Reply to Smoliar's "Mathematical Logic"

Jay Rahn

[0] The following reply to Smoliar's "Mathematical Logic" tries to be as brief and constructive as feasible. I focus on three topics introduced into the discussion by Smoliar: demarcationism (section 1, below), Diana Deutsch's demonstration of the tritone "paradox" (section 2), and "categorical" pitch perception (section 3).

[1] Demarcationism

[1.0] Smoliar states that "it is unclear that there is any standard of rating which would allow us to conclude that it [i.e., first order logic] is the best way [to try to describe] [the world] (or that any other way is decisively better)". Plausibly, Smoliar is unfamiliar with the concepts of consistency, decidability, and semantic, syntactic, and negation completeness. Theorems concerning these aspects of first (and higher) order logics have been proved for more than 50 years. Geoffrey Hunter's *Metalogic* (1972, esp. 259–61) provides a handy survey. For such first order predicate systems as the AH-formulation discussed in my essay, Nelson Goodman has provided a way of assessing economy which, for Goodman, involves both simplicity and power (1966). Willard Van Orman Quine reports advances in predicative set theory in his recent revision of *Pursuit of Truth* (1992).

[1.1] At stake in such formulations are issues of truth and ontology, i.e., what the world is "really". Related empirical issues involve reference and "meaning"; extension and "intension"; bound and free variables; "recursive" and "cylindrical" quantification; "classes", "sets", "numbers", "properties", and individuals; definition, "postulation", and axiomatization; finite, "infinite", and non-finite formulation; verifiability, falsifiability, degree of confirmation, strength and weakness of assertion; etc. All these can be framed in terms germane to first order logic, as can issues that arise in connection with modal and probabilistic logics. And in applications of the latter via statistics, such concerns as the probability of Type 1 and Type 2 error, goodness-of-fit (between model and data), and reliability have been formulated in standard ways.

[1.2] Plausibly, Smoliar has reasons for rejecting all such criteria: for example, along the lines of Paul Feyerabend's methodological anarchy, as advanced in *Against Method* (1975), or of Thomas Kuhn's relativist doctrine of incommensurability in *The Structure of Scientific Revolutions* (1962). However, as both these positions are readily demolished, plausibly Smoliar has in mind other arguments against demarcationism.

[2] The Tritone "Paradox"

[2.0] Smoliar cites Deutsch's public demonstration of the tritone "paradox" at the 1990 SMT meeting in Oakland as evidence for the view that "two physically identical stimuli may be perceived as different". The sense in which I employ the terms "identical" and "identity" follows Goodman (1966). In my usage, any things, x and y, are identical (i.e., are identical with each other; are precisely the same thing; are a single thing) if and only if x overlaps y, and there is no part of x that does not overlap y, nor is there any part of y that does not overlap x. Following Goodman, the overlaps predicate can be rendered verbally as "shares content with". A related materialist or physicalist formulation by Quine holds two things to be identical if and only if they coincide exactly spatio-temporally, however extended or even scattered their shared spatio-temporal "filament" might be.

[2.1] As stimuli, the individual sound waves in Deutsch's public demonstration differed spatio-temporally. I responded to the portion of each wave that reached my ears; others responded to the portions that reached theirs. Though these various wave-portions were very similar, they were not identical. Plausibly, Smoliar might render "physically identical" as "physically similar in all respects save spatio-temporally" or as "physically similar but not identical in content". In any instance, Deutsch's demonstration provided evidence for the assertion (among others) that physically similar, but not identical, stimuli may be perceived as different. This is a truism of psychology. Helpful in sorting through questions of similarity relevant to both psychology and music is Goodman's exposition of "Seven Strictures on Similarity" (1972).

[3] "Categorical" Pitch Perception

[3.0] In psychology, a distinction has been advanced between "categorical" and "continuous" perception. As the survey cited by Smoliar documents, any putative "distinction" between these "two" "kinds" of perception is really a matter of degree; a matter of opposites, not complements. Evidence of relatively categorical perception consists in the relatively wide plateau and relatively steep slopes in the statistical distribution of a particular sort of response. There is no clear, privileged cut-off point between relatively categorical and relatively continuous percep-

[3.1] Although I do not deal with categorical perception in the essay to which Smoliar's response is addressed, another publication (Rahn 1992: cited in the essay in question) introduces a probabilistic logic that should suffice for this and other probalistic formulations in music theory. Links between this probabistic logic and the first order AH formulation are established in the earlier article. Plausibly, Smoliar has reason to disagree with my account in this regard. In general, his reasons for condemning and praising my essay remain quite unclear to me. I hope my reply here might help him articulate these more effectively.

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