

- Ole Kühl's. *Musical Semantics: Cognitive Musicology and the Challenge of Musical Meaning* *Musical Semantics. European Semiotics / Sémiotique Européenne* Vol. 7. Bern: Peter Lang, 2007. 261 pp. ISBN 978-3-03911-718-5. Price: € 47.50; £35.60; \$ 73.95.

It is striking that, of all the many books published on music and meaning over the past half century, only two bear the title *Musical Semantics*: Otto Laske's slim volume of 1973 (with the subtitle "A Procedural Point of View"), and Ole Kühl's study of 2007. The reluctance of music scholars to employ the term might reflect reservations about venturing the sort of comprehensive account of musical meaning suggested by the notion of a musical semantics. It might also point to doubts about whether musical meaning can be approached in a formal way, a kind of systematicity suggested both by approaches to semantics that developed in the mid-twentieth century and by use of the term to designate an aspect of communication distinct from that of syntax. It was, in fact, in the sense of a network made up of symbolic representations of musical knowledge and relationships among these representations that Laske employed the term. Kühl, by contrast, is content with a more relaxed, if no less comprehensive, view of musical semantics: for Kühl, musical semantics involves not only musical meaning as understood and experienced by the individual, but musical meaning as a reflection of the cognitive capacities of human beings.

The breadth of Kühl's view of musical semantics reflects the larger purpose of his book, which aims to set out what he regards as the essential features of cognitive musicology. These features are, in most respects, markedly different from those associated with what Laske called cognitive musicology—indeed, it would not be inaccurate to say that Kühl's cognitive musicology is a completely different discipline from Laske's cognitive musicology. In his 1977 book *Music, Memory, and Thought: Explorations in Cognitive Musicology*, Laske described his approach as follows:

I am taking a cognitive view at problems in musicology, suggesting that to comprehend precisely what it is that musicians are doing is as essential for understanding music as is comprehending the end product of their activities. I am concerned, then, with exploring issues in cognitive musicology, a science that takes an equal interest in musical structures and in the musical processes from which such structures result (Laske, 1977, p. xiii).

As Laske construed it, this science was to be a practical one in which the use of computers was a key element — indeed, he saw the goal of cognitive musicology as involved with "capturing human musical knowledge, transferring it to computers, and integrating it into intelligent programs" (Laske, 1988, p. 257). This perspective is one that reflects Allen Newell and Herbert Simon's work on human problem solving (Newell & Simon 1972), embracing the assumption that the cognitive representation of knowledge is accomplished through amodal symbols for which the binary code of

computer languages serves as an apt metaphor: human cognition is thus viewed as functionally equivalent to computation. Although this approach to cognitive musicology is one that retains some currency (Leman & Schneider, 1997; Leman, 1999; Honing, 2006), it is not one shared by Köhl. Indeed, computation plays no part in his account of cognitive musicology. Köhl instead sees the discipline as a natural consequence of continued research in the mind and brain sciences:

Recent developments in cognitive science and neuroscience have made it feasible to build a descriptive architecture of musical cognition that covers the span from traditional musicology, via cognitive science and music psychology, to the empirical data provided by neurobiological research. In fact, these developments emphasize the urgent need to rethink musicology in order to bring it *at par* with the development in related fields of study: there is now a cognitive linguistics, a cognitive poetics, and a cognitive approach to the visual arts is now under development. Why not a cognitive musicology (p. 15)?

The model provided by cognitive linguistics is particularly instructive: this approach to the study of language began in the 1970s as an alternative to Chomskian linguistics, and has never had a significant computational component. Cognitive linguists have instead been interested in describing how human cognitive capacities are specified for language, how the structure of language both reflects and shapes those capacities, and in exploring the role of language within human cultures (Croft & Cruse, 2004; Geeraerts & Cuyckens, 2007). As Köhl sees it, cognitive musicology should be concerned with describing how human cognitive capacities are specified for music, how the structure of music reflects and shapes those capacities, and with giving an account of the role of music within human cultures. An exploration of musical semantics is central to this project since, as Köhl argues, humans are semiotic beings who search for meaning in their experience of the world (p. 18).

In what follows I would like first to offer a brief overview of Köhl's book, with particular attention to the different disciplinary perspectives on which he draws. I shall then turn to some of the contributions the book makes, as well as the frustrations it presents to the sympathetic reader. In the final section I shall return to the topic of cognitive musicology and consider the prospects for its future in light of Köhl's contributions.

#### MUSICAL SEMANTICS: AN OVERVIEW

Köhl's study is laid out in two main parts. In the first, he sets out the elements of his view of cognitive musicology, drawing on a wide range of research from fields as diverse as formal semiotics, neurophysiology, developmental psychology, cognitive linguistics, cognitive psychology, psychoacoustics, and the neurobiology of emotions. Although Köhl's goal is to establish a foundation on which he can build the account

of musical semantics he will offer in the second part of the book, as a way to both motivate and circumscribe his view of cognitive musicology he begins his survey with a consideration of what musical semantics involves. As Köhl argues in his second chapter, one of the defining characteristics of musical meaning is that it is fluid rather than fixed: it is simply not exceptional for two people to take different meanings away from their experience of the same musical phenomenon. This does not mean that individuals differ in any substantive way in their perception of auditory phenomena, only that such perceptions are not, in themselves, sufficient for musical meaning. What is first required are cognitive responses to various perceived musical elements, and it is from a variety of such responses that musical meaning is built. Musical meaning thus emerges as what Köhl calls a proto-concept, “a preverbal, unified whole, sensed rather than thought” (p. 49).

With this perspective in place, Köhl then sets out to discover the context for the processes that support the transformation of musical percepts into musical proto-concepts. In his third chapter he explores the idea that this sort of transformation is, broadly speaking, adaptive, in that it supports preverbal interactions between an infant and its parents. As Colwyn Trevarthen and others have argued (Trevarthen, 1999-2000; 2001; Trevarthen & Aitken, 2001; Trevarthen & Malloch, 2000; Dissanayake 2000; 2001a), human infants are apparently unique in the richly rhythmic interactions in which they engage with their caregivers, both attending and responding to movement and to sonic representations of movement. This capacity supports the regulation of emotions (Dissanayake, 2006), and provides the basis for the complex social interactions that are uniquely human. In Trevarthen’s words, “The foundations of all psychological co-operation or intersubjectivity are to be found in a sense of movement and in detection of the generation of qualities of movement in other bodies” (2002, pp. 26-7). The same features that mark infant-caregiver exchanges — rhythmic structure, parametrically varied sound sequences, the regulation or production of emotional states, and opportunities for varied forms of social interaction — also mark music. Köhl builds on this insight by drawing on Vygotsky’s analysis of children’s preconceptual knowledge to account for the origin of the musical proto-concept. Vygotsky argued that a key phase in the development of conceptual thought was what he called “thinking in complexes,” with a complex construed as a preconceptual agglomeration of impressions and observations. The bonds between the components of a complex are concrete and factual rather than (as in the case of concepts) abstract and logical (Vygotsky, 1962, p. 61). Köhl proposes that this same kind of loose affiliation is typical of the cognitive processes bundled together in the proto-concept: “Musical meaning joins uneven elements, like phrases, timbre, and form, in order to name a few possibilities that involve cognitive processing at different levels. The formation of a unified gestalt, as met with in a Vygotskian complex, seems to rest on an innate property of the human mind/brain” (p. 67).

The developmental work of Trevarthen, Vygotsky, and others provided Köhl one

way to account for how musical percepts are transformed into musical proto-concepts; another avenue was offered by work in cognitive semantics, which he explores in his fourth chapter. One of the key influences on cognitive semantics was George Lakoff and Mark Johnson's work on metaphor during the early 1980s, which also provided a significant impetus for the development of cognitive linguistics. According to the view developed by Lakoff and Johnson, metaphor is not simply a figure of speech but is instead a basic structure of understanding (Lakoff & Johnson, 1980): the expression "He fought to win her affection," for example, reflects a large system of metaphors based on a characterization of romantic love as a form of warfare. This insight led Lakoff and Johnson to distinguish between conceptual metaphors (which involved the systematic mapping of structure from one domain of knowledge onto another) and linguistic metaphors (which were the expression, through language, of a conceptual metaphor). The conceptual metaphor LOVE IS WAR thus serves as the basis for many different linguistic expressions, including "He fought to win her affection." Köhl notes that, in a similar fashion, concepts from other domains (such as ascent or descent through physical space, or forces associated with physical motion) have been used to structure our understanding of music (pp. 81-3).

The notion that linguistic expressions were simply manifestations of more general structures of understanding was an important contribution to the set of intellectual commitments that came to typify cognitive linguistics. It also led to inquiries into the ultimate bases of such general structures. One of the most influential of these has been Mark Johnson's theory of image schemas, which holds that conceptual metaphors are grounded in repeated patterns of bodily experience (Johnson, 1987). This theory provides a way to explain how conceptual knowledge is embodied and, because of its generality, has provided a way to extend Lakoff and Johnson's insights beyond language into domains such as music (for a review, see Zbikowski, 2008). The prevalence of metaphorical language in accounts of music is thus for Köhl a marker of the operation of more general cognitive processes, ones that have their ultimate source in embodied image schemas. Another manifestation of such general processes are the categories through which we organize our understanding of a variety of domains. Work on categorization provided a way to explain the origin of concepts that was substantially independent of linguistic knowledge, not the least because such processes are evident in a wide variety of species (Rosch, 1978; Lakoff, 1987). Although this approach has been extended to music (Zbikowski, 1999b; 2002, chap. 1), Köhl is rather guarded in his enthusiasm for research on categorization, focusing in the main on the implications of basic-level categories for musical understanding (pp. 88-91).

A somewhat more detailed account of how musical knowledge is embodied is offered by recent work on the neurophysiology of music, which Köhl reviews in chapter 5. He draws particular attention to the distinct levels of cognitive functioning associated with different time spans, noting that the cognitive processes that organize

our understanding of brief spans of music — below and at the level of attention — are almost certainly different from those focused at the level of the phrase (starting at around a ten-second time span). This difference leads him to argue that an approach to music cognition that begins at the smallest level of a hierarchy of musical structures and moves in steady increments of increasing complexity up to the highest level will, of necessity, miss much that is important. Köhl, for his part, would like to propose that a more realistic account will begin at a middle level, one occupied with what he will describe, in the second part of the book, as musical gestures, and move from there upwards to the level of musical form, and downwards to the level of the individual note (p. 113).

In the final chapter of part one Köhl addresses the relationship between music and emotion. In that Köhl bases his perspective on the neurobiological approach to emotions developed by researchers like Edmund Rolls (2005) and Antonio Damasio (1999; 2003), this relationship provides further evidence for the embodied aspect of musical understanding. It also offers another perspective on how music is used to create meaning. In a broad sense, the use of proto-musical structures to synchronize the attention and activities of infant and parent that Köhl reviewed in chapter 3 creates one kind of meaning (namely, the meaning that derives from an awareness of intersubjective social attunement). Emotions, from Köhl's perspective, contribute to musical meaning in two additional ways. First, emotions — either as a coordinated physiological and psychological response to environmental conditions or more generally as moods — form a backdrop for our experience of music. Second, music itself evokes affective responses — that is, it is a special sort of environmental condition. Of course, the changes evoked by music transform our internal emotional landscape, which then conditions our subsequent experience of music. Köhl proposes that this recursive process provides a way to bring emotion into an account of musical meaning that includes embodied experience and our awareness of that embodied experience through cognitive processes (pp. 130-31).

One of the principal points that Köhl develops in the second part of his study is that a thorough account of musical meaning requires an integrative approach: as is evident from the overview he provided in the first part, the processes that support the transformation of musical percepts into musical proto-concepts are various, and may in some cases go beyond what is typically construed as “musical.” One platform for this integration is provided by the units of mental control Albert Bregman called schemas, which interact with the clusters of sensory input produced by preattentive perceptual processes (Bregman, 1990, p. 666). Köhl describes the process as follows:

The auditory stream *presents* humanly structured sound to the human ear, which is not yet music. Auditory scene analysis and schema based perception leads to an extraction of musical elements from the sound stream, like for instance rhythm, melodic phrase and micro pitch as suggested here. Some of these elements are *selected* subjectively as being of special interest, evoking cognitive responses that are *mapped* to the elements: motor pattern

to rhythm; gesture to melodic phrase; and affective responses to micro pitch. Through cognitive processing, involving functions like categorization and integration among others, responses are developed and *bundled* in an *emerging* musical experience (pp. 150-1).

This experience is, more specifically, a semantic experience: what Köhl aims to describe is an integrated sequence of perceptual and cognitive processes that has as its consequence musical meaning.

As emerges in the course of chapter 7, the sort of integration that Köhl sees as fundamental to the development and bundling of cognitive responses is a consequence of a cognitive process that Gilles Fauconnier and Mark Turner called conceptual blending (Fauconnier & Turner, 2002). In a conceptual blend, concepts from disparate domains are brought together to create new meaning. A ready example is provided by fairy tales that feature talking animals: concepts associated with an animal (in particular, its characteristic behavior and physiognomy) are integrated with concepts associated with humans (in particular, the capacity for speech and rational thought) to create a new kind of creature that lends itself to any number of possibilities for narrative structure and the play of the imagination. (For an introduction to conceptual blending in musical contexts, see Zbikowski, 1999a; 2002, chap. 2; 2008.) Köhl suggests that, in a similar fashion, musical meaning is a result of the integration of sound, emotional state, and schematic material (p. 163).

The construct that typifies this sort of integration, and which is considered in detail in Köhl's eighth chapter, is the musical gesture. As Köhl conceives it, the musical gesture is a rich gestalt that occupies a middle level of both cognitive processing and musical structure; combines auditory, somato-sensory, and emotional information; and lends itself to imaginary visualizations of musical material (166). He pursues each of these characteristics in some detail, supported by brief analyses of works by Mozart, Charlie Parker, The Band, Bob Dylan, and Stevie Wonder.

This view of musical organization is then drawn together in chapter 9 through a consideration of how accumulations of musical gestures produce higher-level structures. The process envisaged by Köhl relies, in the main, on a metaphorical understanding of successions of musical gestures as instantiating various image schemas (such as those Johnson called the BALANCE schema or the SOURCE-PATH-GOAL schema; this view of musical form has been developed in some depth by Candace Brower (1997-1998; 2000)). The result is a kind of narrative, but one based on embodied experience rather than on literary models. (A similar argument has been made for literature by Mark Turner, who has proposed that narratives based on image schemas are basic to literary models; see Turner, 1996.) Although Köhl is clearly interested in the possibility of such narratives, he also believes that they stand at a remove from musical meaning proper:

The primary musical signification lies at the level of the gesture, in its expressive, microstructural dimensions, and in the expanding of the gestural flow inside the extended

present. Formats larger than this juxtapose more or less interchangeable sets of gestures in ways that are determined by extramusical conditions, such as rituals and other functions, or they install developmental features through artful invention, as in symphonic forms, opera, *etc.* (p. 226)

In his concluding chapter Köhl returns to the semiotics of music and uses Saussure's conception of the sign function as a basis for an account of the musical sign. For Saussure, the sign function was a consequence of linking the signifier (the hearer's psychological impression of a sound) with the signified (which is some concept). Köhl proposes that, in the case of music, the sound pattern of the signifier is linked to an implied physical gesture (with "gesture" including both perceived patterns of movement and proprioceptive experiences of movement). The basic musical sign function is thus the musical gesture, which Köhl argues must provide the basis for any semiotics of music.

#### CONTRIBUTIONS AND FRUSTRATIONS

As my summary of Köhl's *Musical Semantics* will have suggested, one of the chief contributions of his book is a thoroughgoing integration of a broad range of work in cognitive science, with the express aim of providing a comprehensive view of music cognition which can serve as a basis for a new disciplinary approach. Some readers will be surprised to find an absence of familiar names — Carol Krumhansl and John Sloboda, for instance, each appear but twice in the bibliography — but given the intellectual context for Köhl's work such omissions are perhaps inevitable. Köhl's intent, after all, is to sketch a disciplinary approach equal to that of cognitive linguistics or cognitive poetics, and neither of these fields has been driven by psychological studies of the sort that have informed music cognition. That said, Köhl makes every effort to draw on empirical work focused on music, and especially on more recent research in the neurophysiology of music. This too has to be recognized as a significant contribution, for much of the work that might be gathered under the banner of Köhl's cognitive musicology — and here I am thinking of work by David Borgo, Candace Brower, Martin Clayton, Arnie Cox, Ian Cross, Adam Ockelford, Marc Perlman, Mark Reybrouck, Janna Saslaw, and Bob Snyder — has placed more emphasis on research in cognitive science with broad implications for how humans structure their understanding of the world, and rather less on the findings of music psychology. The breadth of Köhl's approach is also reflected in — and to some extent driven by — an attention to music's cultural context. Music is, for Köhl, more than a consequence of psychoacoustic imperatives; music is both shaped by and shapes human cultural interactions. This perspective not only allows Köhl to put cognitive musicology in dialogue with cognitive linguistics and cognitive poetics but also throws open the entire range of human musical expression for investigation.

Although early work in cognitive science sometimes proceeded as though human cognitive processes operated independent of human physiology, recent work (Damasio, 1994; Donald, 2001) has begun to explore how the body shapes thought. Köhl takes full advantage of this work, and the result is a perspective on music cognition that is much more sensitive to interactions between musical and embodied experience. We clearly have more to learn about how embodied experience informs higher-level cognitive processes, but Köhl's work suggests that music has any number of interesting things to tell us about the relationship between body and mind.

There is also much promise in Köhl's incorporation of developmental research into his account of how the musical proto-concept emerges. The study of the ways infants and young children develop an understanding of music is, of course, hardly new. Köhl's contribution comes through his focus on musical semantics, which leads him to develop a perspective closer to Ellen Dissanayake's ethological view of music (Dissanayake, 2001b): Köhl is interested in the role of sounds and rhythmic interactions in how human behavior develops, as well as what such developments tell us about musical organization and musical meaning. The colloquy between research on development and research on communication evident in this perspective is reminiscent of Michael Tomasello's research on young children's acquisition of language. Tomasello sees this process as deeply intertwined with the development of human culture, and as reflecting certain aspects of linguistic structure proposed by cognitive linguists (Tomasello, 1999; 2003). As noted above, Colwyn Trevarthen and his associates have laid much of the groundwork for a similar approach for music; by making this a part of his theory of musical semantics, Köhl has suggested how such an approach might be integrated with accounts of musical structure.

Finally, through grounding his approach to musical semantics on research in cognitive science, Köhl offers a new way to think about musical semiotics. The notion that the sign is a psychological construct is one that goes back at least to C. S. Peirce, but music's lack of referentiality has always made the psychological status of the musical sign difficult to specify. By linking musical sounds to gesture (and gesture to both processes of communication and to embodied experience) Köhl points the way to a cognitive semiotics of music.

My enthusiasm for *Musical Semantics* is conditioned by some of the frustrations it presents to the sympathetic reader. Köhl's is a very ambitious project, and all too often he is able to present only an outline of issues that would seem to demand more sustained discussion. In chapter 5, for instance, which deals with the neurophysiology of music, Köhl's treatment of the auditory pathway within the brain spans three pages; the survey of brain architecture that follows, in which he considers, among other things, the areas of the brain involved with musical consciousness, spans two. Köhl's book is not, of course, a treatise on neurophysiology or brain architecture, but the brevity of these discussions will disappoint many informed readers. It also bears mention that, while there are many citations to the published work of others in each of these sections, the works cited do not always agree with one another on the point

at hand. It is thus not always easy to know if a given citation is intended as a general gesture toward relevant research or as an indication of findings that support a particular viewpoint. There is, of course, much to be said for the value of surveys and the utility of a concise exposition, but one of the consequences of Kühl's presentation is that the reader gets only a glimpse of how his theoretical model might be implemented.

This last difficulty is perhaps most evident in Kühl's treatment of his musical examples. As but one instance, he presents his analysis of the first four measures of the theme from the first movement of Mozart's piano sonata in A, K. 331 (shown in Example 1) with practically no comment, simply remarking "we perceive a series of four melodic gestalts, marked by the dashed ovals" (p. 168). In a footnote he then observes, "Please note that this kind of analysis is a personal interpretation: one could also argue for different segmentations, for instance at the barline between the last two phrases." It would seem, however, that a consideration of the motivations behind or reasons for different segmentations is just what is needed if the notion of a melodic gestalt (a notion directly related to Kühl's conception of a musical gesture) is to have real substance. The discussion of the other examples in chapter 8 is similarly brief, rendering the musical excerpts rather less effective than they might otherwise be, especially when it comes to the light they might shed on some of the fundamental ideas with which Kühl deals.



Example 1.

W.A. Mozart, *Piano sonata in A major*, K. 331, first movement, bars 1-4, from Kühl's Figure 8-1, p. 168 of *Musical Semantics*.

There is also cause for reservations about Kühl's interpretation of earlier work. For example, as part of a discussion of auditory pattern recognition he observes that Tomasello, in his 2003 *Constructing a Language*, "presents a theory on how infants develop their linguistic skills based on an innate capacity for pattern recognition" (p. 147). Although the ability to recognize patterns is important in Tomasello's account, he emphasizes that this skill is not enough for the acquisition of language:

... it is important to remember that 7- and 8-month-old infants who are finding all of these patterns in auditory and visual stimuli in experiments do not process the grammatical

constructions of language — consisting of meaningful symbols — in either comprehension or production. Their pattern-finding skills are thus not sufficient by themselves for dealing with real grammatical constructions used for communication — because the infants do not comprehend the symbolic dimension of those constructions (2003, p. 30).

As Tomasello makes clear, what is required for the comprehension of the symbolic dimension of language is the ability to read intentions: language cannot be acquired on the basis of pattern recognition alone.

Another example of a misunderstanding of sources comes in Kühnl's commentary on my analysis of the *Leidensmotiv* from Wagner's *Tristan und Isolde* (2002, chap. 1), an analysis that takes as its point of departure research on processes of categorization. Kühnl writes,

he [Zbikowski] argues that we form a musical category of the motive, when we listen to this piece. As the motive recurs, we recognize it as belonging to this particular category [citation to the analysis in Zbikowski, 2002]. Although his analysis does not really differ from a traditional motivic analysis, he may well be right in assuming that the cognitive function behind this particular form of experience is categorization — whatever that is. He does not, however, consider the question of stability of the categories thus formed (85).

Kühnl is right in saying that, with regard to an account of the salient musical events in this passage, my analysis conforms in many respects with a traditional motivic analysis. The difference comes in how the object of analysis is defined. With respect to motivic analysis, the object of analysis is defined in terms of intervallic relationships or, in some cases, rhythmic features, with the understanding that these relationships or features are an aspect of compositional design: motives are important because they are basic to the construction of well-ordered musical works. With respect to analysis based on the conceit of a musical category, the relevant features of musical materials reflect the listener's ability to group musical events into cognitive categories. If these groupings are done on the basis of intervallic relationships and rhythmic features — and to my ear this seems a plausible way to proceed with instances of Wagner's *Leidensmotiv* — then the results of an analysis based on this conceit will most likely accord in significant respects with a traditional motivic analysis. As I noted, however, the relevant units may, by contrast, be harmonic (as in a chaconne) or involve a repeated bass pattern (as in a passacaglia or certain groove-based compositions) (2002, p. 59); there is also evidence that they can be based on timbre (Pollard-Gott, 1983). It is not the case, then, that analysis based on the conceit of a musical category is equivalent to a traditional motivic analysis: musical categories are assumed to have a specifiable cognitive status (which is not specified in the case of the motive), and the construal of categories is much more flexible than that of motives. With respect to the stability of musical categories, I offered a relatively extended consideration of the matter in my discussion of the various forms

the *Leidensmotiv* takes over the course of *Tristan und Isolde* (2002, pp. 51-8). In the course of this consideration I propose that the stability of any given member of a musical category is associated with the degree of typicality it demonstrates (with typicality shaped both by the conceptual model around which the category is organized and by the various musical features that members of the category present).

The brevity of Kühl's exposition and the somewhat cavalier way he handles his sources combine to make *Musical Semantics* read more like a manifesto than a clear program for a cognitively-based approach to musical meaning. It could be that cognitive musicology needs such a manifesto, but it could also be that many readers are left wondering just how musicology can take advantage of our growing understanding of the cognitive processes through which humans organize their understanding of the world.

#### PROSPECTS FOR COGNITIVE MUSICOLOGY

For Otto Laske, the semantic aspect of music arose through an evaluation of musical syntax, and in particular musical structures that exhibit properties of closure. The semantic properties of a musical structure were thus "second-hand phenomena": "they derive from a mental projection by which the points of closure of a behavioral sequence underlying the completion of a structure are interpreted as properties of the structure itself which has been completed" (Laske, 1973, p. 1). In that Laske viewed musical syntax as the result of building up syntagmatic and paradigmatic configurations of coded sound objects (1973, p. 6), the evaluation process basic to musical semantics was one that could be described through a computational approach. Cognitive musicology — a discipline focused both on musical structures and on the musical processes associated with such structures — was, in consequence, a computational science. Not incidentally, the nature of the input with which this science dealt was accidental: although the various procedures outlined by Laske took sound as their input, they could have just as easily taken in discrete quantities of reflected light, or phonetic patterns, or differential dimensions of carved stone, possibilities that would have yielded cognitive pictorial art, cognitive poetics, and cognitive architecture.

For Ole Kühl, the semantic aspect of music reflects humans' use of patterned non-linguistic sound to structure their understanding of the world. This comes about through cognitive responses to perceived musical elements. These responses give rise to the musical proto-concept, which represents the most basic element of musical structure. In that the proto-concept is an integrated whole which binds together auditory, somato-sensory, and emotional information it already embodies, in a very general sense, meaning. Musical semantics is, in consequence, not something which happens subsequent to the definition of structure but which happens together with the emergence of structure. In this respect the musical proto-concept has much

in common with what some cognitive linguists call constructions, which are construed as uniting semantic function and grammatical form in one unit (Goldberg, 2003).

The differences between these two approaches to musical semantics is a testament not only to changes in the field of cognitive science over the last thirty-five years but also points to quite different views of how knowledge can be represented. In keeping with many of his contemporaries, Laske believed that human knowledge could be represented through systems of amodal symbols that bore no significant trace of their perceptual origins. Köhl, by contrast, is thoroughly invested in an embodied account of human cognition, as his notions of the musical proto-concept and the musical gesture demonstrate. A difficulty for both approaches is providing a working theory of how percepts become concepts. For computational approaches, this is the familiar transduction problem: there is as yet no explanation of how perceptual information is transduced into the amodal symbols basic to computational processes. For Köhl, the process of concept (or proto-concept) formation relies on the notion of a gestalt, the emergence of which relies on an innate (and otherwise unspecified) property of the human brain. Just how musical percepts become musical proto-concepts thus remains somewhat magical — gestalts simply form because they must. An alternative to both approaches is offered by Lawrence Barsalou's theory of perceptual symbol systems (Barsalou, 1999), which offers a unified account of how percepts become concepts, and for which there is a growing body of empirical support (Barsalou 2008). I believe Barsalou's theory, applied to music cognition, would offer a means to build on current research to yield a very different way of thinking about musical organization.

And so, whither cognitive musicology? What Köhl's book demonstrates, in the final analysis, is that the study of music cognition could benefit enormously — and possibly change fundamentally — by taking the notion of musical meaning seriously. If nothing else, such a strategy could begin to address why music matters — both across the world, and across history — to human beings. It is worth bearing in mind that a similar inquiry into the basis of meaning led to the development of the field of cognitive linguistics over the past thirty years. Just how cognitive musicology should be configured, and what role computational approaches should play in that configuration, remains an open question. What seems more certain is that cognitive approaches can be brought to bear on musicological research, that they can incorporate current work in music cognition, and that they hold the promise of bringing a sharp and clear focus to the role music plays in human cultures.

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