this outcome is the result of the view of evolutionary theory that is set out at the beginning, which then lends itself to *ex post* reasoning: everything we do musically today is because of the way our mind/body developed, the polemical approach taken then allowing illustrative argument without having offered significant proof or been tested out empirically.

In the concluding section, Mr. Nussbaum presents a summary of the argument as an answer to the riddle set out at the beginning. Of course, things are not quite as clear-cut as he conjectures, otherwise we would all be great composers, as he notes in the concluding comments: “There is a secret buried deep in the heart

of modern Western tonal art music, some hidden nexus of touch, movement, cognition, emotion, and human ideals that resists the importunings of theory. It may be that the only initiates into this mystery are those who Wittgenstein designated 'true sons of God,' the great composers of the modern West" (p. 302). The Darwinian and Romantic views of music presented throughout the book then seem to collapse into each other.

Tennessee Williams in *The Glass Menagerie* provides an apt description of what still escapes explanation here: "I didn't go to the moon, I went much farther—for time is the longest distance between two places. . . attempting to find in motion what was lost in space."

In short, Mr. Nussbaum does not solve the riddle of Music here, but this offering is welcome, a substantial and original synthesis of material on the subject. Further, by drawing on biology, psychology, philosophy, and linguistic theory it integrates a good deal of recent research from disparate fields. Despite its drawbacks, it is a rollickingly good read that is bound to stimulate and provoke, and is recommended to anyone interested in the breadth of the topics covered.

## Recordings

### Matthew Ostrowski: *vertebra*

Compact disc, Pogus Productions P21016-2, 1999; available from Pogus Productions, 50 Ayr Road, Chester, New York 10918-2409, USA; fax (+1) 509-357-4319; Web [www.pogus.com/](http://www.pogus.com/).

*Reviewed by Michael Boyd  
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Matthew Ostrowski is a composer, performer, and installation artist

who primarily works in the electro-acoustic medium. His background is varied, ranging from composition to improvised live electronics to work with the noise band Krackhouse.

The recording under consideration here, *vertebra*, was created while the composer studied at the Institute of Sonology at the Royal Conservatory in The Hague during the mid to late 1990s. Regarding this work, the composer writes: "This is a recording of a live performance: one member of a set of possible solutions. *Vertebra* is a computer program, an environmental construction, a scaffold, in which the activity of making sense and its suspensions are not merely illustrated, but actually taking place." Thus, the four tracks found on this compact disc (titled simply *i*, *ii*, *iii*, and *iv*) seem to represent instances or individual realizations of Mr. Ostrowski's larger work, the computer program. Much in the same way that an indeterminate composition can vary significantly in different performance contexts while retaining some essential characteristics, one finds interesting similarities and contrasts between the four tracks of *vertebra*.

All four tracks on this disc are of moderate length, between 10 and 14 minutes, and comprise primarily short- to medium-length threads of sound that are superimposed and juxtaposed. Within each track the sound segments, although diverse, are often interrelated, and in most cases likely stem from a somewhat limited pool of source sounds that are manipulated by Mr. Ostrowski's software. Considered collectively, the pieces of *vertebra* present sonic contrasts, though pairs of tracks, *i/iv* and *ii/iii*, share multiple characteristics. For example, the first and fourth are largely composed of percussive, granular, speech, and inharmonic sounds, whereas the second and third prominently oppose pitched



instrumental and noisy timbres. Despite this distinction, all four parts of this disc are related through the manner in which the source sounds are manipulated and combined, and the highly active texture that results from these processes. Indeed one is almost overcome at times by the extreme level of activity in these works as new gestures are introduced rapidly, sometimes producing several layers of simultaneous activity.

The first track begins with reiterated fragmentary speech, sustained inharmonic timbres, and a variety of percussive noises. Like the other pieces on this disc, these sounds are varied, both subtly and significantly, and often re-presented multiple times. The sonic focus of this track changes roughly every two minutes when new timbres and gestures are introduced or brought to the foreground. These sectional divisions are not always discrete, as many borders are blurred and feature significant overlap. This piece moves from the types of sounds described earlier to bell-like and buzzing timbres midway through the work's third minute, and in subsequent sections to bird sounds, synthesized and/or distorted instrumental pitches, and new speech fragments. The most striking sonic shift occurs midway through the eighth minute when a continuous but internally