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Dawn of Music Theory (Book Review)
The Grammar of Carnatic Music. K. G. Vijayakrishnan. *Phonology and Phonetics Series*, Volume 8. Mouton de Gruyter. Berlin. 2007.

The book under discussion is a field-opening work in a variety of ways. This becomes clear when we compare developments in music theory in the West with that of studies on Indian classical music.

First, demands of orchestral and polyphonic music in the West opened the tradition of written scores in Western (classical) music centuries ago. This textuality not only allowed a wider dissemination of Westen classical music in Europe and beyond, it enabled the development of theoretical investigations into the history, form and (musical) content of the music. In contrast, the tradition of classical music in India, though traceable to the Vedic times, has been essentially an oral tradition, based on emphasis on improvisation. The situation did not improve despite the subsequent institutionalization of classical music through the university system. Music departments in India essentially played the role of widening the base of performance of classical music which was so far restricted to the gharana traditions. Drawing upon inadequate earlier work, Vijaykrishnan's book goes a long way in establishing a theoretically salient notational scheme for displaying salient passages from Carnatic music; the scheme could be easily extended to accomodate Hindustani classical music as well. It is unclear if the scheme transfers adequately to Western notational system, say, on the piano, but there are enough examples in the book (Chapter 4) to suggest that the organization of well-tempered

scheme of current Western music may at least be suitably compared with the tonal organisation of Carnatic music (76-88). In any case, theoretical investigation into the structure and the content of Indian classical music can now be pursued in earnest.

Second, for the purposes of this review, music theory in the Western sense can be broadly classified, until very recently, into two major efforts. With the advent of written scores, as noted, a rich tradition of musicology emerged in the Western tradition. Until about late 19th century, musicology was almost exclusively concerned with systematic archiving of Western classical music into delineable periods such as baroque, classical, romantic, etc. It focused on individual composers and the development of their music, engaged in analysis and criticism of various traditions, styles and composers, musical valuation of compositions and their performances, and the like. Although the study of musical form and tonal organisation was implicit in much of this work, a direct study of tonal structure—music theory proper—was a much later development, not surprisingly. To mention just one of the important theoretical moves in that direction, the work of Heinrich Schenker proposed novel tools for displaying the hierarchy of tonal organisation across large chunks of tonal music. However, even there, the focus was restricted to the study of individual composers, most notably Beethoven. A *general* theory of tonal organisation designed to capture aspects of musical interpretation by the audience of tonal music was still missing.

Third, in that sense, the work of Lerdahl and Jackendoff (1983) could be viewed as a pioneering attempt to develop a cognitive theory of music along the lines of generative theory of language proposed by Noam Chomsky three decades earlier. An

interest in language-theory-governed theory of music could be traced to some ideas proposed by the composer-conductor Leonard Bernstein (1976). Impressed with the development of Chomskyan theory of language, Bernstein suggested that a similar attention be directed to music cognition since, according to him, the system of music displayed many of the central features of human languages: species-specificity, universality, hierarchically articulated structure, and the like. Lerdahl and Jackendoff's work was arguably the first major articulation of Bernstein's project. Building up on Schenker's work and on much else, Lerdahl and Jackendoff showed in careful detail how the listeners of Western classical music perceive hierarchical grouping structures, while aligning them with rhythmic structures, as pieces of music progress through evergrowing complexity. Two restrictions of this otherwise groundbreaking work are worth mention here. For one, the work is essentially restricted to Western classical tonal music with its emphasis on harmony, modulation and counterpoint. Although, some attempts have been made to extend the model to other forms of music, the results are insufficient and unclear. For another, the authors basically set aside a central aspect of Bernstein's project, namely, to study the abstract relationship between language and music. They held that music theory relates to language theory more in style and methodology than in actual content, except for unsurprising points of contact in prosodic and rhythmic structures which are generally assumed to be non-specific to these systems in any case. In fact, according to later work (Ramus et al 2000), it is known that prosodic and rhythmic structure are not even species-specific.

Vijaykrishnan deserves much admiration for covering these phases essentially single-handedly in the space of a single book. Being a trained musician himself, apart from being a first-rate linguist, he has been able to encode much of the nuances of Carnatic music, including its raaga and taala systems, to present a rich view of the variety and the complexity of this music from actual examples. However, in doing this, he very consciously stays away from either listing the raaga system or to engage in aesthetic evaluation. Much like the enterprise in Lerdahl and Jackendoff, his basic focus is to study the progression of this music through individual performances to extract some general features that seem to apply to the whole of this form of music, and probably beyond. Yet, he veers away significantly from the work of Lerdahl and Jackendoff in actually incorporating a specific formal theory—optimality theory—that has so far been applied almost exclusively to study human languages. In the process, the author is able to make some interesting general comments on the very character of Carnatic music vis a vis human languages; as noted, these comments may well apply beyond Carnatic music.

Turning briefly to his specific proposals, Vijayakrishnan holds, in the spirit of optimality theory, that musical progression in Carnatic music is the result of a competition between a set of mutually independent and formally specifiable constraints. The reader will benefit much from the forword to the book in which the noted linguist Paul Kiparsky gives an excellent introduction to the framework of optimality theory and its relevance for musical analysis. The two basic sets of constraints are called Markedness constraints and FaithLex constraints, with individual members specified within each set.

For example, a Markedness constraint says that the notes of the supposedly universal twelve tone scale are less marked and, hence highly ranked in terms of cognitive preference. Carnatic music, however, requires notes such as E flat and B Flat which are highly marked and, hence, have a low rank with respect to the twelve tone scale. This conflicts with a FaithLex constraint which requires that the specifics of a raaga—its tonal structure, ascent/descent conditions, typical phrases, etc.—that belong to the Lexicon of Carnatic music need to be satisfied: a musical structure must be faithful to its lexicon. Interesting details aside, the conflict is addressed in the music such that these low ranked notes are achieved by lowering the targets for them, say, by deflecting the string on the preceding note (63). Such theoretical resources have been used through a rich store of examples across a variety of compositional styles in Carnatic music. The discursive originality of Vijaykrishnan's work is that a very wide survey of Carnatic music is in fact achieved through theoretical moves such as the one just described. This is in sharp contrast to tiring exegesis of hundreds of raagas usually found in treatises of Indian classical music.

Not surprisingly, Vijaykrishnan's work is likely to be most contentious theoretically exactly at these innovative points and the general conclusions about the design of music he attempts to derive thereof. Consider the very choice of optimality theory for studying structure of music. Over two decades of work in optimality theories of human languages arguably suggest that the model applies more convincingly to the phonological aspects of language than to its syntax and semantics. Not only that very little of the core problems in syntax can be directly addressed with the resources of

optimality theory (Barbosa et al 1998), there are concerns that even these restricted resources are psychologically implausible—for example, they are often too 'costly'.

Be that as it may, the point is that, if the preceding scenario regarding the applicability of optimality theory is roughly correct, then optimality theory may apply at best to the 'phonological'—that is, sound—aspects of music, not to its syntax and semantics. Vijaykrishnan seems to be agreed to the idea since, according to him, Carnatic music has no syntax and semantics, only 'phonetics'. In effect, Carnatic music has no hierarchic structures which are computationally interpreted. However, the author seems to allow that Western classical music may have syntax, unlike Carnatic music. If that is so, then the picture raises difficult questions about universality of music as a species-specific device. Limited psychological experiments suggest that in studies on melodic expectancy and tonal hierarchies, considerable agreement was found between listeners from the music's cultural context or from outside it. Thus, 'the inexperienced listeners were able to adapt quite rapidly to different musical systems' (Krumhansl et al 2000). If the tonal structures of Carnatic and Western classical music differ as sharply as Vijaykrishnan suggests, then either the phenomenon just cited remains unexplained or Carnatic and other systems of music somehow fall out of the universal set. In general, we may ask if the author wants to hold that Carnatic music somehow fails to allow for unending embeddings typically found in music (and language) across the world (Fitch 2006). If so, then how do we account for this remarkable specificity?

My own preliminary hunch is that this otherwise unsavoury non-universalistic result is a consequence of the general framework the author adopts. For example, his

suggestion that the Lexicon of Carnatic music contains all of the marked and unmarked pitches, raaga structures, characteristic passages and the like, perhaps helps in creating the no-syntax picture. Since much of the input information to the system is already structured, progression works by simply iterating and re-iterating them in a flat structure. But then a raaga system, viewed as a collection of pitches—a pitch *set*—is itself a structured object. Which device in the system constructs the pitch set, not to speak of the more elaborate characteristic phrases of the raaga system?

The simplest way of constructing an unordered set in the recent minimalist program in linguistic theory (Chomsky 1995) is the basic operation merge that puts α and β to generate {α, β}, incorporating the No Tampering Condition (NTC) which leaves α and β in tact, and results in a hierarchy—embedding—when a third element γ is added. In this alternative picture, the 'atomic' objects α, β, γ belong to the lexicon and the resulting set is generated by the computational system; the complex object is then interpreted by systems external to the core computational system. In a sense then, syntax and semantics follow from the very requirements of set-construction which seems to be an absolutely primitive requirement in any symbolic domain we wish to look at. Since Vijaykrishnan takes these sets themselves to be primitive, it is no wonder that in his scheme Carnatic music fails to have either syntax and semantics.

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