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Metaphor and Music Theory: Reflections from Cognitive Science

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ABSTRACT: A recent discussion on the smt-list focused on Nicholas Cook's claim in *Music, Imagination, and Culture* that musical analysis is essentially metaphorical. This essay investigates this claim through a review of recent work on metaphor by cognitive scientists. This work both supports and modifies Cook's original claim. The latter portion of the essay presents examples of two applications of research on metaphor to music theory.

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1. Introduction

[1.1] In a recent set of exchanges on the smt-list, attention focused momentarily on Nicholas Cook's claim in *Music, Imagination, and Culture* that musical analysis was essentially metaphorical.(1) Although there was considerable interest in the topic at the time, fundamental aspects of Cook's claim were never considered in detail, nor were its broader implications for music theory. In the following I would like to return to this claim, consider recent work on metaphor by cognitive scientists that both supports and modifies Cook's original claim, and suggest ways metaphor informs and shapes the ways we theorize about music.

2. The metaphorical nature of musical analysis

[2.1] As Cook notes, the perspective on musical analysis he presents in *Music, Imagination, and Culture* is informed by the work of the philosopher Roger Scruton. Scruton directly addresses the metaphoricity of our accounts of music in his 1983 essay "Understanding Music." Scruton's argument centers on a crucial distinction between sound and music. Sound, from his perspective, is a material fact, and as such is a matter for scientific understanding. Music, in contrast, is an intentional construct, a matter of the concepts through which we perceive the world. The evidence for this distinction is provided by the metaphorical nature of our characterizations of music: although we speak of 'musical space' (and locate tones within it), this space does not correspond, in a rational way, to physical space; although we speak of 'musical motion,' the motion is at best apparent, and not real. The concepts of space and motion are extended to music through metaphorical transference as a way to account for certain aspects of our experience of music. These metaphors are not an addition to musical understanding, but are in fact basic to it. Scruton writes,

> . . . in our most basic apprehension of music there lies a complex system of metaphor, which is the true description of no material fact. And the metaphor cannot be eliminated from the description of music, because it is integral to the intentional object of musical experience. Take this metaphor away and you take away the experience of music.[(2)]

What Scruton sees as the unyielding metaphoricity of musical understanding points to the intentional nature of music, and leads him to assert that "Music belongs uniquely to the intentional sphere, and not to the material realm. Any analysis of music must be an exercise in intentional rather than scientific understanding."[(3)]

[2.2] In his book Cook adopts Scruton's argument in a very explicit way, and makes it specific to the concerns of music theory. Speaking of Schenkerian analysis in the introduction, Cook writes, "A Schenkerian analysis is not a scientific explanation, but a metaphorical one; it is not an account of how people actually hear pieces of music, but a way of imagining them."[(4)] Cook also extends Scruton's argument by overtly linking the way we imagine music to the ontology of musical cultures: " . . . a musical culture is, in essence, a repertoire of means for imagining music; it is the specific pattern of divergences between the experience of music on the one hand, and the images by means of which it is represented on the other, that gives a musical culture its identity."[(5)] In consequence, the metaphoricity of musical understanding is not only inescapable, but is in fact connected with the establishment of musical cultures.

[2.3] Although Scruton's (and, by extension, Cook's) assertion about the metaphoricity of musical understanding occurs as part of a larger rationalistic argument about musical ontology, there is a body of recent empirical work by cognitive scientists that supports this assertion. This research suggests that metaphor is not simply an anomalous use of language or a mark of the way we conceive intentional objects but is in fact central to human understanding as a whole. This research is also distinct from other discussions of the importance of metaphor to musical understanding, whether from a philosophical[(6)] or music-analytical[(7)] perspective, in that it offers a way to explain why correlations of the sort noted by Scruton— between musical pitch and physical space, or between successions of pitches and motion through physical space—are possible in the first place, and how such correlations are constrained.

3. Metaphor as a fundamental structure of human thought

[3.1] Perhaps the most common conception of metaphor is of a literary device, a manifestation of the figural use of language to create colorful if imprecise images. However, in 1980 George Lakoff and Mark Johnson presented an alternative view: metaphor, they argued, was not simply a manifestation of literary creativity, but was in fact pervasive in everyday discourse.[(8)] As an example, consider the way the spatial orientation of *up-down* is used to characterize emotions:

> I'm feeling *up*. My spirits *rose*. I'm feeling *down*.
> I *fell* into a *depression*. My spirits *sank*.

consciousness:

> Get *up*. I'm *up* already. He *rises* early in the morning. He *fell* asleep.

and health:

> He's at the *peak* of health. Lazarus *rose* from the dead.
> She's in *top* shape. He came *down* with the flu.

Each characterization suggests not a literal representation of the spatial domain implied by the orientation *up-down*, but instead uses our knowledge of physical space to structure our understanding of emotions, consciousness, or health.

[3.2] Based on evidence provided by a large number of similar examples of the appearance of metaphorical constructions in everyday discourse, Lakoff and Johnson proposed that metaphor was a basic structure of understanding through which we conceptualize one domain (typically unfamiliar or abstract—the target domain) in terms of another (most often familiar and concrete—the source domain). Further study has provided a wealth of empirical evidence for this proposal and contributed to the development of the field of cognitive linguistics.(9)

[3.3] Fundamental to the theory of metaphor that sprang from Lakoff and Johnson's work is a distinction between conceptual metaphors and linguistic metaphors. A conceptual metaphor is a cognitive mapping between two different domains; a linguistic metaphor is an expression of such a mapping through language. For instance, the conceptual metaphor STATE OF BEING IS ORIENTATION IN VERTICAL SPACE maps relationships in physical space onto mental and physical states.(10) The cross-domain mapping wrought by this conceptual metaphor then gives rise to innumerable linguistic expressions. Some of these expressions are commonplace, such as "John seems a bit *down* today" or any of the similar statements given above. Others are highly poetic, as demonstrated by the opening of Keats's "Ode to a Nightingale":

> My heart aches, and a drowsy numbness pains
> My sense, as though of hemlock I had drunk,
> Or emptied some dull opiate to the drains
> One minute past, and Lethe-wards had sunk.

Here the descent to the mythical river gives a physical correlate to the narcotic state of the narrator—the act of sinking is mapped onto a melancholy emotional state—and serves as yet another expression of the conceptual metaphor STATE OF BEING IS ORIENTATION IN VERTICAL SPACE.(11)

[3.4] The process of cross-domain mapping offers a systematic way to explain our commonplace notions of musical space. There is ample evidence that our characterization of musical pitches in terms of "high" and "low" is basically metaphorical. Consider "high" and "low" on the piano: how can D4 be "above" C4 on the piano when they are both on the same horizontal plane? Think of playing the two notes on the 'cello—to play the "higher" D4, we have to move our left hand *down*, so that it is closer to the ground. Behind these linguistic expressions is the conceptual metaphor PITCH RELATIONSHIPS ARE RELATIONSHIPS IN VERTICAL SPACE, which maps spatial orientations such as *up-down* onto the pitch continuum.

[3.5] Although Scruton argued that it was virtually inconceivable to construe pitch in any way other than an *up-down* spatial relationship, evidence to the contrary comes from a variety of sources. Greek music theorists of antiquity spoke not of "high" and "low" but of "sharpness" and "heaviness"; in Bali and Java pitches are not "high" and "low" but "small" and "large"; and among the Suyá of the Amazon basin, pitches are not "high" and "low" but "young" and "old."(12) The differences among these ways of characterizing musical pitch suggests that the understanding of music is profoundly metaphorical: not only is the *high* and *low* of musical pitch metaphorical, but it is only one of a number of ways to characterize pitch relations.

[3.6] The variety of conceptual metaphors used to characterize pitch relations leads to the question of the ultimate grounding of the process of cross-domain mapping. Even if we grant that we understand a target domain (such as pitch relationships) in terms of a source domain (such as orientation in vertical space), how is it that we understand the source domain in the first place? Mark Johnson endeavored to answer this question by proposing that meaning was grounded in repeated patterns of bodily experience.(13) These patterns give rise to what Johnson called *image schemata*, which provide the basis for the concepts

and relationships essential to metaphor. An image schema is a dynamic cognitive construct that functions somewhat like the abstract structure of an image, and thereby connects up a vast range of different experiences that manifest this same recurring structure.[(14)] Image schemata are by no means visual —the idea of an image is simply a way of capturing the organization inferred from patterns in behavior and concept formation.

[3.7] As one example of an image schema, consider the VERTICALITY schema, which might be summarized by a diagram of the sort given in **Example 1**. We grasp this structure repeatedly in thousands of perceptions and activities that we experience every day. Typical of these are the experiences of perceiving a tree, our felt sense of standing upright, the activity of climbing stairs, forming a mental image of a flagpole, and watching the level of water rise in the bathtub. The VERTICALITY schema is the abstract structure of the VERTICALITY experiences, images, and perceptions. Our concept of verticality is based on this schema, and this concept is in turn invoked by the various conceptual metaphors that use vertical space as a source domain through which to structure target domains such as emotions, consciousness, health, and musical pitch.

[3.8] By definition, image schemata are preconceptual: they are not concepts, but they provide the fundamental structure upon which concepts are based. In consequence, it is important to emphasize that the diagrams used to illustrate image schemata are intended to represent the key structural features and internal relations of image schemata; they are not meant to summon a rich image or mental picture that we somehow have "in mind," and use to actively structure our thought. More directly, whatever actually occupies our thoughts isn't, by definition, an image schema. We can conceive *of* image schemata, just as we can conceive of any of a number of non-conceptual or preconceptual cognitive processes. We can also note general patterns in the way concepts are structured, which can be attributed to image schemata. However, there are, by definition, no 'image-schema concepts.'[(15)]

[3.9] The relationship between the VERTICALITY schema and our characterization of musical pitch with reference to the spatial orientation *up-down* is fairly immediate: when we make *low* sounds, our chest resonates; when we make *high* sounds, our chest no longer resonates in the same way, and the source of the sound seems located nearer our head. The "up" and "down" of musical pitch thus correlate with the spatial "up" and "down"—the vertical orientation—of our bodies. The VERTICALITY schema offers a straightforward way to explain why we characterize musical pitch in terms of *high* and *low* even when the actual spatial orientation of the means through which we produce pitches either does not reinforce the characterization or runs directly counter to it.

[3.10] The theory of image schemata provides one way of explaining how conceptual metaphors are grounded. However, it does not, by itself, explain why some conceptual metaphors seem intuitively better than others. For instance, the conceptual metaphor PITCHES ARE FRUIT could provide the grounding for such (admittedly idiosyncratic) expressions as "You must play the first note more like an apple, the second more like a banana." To account for why some metaphorical mappings are more effective than others, George Lakoff and Mark Turner proposed that such mappings are not about the *imposition* of the structure of the source domain on the target domain, but are instead about the establishment of correspondences between the two domains. These correspondences are not haphazard, but instead preserve the image-schematic structure latent in each domain. Lakoff and Turner formalized this perspective with the Invariance Principle, which Turner states as follows:

> In metaphoric mapping, for those components of the source and target domains determined to be involved in the mapping, preserve the image-schematic structure of the target, and import as much image-schematic structure from the source as is consistent with that preservation.[(16)]

[3.11] Mapping the spatial orientation *up-down* onto pitch works because of correspondences between the image-schematic structure of components of the spatial and acoustical domains. Both space and the frequency spectrum are continua that can be divided into discontinuous elements. In the spatial domain, division of the continuum results in points; in the acoustic domain, it results in pitches. Mapping *up-down* onto pitch allows us to import the concrete relationships through which we understand physical space into the domain of music, and thereby provide a coherent account of relationships between musical pitches. Mapping various fruits onto musical pitches works less well because fruit do not (in any ordinary way) constitute a continuum. To employ this mapping is to highlight instead the discontinuity among musical pitches, as well as how they are *unlike* one another (an emphasis on difference suggested by the idiomatic phrase "like apples and oranges").

[3.12] One additional factor that guides cross-domain mapping is cultural knowledge. As seen above, different cultures have different ways of organizing their understanding of pitch relationships; the same goes for virtually every other aspect of music.[(17)] According to one theory, conceptual metaphors reflect the influence of idealized cognitive models, which are knowledge structures that guide inference and reason and that are part of the knowledge that is essential to culture.[(18)] I shall not attempt a review of such knowledge structures here[(19)]; however, it is worth noting that such structures provide the mechanism through which the 'repertoire of means for imagining music' spoken of by Cook may be effected.

4. Summary

[4.1] Research over the past two decades has made a strong argument that metaphor is not simply an anomalous use of language but is in fact central to human understanding. Fundamental to the linguistic expression of metaphor are conceptual metaphors, which establish mappings between two domains. The theory of image schemata provides a way to explain how conceptual metaphors are grounded, as well as how metaphorical mappings between domains are constrained.

[4.2] Inasmuch as music theory is part of human understanding, it follows that metaphor must play a part in our theories of music. In light of this, Cook's claim that 'a Schenkerian analysis is not a scientific explanation, but a metaphorical one' seems inevitable. However, the claim, as such, is only a beginning. Research on metaphor not only gives support to the claim, but also obligates the claimant to undertake a systematic elaboration of *how* metaphor is instantiated in Schenker's—or anyone's—accounts of music. In the following, I would like to give examples of two applications of research on metaphor to music theory, and briefly discuss two extensions of research on metaphor that hold promise for a better understanding of how we conceptualize music.

5. Applications to music theory

[5.1] An understanding of the role of metaphor in structuring our thought can be used to make explicit the bases of the theoretical constructs that guide our understanding of music. Consider, for instance, the notions embraced by the German word *Spannung* as it is used by Schenker in *Der freie Satz*. Here are two passages in which the term is prominent:

> Den Menschen is die Erfahrung eines Endes, des Erlöschens aller *Spannungen* und Ziele gegeben. In diesem Sinne ist es uns ein natürliches Bedürfnis, auch die Urlinie bis hinab zum Grundton 1 zu führen, wie auch den Bau wieder zum Grundton des Klanges zurückfallen zu lassen; mit 1/I erlöschen alle *Spannungen* eines Kunstorganismus. (1956: section 10, page 43; emphasis added) [To man is given the experience of ending, the cessation of all tensions and efforts. In this sense, we feel by nature that the fundamental line must lead downward until it reaches 1, and that the bass must fall back to the fundamental. With 1/I all tensions in a musical work cease. (1979: section 10, page 13)]

> Freilich, bei *Spannungen* ueber grössere Strecken ist Genie, die Gabe der Improvisation und des Weithorens Voraussetzung. (1956: section 30, page 50; emphasis added) [But genius, the gift of improvisation and long-range hearing is requisite for greater time spans. (1979: section 30, page 18)][(20)]

[5.2] In the first passage *Spannung* invokes a conceptual metaphor that correlates the domain of human experience with that of pitch organization; in its broadest form, this metaphor could be stated as MUSICAL PITCHES ARE LIVING ORGANISMS. This conceptual metaphor is important throughout Schenker's work, and is associated with his interpretation of pitch relationships as highly dynamic.

[5.3] A different conceptual metaphor underlies the second passage. This metaphor correlates the domain of physical structure with the elements of music, and can be rendered as MUSICAL ENTITIES ARE PARTS OF A BUILDING. The 'spans over large stretches' spoken of by Schenker suggest a rather more static image than the first use of *Spannung*, and one that is directly linked to the notion of 'structure' that pervades much analytical writing.

[5.4] It is important to note that these two conceptual metaphors, although invoked by the same word, are incommensurate. The tension inherent in living beings is not the same thing as a span across physical space. Although we might speak of such a span as being "under tension," this tension can be correlated with life-force only through metaphor. It must also be noted

that Schenker's theory of music is in no way deficient in its reliance on a number of conceptual metaphors, for the metaphors serve different purposes. The image evoked by the use of *Spannung* in the first passage comes from a perspective that views music as highly charged and *essentially* dynamic. This perspective, engaged and at times passionate, is one of the things that makes Schenker a compelling writer. The image evoked by the use of *Spannung* in the second passage comes from a perspective that views music as a made object consisting of components and relations. This perspective is a more familiar, "music-theoretical" one, well suited to the deliberate contemplation of musical relations conducive to systematic theorizing and to pedagogy.

[5.5] My discussion of the role of metaphor in structuring our music- theoretical thought is of necessity brief; however, I can note three, more extensive treatments of the topic. In one recent article Janna Saslaw offers a detailed analysis of the modulation theory of Hugo Riemann in light of current research into metaphor; Saslaw also provides an invaluable summary of image-schema theory.(21) In another article, Saslaw discusses metaphorical manifestations of force schemata in the theories of Schenker and Arnold Schoenberg.(22) And in a forthcoming essay, I explore the way two models of hierarchy are mapped onto music, and how these mappings constrain our inferences about musical organization.(23) The discussions of the role of metaphor in structuring our music-theoretical thought that are undertaken in these three essays elaborate many points that are only glossed here.

[5.6] Research into metaphor can also be used to explain more immediate, less overtly theoretical ways that we understand music. As an example, let us consider a bit of text painting from the Credo of Giovanni da Palestrina's *Pope Marcellus Mass*; the music is given in **Example 2**. As can be seen, with the first occurrence of the word "descendit," each voice begins a scalar descent. The commonplace answer to why this text painting works is that the descent evoked by the text correlates with the descent through musical space. However, as I showed above, there is no necessity to this correlation: "descendit" also correlates with an increase in heaviness, an increase in the size of the notes, and the growing age of each note. Which two domains are correlated depends only on the conceptual metaphor used to structure pitch relations. A fall-back answer is that the correlation between physical space and musical pitch is simply stylized: although there is no necessity to it, it has been done so often that we readily accept the mapping. A somewhat more interesting answer is that the physical sensations associated with descent are well represented by a series of pitches produced by successively less-rapid vibrations of the sounding medium. The descent of our bodies through physical space (unaided by artificial means) involves a lessening of kinetic energy and a continuous action in one direction, articulated by the regular transfer of weight from one leg to another.(24) The DESCENT image schema will include these sensations, as well as a motion downward in physical space. The act of singing a descending scale correlates well with the basic structure of this image schema: the relaxation many singers feel as they sing a descending scale matches the lessening of kinetic energy; the temporary pauses on each note of the scale match the regular transfer of weight which articulates a physical descent. The text painting of "descéndit" is thus supported by our embodied knowledge of descent. Although the text painting is not necessary, it seems so intuitively right that it is only with a struggle that we can imagine the alternatives.

[5.7] This approach could be extended to provide an account of such kinesthetic notions as gesture, tension, and release. Grounding such notions in embodied knowledge was proposed by Ray Jackendoff a full ten years ago. Jackendoff proposed that music is represented cognitively through a level of mental representation he called *bodily representation*, "essentially a body-specific encoding of the internal sense of the states of the muscles, limbs, and joints."(25) However, because Jackendoff took the position that musical knowledge was non-conceptual, there is no explicit link between bodily representation and conceptual representation. There is, however, such a link between image schemata and concepts. Image-schema theory may also provide a way to address the oft-noted emotional aspect of music by building on Zoltán Kövecses's work on emotion concepts, which Kövecses has argued are based on conceptual metaphors.(26)

[5.8] Finally, two extensions of work in cross-domain mapping hold promise for investigating the structure of musical thought. In his argument for the importance of figurative thought to human understanding, Raymond Gibbs makes a strong case for metonymy (where the part stands for the whole) as well as metaphor as an essential cognitive process.(27) Gibbs's analysis of metonymy gives a way to approach systematically the practice of musical allusion, especially where this allusion is used to invoke the *function* as well as the affect of the larger section of music recalled through the allusion. Other researchers have recently proposed expanding the conventional two-domain model of cross-domain mapping to four (or more) domains

as a way of more completely accounting for the blending and integration of concepts.[28] I have used this approach to provide an explanation for the unique cultural product that, at times, is the result of combining words and music through song.[29]

6. Conclusion

[6.1] Recent work on metaphor by cognitive scientists has much to offer music theory: a systematic approach to the role of metaphor in structuring our music-theoretical thought; a means to integrate embodied knowledge into the ways we understand music; and theoretical paradigms for extending and modifying the application of cross-domain mapping to music. There seems little doubt that musical analyses are not scientific explanations, but metaphorical ones. It remains to explore the nature and depth of these metaphors, and, in doing so, to come to a better appreciation of the processes through which we organize our understanding of music.

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Footnotes

1. The discussion began with Larry Solomon's posting of May 19, 1997, and can be retrieved through the SMT discussion archive at ftp://societymusictheory.org/pub//smt-talk/.
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2. Roger Scruton, "Understanding Music," *Ratio* 25, no. 2 (1983): 106.
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3. Scruton, "Understanding Music," 107.
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4. Nicholas Cook, *Music, Imagination, and Culture* (Oxford: Clarendon Press, 1990), 4.
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5. Cook, *Music, Imagination, and Culture*, 4.
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6. See, for instance, Cynthia Grund, "Metaphors, Counterfactuals and Music," in *Essays on the Philosophy of Music*, edited by Veikko Rantala, Lewis Rowell, and Eero Tarasti, Acta philosophica Fennica, vol. 43 (Helsinki: Philosophical Society of Finland, 1988), 28–53; and Daniel Charles, "Music and Antimetaphor (to Eero Tarasti)," in *Musical Signification: Essays in the Semiotic Theory and Analysis of Music*, edited by Eero Tarasti, Approaches to Semiotics, vol. 121 (Berlin: Mouton de Gruyter, 1995), 27–42.
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7. See, for instance, Marion A. Guck, "Two Types of Metaphoric Transfer," in *Metaphor: A Musical Dimension*, edited by Jamie C. Kassler, reprint, 1991, Musicology, vol. 15 (Basel: Gordon and Breach, 1994), 1–12; and Robert S. Hatten, "Metaphor *in* Music," in *Musical Signification: Essays in the Semiotic Theory and Analysis of Music*, edited by Eero Tarasti, Approaches to Semiotics, vol. 121 (Berlin: Mouton de Gruyter, 1995), 373–91.
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8. George Lakoff and Mark Johnson, *Metaphors We Live By* (Chicago: University of Chicago Press, 1980).
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9. For a review of the empirical evidence supporting metaphor as a basic cognitive process see Raymond W. Gibbs, Jr., *The Poetics of Mind: Figurative Thought, Language, and Understanding* (Cambridge: Cambridge University Press, 1994). For discussion of the link between the study of metaphor as a cognitive process and the central concerns of cognitive linguistics see George Lakoff, "The Invariance Hypothesis: Is Abstract Reason Based on Image-Schemas?" *Cognitive Linguistics* 1, no. 1 (1990): 39–74.
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10. The conceptual metaphor STATE OF BEING IS ORIENTATION IN VERTICAL SPACE is a variant of the STATES ARE LOCATIONS conceptual metaphor discussed by George Lakoff and Mark Turner in *More Than Cool Reason: A Field Guide to Poetic Metaphor* (Chicago: University of Chicago Press, 1989). On cross-domain mapping as a general phenomenon see Lakoff and Turner, *More Than Cool Reason*, 4; George Lakoff, "The Contemporary Theory of Metaphor," in *Metaphor and Thought*, 2d ed., edited by Andrew Ortony (Cambridge: Cambridge University Press, 1993), 202–51; Gibbs, *The Poetics of Mind*; and Gilles Fauconnier, *Mappings in Thought and Language* (Cambridge: Cambridge University Press, 1997). For a fine essay that anticipates a good portion of the theoretical perspective on cross-domain mapping I outline here, see Marianne Kielian-Gilbert, "Interpreting Musical Analogy: From Rhetorical Device to Perceptual Process," *Music Perception* 8, no. 1 (Fall 1990): 63–94.
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11. The conceptual metaphor MUSIC IS A LANGUAGE structures much of our discourse about music, and often plays a part in semiotic analyses of music (inasmuch as the attribution of linguistic tropes to musical events is oftentimes dependent on this metaphor). For an intriguing analytical essay that uses the MUSIC IS A LANGUAGE metaphor as a point of departure, see Justin London, "Musical and Linguistic Speech Acts," *Journal of Aesthetics and Art Criticism* 54, no. 1 (Winter 1996): 49–64.
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12. On the matter of the characterization of pitch by Greek music theorists of antiquity see Andrew Barker (ed.), *Greek Musical Writings, Volume II: Harmonic and Acoustic Theory* (Cambridge: Cambridge University Press, 1989), n. 43, p. 134. For information about the characterization of pitch in Bali and Java I am indebted to Benjamin Brinner, personal communication. Regarding the characterization of musical pitch by the Suyá, see Anthony Seeger, *Why Suyá Sing: A Musical Anthropology of an Amazonian People* (Cambridge: Cambridge University Press, 1987).
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13. Mark Johnson, *The Body in the Mind: The Bodily Basis of Meaning, Imagination, and Reason* (Chicago: University of Chicago Press, 1987).
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14. Johnson, *The Body in the Mind*, 2. It should be noted that, for the most part, the image schema remains a theoretical construct. Nonetheless, two independent lines of research have leant credence to the notion: Raymond W. Gibbs Jr. and Herbert L. Colston provide a review of evidence for image schemata drawn from a wide variety of psychological studies in "The Cognitive Psychological Reality of Image Schemas and Their Transformations," *Cognitive Linguistics* 6, no. 4 (1995): 347–78; Gerald Edelman discusses connections between image-schema theory and research in neuroscience in *The Remembered Present: A Biological Theory of Consciousness* (New York: Basic Books, 1989), chapter 8.
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15. It is also important to note that image schemata do not simply reduce to gestures, nor gestures to image schemata. For a discussion, see David McNeill, *Hand and Mind: What Gestures Reveal About Thought* (Chicago: University of Chicago Press, 1992), 263–64.
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16. Mark Turner, "Aspects of the Invariance Hypothesis," *Cognitive Linguistics* 1, no. 2 (1990): 254; emphasis as in original. For additional writings on the Invariance Principle (which at first was called the Invariance Hypothesis) see Lakoff, "The Contemporary Theory of Metaphor"; Lakoff, "The Invariance Hypothesis"; Mark Turner, "An Image-Schematic Constraint on Metaphor," in *Conceptualizations and Mental Processing in Language*, edited by Richard A. Geiger and Brygida Rudzka-Ostyn, Cognitive Linguistics Research, vol. 3 (Berlin: Mouton de Gruyter, 1993), 291–306; and Mark Turner, *The Literary Mind* (New York: Oxford University Press, 1996), chapter 3.

A preliminary discussion of a similar sort of topographical invariance, with applications to music, can be found in Peter Gärdenfors, "Semantics, Conceptual Spaces and the Dimensions of Music," in *Essays on the Philosophy of Music*, edited by Veikko Rantala, Lewis Rowell, and Eero Tarasti, Acta philosophica Fennica, vol. 43 (Helsinki: Philosophical Society of Finland, 1988), 9–27.
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17. A particularly interesting example of how a culture organizes their understanding of pitch relationships (and one which builds on Lakoff and Johnson's early work) is provided by Steven Feld's discussion of music theory among the Kaluli of Papua New Guinea. See Feld, "Flow Like a Waterfall: The Metaphors of Kaluli Musical Theory," *Yearbook for Traditional Music* 13 (1981): 22–47.
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18. For additional discussion of idealized cognitive models and their relationship to cultural knowledge see Gilles Fauconnier, *Mental Spaces: Aspects of Meaning Construction in Natural Language*, 2d ed., with a foreword by George Lakoff and Eve Sweetser, reprint, 1985 (Cambridge: Cambridge University Press, 1994), chapter 1; George Lakoff, *Women, Fire, and Dangerous Things: What Categories Reveal About the Mind* (Chicago: University of Chicago Press, 1987), part I; Naomi Quinn and Dorothy Holland, "Culture and Cognition," in *Cultural Models in Language and Thought*, edited by Dorothy Holland and Naomi Quinn (Cambridge: Cambridge University Press, 1987), 3–40; Gibbs, *The Poetics of Mind*, chapter 4; and Bradd Shore, *Culture in Mind: Cognition, Culture, and the Problem of Meaning* (New York: Oxford University Press, 1996), chapter 13.
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19. I have, however, discussed such knowledge structures elsewhere. See Lawrence Zbikowski, *Large-Scale Rhythm and Systems of Grouping*, Ph.D. Diss. (Yale University, 1991), chapter 4; and Lawrence Zbikowski, "Charles Seeger's Unitary Field Theory for Musicology and Recent Theories of Linguistic and Cognitive Structure," in *Foundations of Modern Musicology: Understanding Charles Seeger*, edited by Bell Yung and Helen Rees, forthcoming.
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20. Heinrich Schenker, *Der freie Satz*, 2d ed., edited by Oswald Jonas, Neue musikalische Theorien und Phantasien, vol. 3 (Vienna: Universal Edition, 1956); English translation from Heinrich Schenker, *Free Composition (Der Freie Satz)*, edited and translated by Ernst Oster, New musical theories and fantasies, vol. 3 (New York: Schirmer Books, 1979). I have used the 1956 edition of *Der freie Satz* on account of its general availability. I have used Oster's 1979 translation for similar reasons, and also because it invokes a debate about translation that may be profitably viewed through the lens of cross-domain mapping. For one viewpoint on this debate see Robert Snarrenberg, "Competing Myths: The American Abandonment of Schenker's Organicism," in *Theory, Analysis and Meaning in Music*, edited by Anthony Pople (Cambridge: Cambridge University Press, 1994), 29–56. My thanks to Janna Saslaw for bringing the different uses of *Spannung* in *Der freie Satz* to my attention.

For a brief discussion of a similar contrast between meanings of *Spannung* in the first volume of *Das Meisterwerk in der Musik* see Robert Snarrenberg, *Schenker's Interpretive Practice*, Cambridge Studies in Music Theory and Analysis, vol. 11 (Cambridge: Cambridge University Press, 1997), 93–94.
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21. Janna K. Saslaw, "Forces, Containers, and Paths: The Role of Body-Derived Image Schemas in the Conceptualization of Music," *Journal of Music Theory* 40, no. 2 (Fall 1996): 217–43.
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22. Janna K. Saslaw, "Life Forces: Conceptual Structures in Schenker's *Free Composition* and Schoenberg's *The Musical Idea*" (Under review).
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23. Lawrence Zbikowski, "Conceptual Models and Cross-Domain Mapping: New Perspectives on Theories of Music and Hierarchy," *Journal of Music Theory* 41, no. 2 (1997).
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24. Most of us find descent—especially scalar descent—well represented by the thought of walking down a staircase, but I think it could be argued that walking down a hillside works as well. The reason is that it isn't so much the neat, two-dimensional image of stairs that is operative but the regular transfer of weight from one leg to another. Indirect evidence is provided by a striking anecdote related by John Hockenberry, from a time when he was a reporter for National Public Radio. In order to get to a group of Kurdish refugees on a remote edge of Iraqi Kurdistan during the aftermath of the Gulf War, Hockenberry, a paraplegic since 1976, had to temporarily abandon his wheelchair and get a ride on a donkey. He comments on the effect of becoming reacquainted with a non-wheeled mode of transportation through the rhythm of the donkey's gait: "It was walking, that feeling of groping and climbing and floating on stilts that I had not felt for fifteen years. I had long ago grown to love my own wheels and their special physical grace, and so this clumsy leg walk was not something I missed until the sensation came rushing back through my body from the shoulders of a donkey." John Hockenberry, *Moving Violations: War Zones, Wheelchairs, and Declarations of Independence* (New York: Hyperion, 1995), 2–3.
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25. Ray Jackendoff, *Consciousness and the Computational Mind* (Cambridge, Mass.: MIT Press, 1987), 238.
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26. Zoltán Kövecses, *Emotion concepts* (New York: Springer-Verlag, 1990).
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27. Gibbs, *The Poetics of Mind*, chapter 7.
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28. For work on conceptual blending and conceptual integration see Mark Turner and Gilles Fauconnier, "Conceptual Integration and Formal Expression," *Metaphor and Symbolic Activity* 10, no. 3 (1995): 183–204; Gilles Fauconnier and Mark Turner, "Conceptual Integration Networks," *Cognitive Science* (1996); Fauconnier, *Mappings in Thought and Language*, chapter 6; and Turner, *The Literary Mind*, chapters 5 and 6.
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29. Lawrence Zbikowski, "Conceptual Blending and Song," unpublished paper (1997). Conceptual blending can also be used to account for relationships between instrumental works, text, and images, such as those outlined in Kielian-Gilbert's analysis of Erik Satie's "Le Water-chute" in "Interpreting Musical Analogy," 90–91.
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