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Music, Language, and the Brain
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Background

Among the remarkable achievements of the present intellectual age are the momentous inroads that have been made into what is arguably the last great frontier of science: the study of the enigmatic, imponderable workings of the human mind. We live in the wake of what has been called the “cognitive revolution,” a surge of new theoretical concepts and methodologies that arose from a rich interdisciplinary cross-fertilization, one perhaps unequaled in modern times. The cynical behaviorist approach of the early- to mid-twentieth century, which sought to understand mental processes only through their directly observable manifestations (i.e., behavior), was overtaken with a new approach that recognized in the human mind a discoverable (albeit not directly observable) logic and structure. Benefiting from analogies to the

the New Musicology's foundational critique, its results have been evident ever since, from the pages of the *Journal of the American Musicological Society* (JAMS), to the entry headings of the *New Grove Dictionary of Music and Musicians*, to the course offerings at our colleges and universities. Even music theory and analysis, which bore a large portion of the New Musicology's revolutionary indignation, seemed to change, broadening in both repertoire and approach.

It is ironic, therefore, that in the midst of these polemical calls for a greater attention to meaning and value, and for the rejection of sterile positivism, a substantial and growing number of scholars were somewhat less stridently applying the insights of the cognitive revolution and the (sterile) scientific methodologies of experimental psychology in pursuit of nothing less

mind, rightly commands the eager attention of philosophers and psychologists interested in mental processes. But as has often been noted, language shares a great deal with music: outwardly (they are both essentially oral/aural forms), functionally (they are both means of expression), and structurally (they employ phonology and syntax—that is, a culturally prescribed set of discrete elements along with rules or norms for their combination). Indeed, the relationship between music and language, long the inspiration for far-flung speculation and grandiose metaphors (music as a “universal language,” the “language of the soul,” etc.), as well as the source of careful ruminations by great thinkers from Adorno to Agawu, has recently spawned vigorous and widespread theoretical and scientific efforts that build on the foundations of cognitive psychology. This young, hybrid field will be of interest to any music theorist working in the area of music psychology and, more generally, to any music scholar who senses some truth in those aforementioned metaphors (as I suspect most do). Happily, the field of music-language studies has now witnessed a landmark publication of its own: Aniruddh Patel’s prodigious and fascinating *Music, Language, and the Brain*.

Music theorists who read across the disciplines have often raised a bemused eyebrow at erudite writers who nevertheless show themselves to be in over their head when it comes to music. The erudition behind *Music, Language, and the Brain*, on the other hand, is uncommonly deep, and the result is an exemplary interdisciplinary achievement, a commanding view of musical and linguistic structure from the perspective of the brain sciences. Patel presents a cogent and sensitive account of these three highly technical fields and their interrelationships, while assiduously resisting facile or sensational conclusions. The book is organized into deceptively neat topics, each occupying a chapter: pitch and timbre, rhythm, melody, syntax, meaning, and evolution. Along the way, the author calls forth a dizzying panoply of often unfamiliar case studies, the breadth of which is only hinted at through a brief sample: absolute pitch in speech; the vocables of tabla drumming; “perceptual warping” of phoneme space; “sine-wave speech”; pitch realization in tone languages; structural hierarchies both linguistic and musical; the rhythmic consequences of vowel reduction; temporal predictability in speech; the mapping of lexical tone onto musical tone in song; statistical learning of musical and linguistic regularities; cognitive abnormalities both familiar (tone deafness) and fantastic (“pure word deafness”); syntactic “dependency locality theory”; the effect of musical training on the discrimination of vocal affect; songbirds and elephant drummers; and scattered throughout, a legion of valiant babies—unwitting experimental subjects who are sometimes smarter than we think. Importantly, material that is more routine for musicians occupies an equally central role, and on the whole, Patel’s explications are fair and accurate. To be sure, this is a work of high scholarship: the questions are big, the engagement with the literature extensive, and the logic painstaking.

noticeable in the eighteenth century and which gradually wanes over the next two hundred years.¹ This explanation is not only elegant but virtually unimaginable without the tools of empirical linguistics.

In chapter 4, Patel takes up the matter of melody, “an organized sequence of pitches that conveys a rich variety of information to the listener” (182). Music theorists, accustomed as we are to dealing systematically with (discrete) musical pitch, will find nothing in language analogous to the concept of scale, and hence we might reasonably throw up our hands when con-

theory. He provides a good introduction to that theory and an admirable description of the multilevel syntactic organization of pitch in music (at the level of note, chord, and key). Some of the experimental designs that he cites, however, suffer from an asymmetry in their treatment of music versus language. For instance, the following set of sentences was ingeniously constructed as controlled exemplars of “easy, difficult, or impossible” syntax (272):

Some of the senators had promoted an old idea of justice.

Some of the senators endorsed promoted an old idea of justice.

Some of the senators endorsed the promoted an old idea of justice.

The corresponding musical stimuli, however (see Example 1), are comparatively unimaginative and lack the graded complexity exemplified by the sentences. Indeed, while Patel’s exposition of musical syntax is rich and musically sensitive, the experimental results under discussion seem largely to

stimuli together (e.g., studies of event-related potentials using sung or musically accompanied sentences). These studies are enlightening but extremely limited; one only hopes that we are witnessing the beginnings of a new research program.

The last music-language connection Patel considers is meaning (chapter 6). Patel skillfully enumerates several types of musical meaning in turn, from the most abstract formal qualities of a particular piece (those celebrated by Eduard Hanslick, Peter Kivy, and others) to the most general resonances between musical styles and the values of the cultures that create and perpetuate them. (Patel discusses this latter notion in a tentative, self-conscious way, as if it were a new and speculative idea. The omission of any reference to Susan McClary here and elsewhere is regrettable.) What Patel recounts of the scientific perspectives on music's meanings, however, is a bit rudimentary. Studies appear to simply confirm (as science of course must!) what we generally take for granted: that listeners associate broadly referential and emotional meanings with various musical stimuli, with some degree of consistency. (Patel offers these results as counterevidence to Kivy's extreme view of musical meaning, though he perhaps reads Kivy too narrowly.) Of course, one of the great questions of musical aesthetics concerns the mechanics of musical emotion, and this question provides an important locus for music-language studies. Patel reviews several important cross-cultural and metastudies connecting vocal emotional expression and musical cues of emotional qualities, citing this as a "key link."

One unusually evocative approach described in this chapter does not concern semantics per se but rather the inferential strategies that listeners use in constructing a coherent message from a series of utterances—the strategies postulated by "discourse theory." Certain basic epistemological principles (first proposed by Hume as "connections among ideas") have been offered as the basis for these strategies: resemblance, causation, and contiguity (each of which encompasses a number of individual "coherence relations"). Patel only hints at the potential application of these principles to music, and without noting the like-minded insights of Baroque rhetoric theory; discourse theory, as described by Patel, seems to represent a twenty-first-century version of Mattheson, Kircher, and Mersenne. Patel gives no examples nor cites any specific studies, implying that musical discourse theory is up for grabs; the concocting of suitable experimental materials will benefit from the insights and dispositions of theorists and composers (at least as much as was the case for syntax).

Origins

This wide-ranging, ambitious book closes with a consideration of what is arguably the most far-reaching and provocative branch of modern cognitive science: evolutionary psychology. In gradually bridging the gap between spirit and matter—between mind and brain—cognitive neuroscience has

begun to render intelligible a commonplace but epistemologically thorny intuition: that behavior itself is at least in part genetically determined. Such an idea represents a formidable challenge to a “blank slate” view of human nature and therefore has profound and politically fraught implications for the nature-nurture debate.

Not only individual behavior but also collective behaviors and aesthetic dispositions (which is to say, the elements of *culture*) have recently been accounted for in biological terms, as products of selection. Many music scholars will have first encountered this approach in the edited volume *Origins of Music* (Wallin, Merker, and Brown 1999), but the idea of music as adaptation goes back to Darwin himself, who also (like his contemporary Herbert Spencer, and like Rousseau before him) imagined a close connection between the

that robust language can develop out of purely pragmatic interspeaker constraints on communication, and the matter of “biological cost,” which as it happens goes utterly unexplained by Patel, essentially begs the original question. Most of the evidence for a language instinct, nevertheless, does seem compelling.

In the case of analogous evidence for music, on the other hand, Patel is more hesitant: music compares unfavorably to the robustness of language. For instance, music is generally unable to transfer to other, nonaural modalities, and musical competence is much more variable from individual to individual than is linguistic competence. Furthermore, musical abilities and proclivities can themselves largely be thought of as subsumed within the language faculty. In the end, what Patel requires of an adaptive explanation of music is some evidence of a domain-specific skill that develops “precociously and spontaneously” in humans but not in other animals (402). He consequently calls for research into human “beat-based processing,” what he feels is the strongest candidate: with the exception of isolated, anecdotal examples, no animal other than humans can spontaneously and flexibly synchronize to a beat (and human infants’ poor abilities at beat synchronization may only indicate a lag in motor skills, analogous to the corresponding well-known lag in speech production).² In closing, Patel insists that even if music is not an adaptation, neither is it a “frill”; rather, music should be thought of as one example “of technologies invented by humans that have become intimately integrated into the fabric of our life, transforming the lives of individuals and groups” (401).

Conclusion

Patel freely admits that the question of music and evolution is “not yet settled” (400), and this sentiment, encountered more than a handful of times throughout the book, emerges almost as a motto—and a welcome one. The book is chiefly a summary and assessment of the state of scientific music-language studies. Its whopping sixty-seven-page works cited list gives some indication of the vastness of the field and of Patel’s superhuman achievement in presenting and critiquing that field, which he carries out not only cogently and commandingly but also with sensitivity, imagination, and even flair. The author is himself an engaged and ambitious researcher in the field, so the book is also something of a vehicle for his own cutting-edge (and therefore at times speculative and controversial) theories. (That latter fact makes the balance and even-handedness of the writing all the more notable.) And at the same time, Patel’s narrative represents an ardent *invitation* into that field, with an eye firmly on the future. Virtually every section of the book includes an

² More recent work by Patel, however, suggests that parrots also have an ability to flexibly coordinate physical movement with musical stimuli (Patel et al. 2009).

appeal for the replication, generalization, or refinement of the reported experimental results, and proposals for specific experimental designs are offered frequently and graciously. This spirit of a collective pursuit of truth bespeaks a disciplinary perspective unfortunately foreign to the humanities, and one that is both refreshing and exciting.³

A field that previously existed in the form of hundreds of articles across a diverse range of journals now exists in the virtuosic synthesis of *Music, Language, and the Brain*. That synthesis is an imposing one, and those intent on digesting the whole book will not do so easily, despite the clarity and grace of the writing. The sheer volume of material covered and its meticulous treatment make for a challenging journey, and the organization often makes great demands on the reader: an inevitable consequence of Patel's exhaustiveness is the sometimes labyrinthine arrangement of often colliding topics, an arrangement he has handled as well as could be expected. Frequent pit stops and map checks are necessary along the way but are aided by detailed outlines at the beginning of each chapter. These outlines will especially help readers who use the book more selectively (as many will, and profitably so), whether as a reference source or as a collection of discrete, topic-focused chapters. (Less helpful to such readers is the rather stingy index.) Both types of reader will be greatly rewarded for their efforts. The impact of this book within music-language studies promises to be profound and will surely necessitate a second edition before too long. A second edition would also provide a welcome opportunity to address the alarming—and for so reputable a press, embarrassing—profusion of copyediting errors.

For music scholars generally, *Music, Language, and the Brain* is a unique gift, and its appearance is timely. Music theory in the early twenty-first century bears an affinity with ethnomusicology, though not necessarily in ways that would be recognized as such by ethnomusicologists. At the very least, theory's current openness to noncanonic repertoires, to oral traditions and oral "texts," and to issues of subjectivity suggests a very different field than that critiqued (more or less accurately) by the New Musicology twenty years

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