musicological *and* sociological. Given that music is a social practice, it's hard to see why we should settle for less.

So that's my prediction for something that has as yet barely come over the horizon but could become quite normative if musicologists and theorists started seriously thinking of music as what everyone else thinks it is: a performing art, that is to say one that is not reproduced but rather *created* in the act of performance. But please note I am not giving a timescale. That way, when it doesn't happen, I won't have utterly failed at divination. It will just be taking longer than I expected.

Nicholas Cook

Music(s), Science(s), and Post-Positivist Pluralities

In the interpretive, postmodern, or even post-postmodern ("post^{2}modern") view, any approach to music that embraces science must be suspect, it seems. A reliance on science stands revealed to the interpretive and postmodern gaze as positivist, monolithic and hegemonic, reductive and oppressive, enforcing its tenets by suppressing, neglecting or disdaining the "otherness" of the objects of its discourse.

And something approximating to a postmodern view now appears to be the musicological norm (see, e.g., Cook & Everist 1999); the universal slogan is now "Plurality and Performativity," whether or not the players are willing to wear the postmodern team colours. And rightly so: the idea that a unitary and all-weather theory can account for all the musics and musical ontologies that have crept out from the conceptual undergrowth of the last half of the twentieth century is surely ludicrous. Plurality has had to become a fact of musicological life. Plurality in the Bakhtinian heteroglossia that can be read as constituting the "works" of the Western "canon," from the *Roman de Fauvel* through "Louie,

Louie" to *Notations pour orchestre*, plurality in the profusion of microcultural, intercultural and supercultural interpretations of the musics that press on us even as the institutions that embodied the Western canon—the classical music recording industry, the full-time professional symphony orchestra—collapse and wither away.

For music theory this is perhaps not such a problem; even when the theoretical focus remains fixed on the single "work," for theory that work may now be neither autonomous nor univocal. But it puts "scientific" music psychology in something of a predicament. It seems much more feasible to posit *theories* of musics than it is to postulate *psychologies* of musics; in the former case any losses in existential certitude are more than compensated for by possible gains in complexity, richness and depth, but in the latter case the generalizability that endows science with its explanatory power appears to evanesce.

But musics, though plural, have materiality, and musicality has some unitary corporeality in human behavior and its traces; the Bakhtinian heteroglossia of musics are being voiced by one recently-emerged species, *Homo sapiens sapiens*. From a materialist perspective, music as humanly-produced sound and action, music as patterns of central nervous system activity and music as patterns of socio-cultural interaction are *in principle* connected; human life and behavior is not discontinuous with human biology, though the relationship of the one to the other is far from linear or deterministic (for an up-to-date overview of attempts to relate music to human biology, see Zatorre & Peretz 2001). From a materialist perspective, the exploration of music requires interpretive frameworks for human behaviors that have explanatory powers predicated on something beyond the specific circumstances of any particular act of interpretation. Of the available frameworks that purport to deal with generalizations concerning human behavior—philosophy, economics, politics, etc.—the one that seems to offer the broadest explanatory scope is science, or rather, the sciences, for, as we shall see, to speak of "science" is as problematic as to speak of "music."

Pace Brown & Dempster's 1988 paper, "The Scientific Image of Music Theory," and *pace* the stances of many of their

respondents, to adopt a scientific perspective on music theory or indeed on music is *not* to embrace a positivist, unitary or hegemonic perspective (as seems implicit in Brown & Dempster's valorization of Hempel's deductive-nomological model). The notion that there is a single, formally expressible set of principles that define and constitute science or scientific method is simply untenable in the context of recent philosophies of science. Moreover, the idea that the generalizability of a scientific perspective entails an ontological commitment to reduce the object of the scientific gaze to the terms of basic science is at best questionable, at worst plain silly. Indeed, the adoption of an ontologically reductionist stance by scientists (usually physicists) can be seen as an attempt to assert hegemonic status *within* the sciences themselves.

That the sciences *deal with* the general does not mean that the sciences *reduce to* the general: to apply science to music is not to reduce music to the scientific theories of physics, psychophysics or psychology. Science is not an objective, unitary and reductive enterprise; it has unarguably societal (Kuhn 1962, Feyerabend 1981) and experiential (Lakoff 1987) dimensions, and is made up of multiple and mutually irreducible frameworks of exploration and understanding (Rose 1996, Fodor 1998). For example, scientific accounts of the experience of a musical performance might be couched in terms of acoustics (dealing with the physical systems and dynamics that constitute the musical sound), or psychoacoustics (dealing with the principles that govern the ways in which the sounds are registered by the human auditory system), or cognitive psychology (dealing with the regularities that the mind may interpret in or abstract from the sound that is registered). But while these multiple frameworks might be mutually *irreducible* (e.g., the regularities that mind may abstract in the experience of musical sound are unlikely to be specifiable in, or reducible to, acoustical terms), they are *commensurable*. The theories, procedures, descriptions and predictions that different scientific accounts adhere to and provide are at least *understandable* in respect of each other (see Lakoff 1987: 322), even if they might not be *translatable* one to another (as Rose 1996: 89 would have it).

As Fodor (1998: 22) puts it, "Science postulates the kinds that it needs in order to formulate the most powerful generalizations that its evidence will support", and the historical application of this methodological instrumentalism has resulted in a dense constellation of inter-relatable procedures and understandings of unparalleled predictive and explanatory power. Unparalleled, though, neither omnipotent nor absolute...

Simply, the sciences offer ways of explicating aspects of complex human behavior—including social behavior—that are differently ramified from and more comprehensively grounded than are those understandings that emerge from interpretive or postmodern approaches. There is no *a priori* reason to exclude science from the enterprise of understanding musical behaviors, and indeed certain aspects of those behaviors might only be explicable in terms of science—yet science itself provides no grounds for believing that its theories and findings should be accepted as supplanting all other possible frameworks of understanding for all possible purposes.

Only when this caveat is ignored do the sciences become reductive and absolute, but at that point they slip from "science" into "scientism." Within musicological discourse the charge of "scientism" has been sometimes used in a way that appears to equate it with the charge of formalism (as Born 1995 appears to do at several points in her otherwise insightful narrative of IRCAM—see pp. 51-55 in particular). But if "scientism" is to mean anything, it would be most appropriately employed to refer to the co-optation of science's supposed foundational (and thus intellectually hegemonic) status as an element of critical and theoretical rhetoric in the post-positivist era in which musicology and the sciences find themselves. As such it can be analyzed, ignored or condemned. But "scientism" has little to do with "science" *per se*, but rather with contemporary social images of science; as such it is an aspect of discourse, at best rhetorical, at worst fraudulent, but always employed for ideological ends (sometimes even commercial—see http://www.advancedbrain.com for a stunning display of musico-scientistic snake-oil peddling).

In a pleasing instance of symmetry, Sokal and Bricmont's castigation in their *Intellectual Impostures* (1998) of the sham "science" embodied in much postmodern writing can be read in part as an attempt to co-opt scientism's evil postmodern twin, unreflective reflexivity, into a debate that is internal to science itself by seeking to paint certain prospectively scientific theories (particularly those of Prigogine) with a brush loaded with postmodernist pollutants (see Schaffer 2000). Indeed, from Sokal and Bricmont's position, postmodernism could be regarded, *like science itself*, as an abstract tradition in Feyerabend's (1981: 7) sense of the term, "too poor to reflect the peculiarities of any particular tradition and thus seem[ing] to be tradition independent"; after all, as D'Andrade (1995: 251) puts it, postmodernism can be interpreted as "a theory in which there is only one real system, the power system", a position from which a postmodern view appears even more limiting than is the ontologically reductionist version of "science."

But this is a bogus view of postmodernism: even at their least convincing, interpretive and postmodern approaches grapple with issues that the sciences are just beginning to recognize as their most intractable problems, those of comprehending human cultures and societies. After all, music is not a property of an individual human being but of groups of individuals. Interpretive and postmodernist approaches to music can articulate the embeddedness of music in motivated human interactions, reaffirming and re-representing the cultural complexity that enables and sustains the interpretation and experience of musics; the sciences of music ignore the societal dynamics that construct and sustain musics at the risk of mistaking the individual and the contingent for the generalizable and principled.

Setting aside the brouhaha that accompanied Sokal and Bricmont's (ultimately turgid) tirade, postmodernist nonsense about science matters little to the conduct of the sciences; after all, most scientists don't read *Social Text* (the site of Sokal's original hoax). The problem is that most scientists don't encounter *any* literature that embodies interpretive or postmodern stances; in the sciences, as in the world of espionage, "Nobody pays good money

for pieces of discourse" (Bossy 2001: 139). Hence scientists are often willing to subscribe—albeit implicitly—to unfeasible notions of epistemological and ontological reductionism which factor culture out of the domain of enquiry

For any engagement with music this is simply an unfeasible position. The sciences of music need to be informed by the plural visions, divergent hearings and heterogeneous voices of contemporary musicology and theory. But musicology can inform the sciences only if it takes them for what they are, rather than for their social image. The methods and claims of science require continually to be interrogated from postmodern, post-postmodern and even post-post-postmodern perspectives. From an academic perspective, science is not the only game in town but it's certainly the one with the most muscle, political and economic and ideological. But if we post[3]modernists don't know the rules we can't even be knowledgeable spectators, never mind active players (I say nothing, however, of owners...).

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Music Theory as Knowledge Building

Since the summer of 2001, things we had considered solid and unchanging were radically altered by the terrorist attacks on the World Trade Towers and the Pentagon. As a resident of the New York City area, I experienced in palpable ways the upheavals to a normal existence: a colleague whose spouse just escaped, students whose parents were among the lucky ones, and alumni who were not. In the fall of 2001, reflection on the present moment of the music theoretical enterprise and what lies ahead in the new millennium seemed strikingly irrelevant. Within the shadow of an ever-escalating cycle of world terrorism and reprisal, a "business as usual" approach to my work was unthinkable. But the unthinkable brought about reflection that eventually led not to a reconceptualization but rather to a rediscovery of the underlying motivation for understanding music—a motivation that I propose to think of as knowledge building.

Study of the history of music theory and its attendant analytical practices provides evidence of the conceptual milestones that mark the historical path of theory-building. And each of these milestones corresponds to processes of understanding that eventually have taken shape as formal concepts. Rather than focus on these conceptual milestones, I propose to consider the aspects of process and discovery in the theoretical enterprise, to establish how the practice of music theory may be understood within a broader context of living in the world. I begin by distinguishing between perceptual and conceptual understanding, establishing a reciprocity