Functional Harmony Revisited: A Prototype-Theoretic Approach

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I. PRELIMINARIES

"How do we sort the objects, people, events, and ideas in the world into their proper categories? What transforms the 'booming, buzzing confusion' that enters our eyes and ears at birth into that orderly world we ultimately experience and interact with?" With these questions Stevan Harnad introduces an important collections of essays entitled *Categorical Perception: The Groundwork of Cognition*.[1] As Harnad immediately explains,

> Categorical perception occurs when the continuous, variable, and confusable stimulation that reaches the sense organs is sorted out by the mind into discrete, distinct categories whose members somehow come to resemble one another more than they resemble members of other categories. The best-known example is color categories: Physically speaking, colors differ only in their wavelengths, which gradually get shorter across the spectrum of visible colors. What we see, however, are qualitative changes, from red to orange to yellow to green, and so forth. The same is true of musical pitches: Gradually increasing frequencies can come to be heard as categorical changes from C to C-sharp to D to E-flat. A lesser-known example is "stop-consonants": (synthesized) "ba," "da," and "ga" also vary along a physical continuum, yet we hear them as three qualitatively distinct and discrete categories. In all three cases, perceptual *boundaries* have somehow arisen along the physical continuum, dividing it into discrete regions, with qualitative resemblances *within* each category and qualitative differences *between* them. These bounded categories may provide the groundwork for higher-order cognition and language.

Harnad's example of color categories aptly introduces the ideas of *prototype* and *prototypicality*, quite often associated with categorical perception. Consider the color category "red." The perceptual class of all reds consists of a variety of different hues, the "redness" of which, intuitively, comes in varying strengths (indeed, there are borderline cases which can be cross-classified as "orange" or "purple"); *prototypicality* is a technical term used to refer to these varying strengths of redness. When ordering all reds on a prototypicality scale, an apex is reached in the form of a particular red (or perhaps a narrow band of reds) that exemplify "sheer redness"; *prototype* is a technical term used to refer to such a red. *Prototype theory* is a theory of categorical perception cast in prototype-structural terms. All three examples of categorical perception cited by Harnad in this passage—that is to say, not only color perception, but also pitch perception and speech perception—have received prototype-theoretic accounts. Prototype theory has also been applied to higher-

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[1]Ed. Stevan Harnad (Cambridge: Cambridge University Press, 1987), ix.

level mental processes involving semantic analysis, memory organization, and abstract thought.[2]

Music cognition is a relatively young discipline, formed in the wake of the cognitive revolution of the late fifties. Like all branches of cognitive science, music cognition is interdisciplinary in nature: philosophy, psychology, neurology, linguistics, computer science, and of course, music theory, have all contributed to shaping the field. Given that prototype theories have been highly influential in cognitive psychology in the last two and a half decades, it is not surprising that such theories have found their way into music-cognitive discourse. A recent issue of *Psychomusicology*, for example, is devoted in its entirety to the idea of music prototypes. According to Mari Riess Jones, the guest editor, the issue shows that the idea "is useful in developmental approaches to music perception, in generating new approaches to rhythm perception and production, in understanding aspects of tonality, as well as in expanding our understanding of complex music structure."[3] Among the researchers who have referred to prototype theory in a musical context even before the appearance of this issue of *Psychomusicology* are Carol Krumhansl, Fred Lerdahl, and Anna Unyk.[4]

The present article applies prototype theory to the domain of harmonic theory. Specifically, it presents a prototype-structural account of the music-theoretic construct known as *harmonic functions*. The hallmarks of functionalism are: (1) the characterization of individual chords as tonic (T), subdominant (S), or dominant (D) in function; and (2) the notion that the so-called primary triads I, IV, and V somehow embody the essence of each of these functional categories.[5]

A theory of functions as such was first announced by Hugo Riemann, who openly acknowledged his debts to other theorists. Riemannian *Funktionstheorie* engendered considerable controversy early on, and continues to do so even today. Yet its significance is borne out by the many modern accounts of traditional harmony which incorporate one version or another of functionalism as an essential component. Possible examples are the harmony textbooks of William Mitchell, Allen Forte, and Joel Lester, from the last of which Example 1 is reproduced.[6] One conspicuous counterexample would

[2]For a prototype-theoretic account of color perception see Eleanor Rosch Heider, "Universals in Color Naming and Memory," *Journal of Experimental Psychology* 93 (1972): 10–20; for a prototype-theoretic account of pitch perception see Eytan Agmon, "Towards a Theory of Diatonic Intonation," *Interface* 22 (1993): 151–63; and for a prototype-theoretic account of speech perception see Gregg Oden and Dominic Massaro, "Integration of Featural Information in Speech Perception," *Psychological Review* 85 (1978): 172–91. Eleanor Rosch has been highly influential in prototype-theoretic accounts of higher-level mental processes; e.g., "Classification of Real-World Objects: Origins and Representations in Cognition," in *Thinking: Readings in Cognitive Science*, ed. P. N. Johnson-Laird and P. C. Wason (Cambridge: Cambridge University Press, 1977), 212–22.

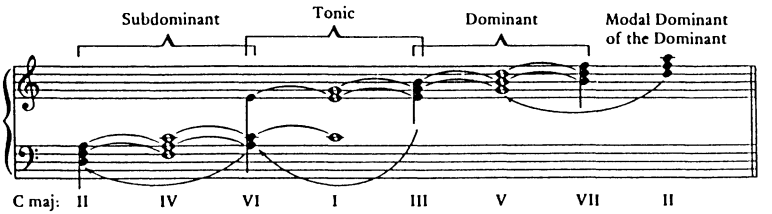
[3]Mari Riess Jones, "Preface," *Psychomusicology* 10 (1991): 71.

[4]Carol Krumhansl, "The Psychological Representation of Musical Pitch in a Tonal Context," *Cognitive Psychology* 11 (1979): 349; Fred Lerdahl, "Timbral Hierarchies," *Contemporary Music Review* 2 (1987): 144–45; Anna Unyk, "An Information-Processing Analysis of Expectancy in Music Cognition," *Psychomusicology* 9 (1990): 236–37.

[5]For empirical studies of harmonic representation incorporating a prototype-theoretic approach see Carol Krumhansl, Jamshed Bharucha, and Edward Kessler, "Perceived Harmonic Structure of Chords in Three Related Musical Keys," *Journal of Experimental Psychology: Human Perception and Performance* 8 (1982): 24–36, and Jamshed Bharucha and Carol Krumhansl, "The Representation of Harmonic Structure in Music: Hierarchies of Stability as a Function of Context," *Cognition* 13 (1983): 63–102. These studies differentiate between a harmonic core consisting of the triads I, IV, and V, and the remaining four diatonic triads, but do not otherwise partition the group of seven diatonic triads into three functional categories.

[6]William Mitchell, *Elementary Harmony*, 2nd ed. (New Jersey: Prentice-Hall, 1948), 65–66; Allen Forte, *Tonal Harmony in Concept and Practice* (New York: Holt, Rinehart and Winston, 1962), 120; Joel Lester, *Harmony in Tonal Music*, vol. 1 (New York: Knopf, 1982), 21, 25, 251. See also Marion Guck, "The Functional Relations of Chords: A Theory of Musical Intuitions," *In Theory Only* 4 (1978): 29–42; Charles J. Smith, "Prolongations and Progressions as Musical Syntax," in *Music Theory: Special Topics*, ed. Richmond

Example 1. A contemporary view of harmonic functions. From Joel Lester, *Harmony in Tonal Music*, vol. 1, p. 251. Reproduced with permission.



seem to be Aldwell and Schachter's *Harmony and Voice Leading*, where the idea of harmonic functions is never explicitly endorsed; yet careful study of this text reveals that beneath the surface there is more than a trace of functionalism in its approach.[7]

Recruiting prototype theory in the service of functional theory achieves, I believe, a number of goals. First, prototype theory provides functional theory with a conceptual framework which is intuitively appealing, and which also promotes rigor and consistency. Second, this framework promotes reexamination of certain deep-rooted assumptions inherent in a traditional functional approach. As an example, consider Riemann's derivation of the three primary harmonic triads I, IV, and V from a symmetrical, dualistically motivated underdominant and over-dominant relationship to a given tonic; this derivation (which harks back to Rameau) seems not to have been superseded since in any essential respect.[8] Yet the special status of root relationships by fifth is by no means a necessary assumption in the theory of harmonic functions. This is a significant finding, for it means that functional considerations, on the one hand, and chord-progressional considerations, on the other, can be separated from each other.

Browne (New York: Academic Press, 1981), 139–74; idem, "The Functional Extravagance of Chromatic Chords," *Music Theory Spectrum* 8 (1986): 94–139.

[7]Edward Aldwell and Carl Schachter, *Harmony and Voice Leading*, 2nd ed. (San Diego: Harcourt Brace Jovanovich, 1989). See, e.g., Chapter 9, where IV, II, and II^6 are treated together as "intermediate harmonies." See also pp. 185 and 153, where VI is treated "as substitute for I" and as an "intermediate harmony" (a term usually reserved for IV and II), respectively. Significantly, in their discussion of the I–III–V progression (p. 213) the authors take considerable pains to distinguish between the "intermediate harmonies" (II, IV, and VI) and the III chord, which also "leads from an opening tonic to a dominant."

[8]See, for example, David Lewin's *Generalized Musical Intervals and Transformations* (New Haven: Yale University Press, 1987), 171–73, where the fifth-relatedness of IV and I, and V and I (represented by their roots) is depicted by a transformation graph.

It is a central—albeit unproven—thesis in the present article that harmonic theory in general is best conceived in terms of two independent, interacting components, namely a theory of functions (which describes the three harmonic categories) and a theory of chord progression (which characterizes the various root progressions, ascending third, descending fifth, etc.). Indeed, one way of stating the core idea of the present article is: given a separation of chord progression from harmonic function, the notions *function* and *primary triad* are fully reducible to *category* and *prototype*, respectively.

It is my firm belief that music theory, although a latecomer into the cognitive-scientific arena, is no second-rate player in that field. The basis for my belief is twofold. First, music theory has had a rich and impressive history—probably unparalleled in the theory of the arts; this history is replete with significant cognitive undertones. Second, the ontological status of music is possibly unique, being a product of human cognition minimally constrained by the structure of the outer world. By this I mean that music seems to fulfill Claude Lévi-Strauss's dictum that "when the mind is left to commune with itself and no longer has to come to terms with objects, it is in a sense reduced to imitating itself as object."[9] Music, in other words, offers a unique and invaluable window into the inner workings of the human mind. It follows that a prototype-theoretic approach to harmonic functions could serve as an important impetus to theories of the mind which uphold the existence of categories and prototypes.

No approach to functional harmony, however innovative, can afford to ignore the controversy which has surrounded the idea since its inception. Part 3 of this article, therefore, is a critical discussion of the functional controversy; the main issues in dispute are considered in light of the theory as proposed in the present article. Although a clear line is drawn between the notions of harmonic function and chord progression, some tentative suggestions as to how the two components might possibly interact to produce a richer and intuitively more satisfying harmonic theory are included in Parts 4 and 5 of the article, which complete the theoretical discussion begun in Part 2.

[9]Claude Lévi-Strauss, *The Raw and the Cooked*, trans. J. and D. Weightman (New York: Harper & Row, 1969), 10; quoted in Howard Gardner, *The Mind's New Science* (New York: Basic Books, 1985), 240–41.

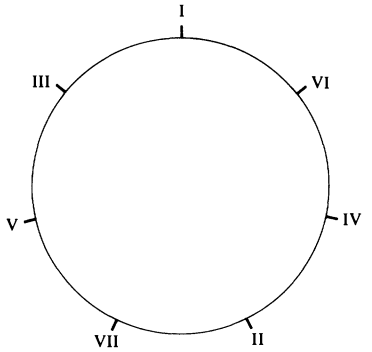
II. A PROTOTYPE-THEORETIC ACCOUNT OF HARMONIC FUNCTIONS

Translating functionalism into prototype-theoretic terms necessarily involves three operations: (1) selecting as prototypes the three primary triads I, IV, and V; (2) associating with each prototype a group of triads, corresponding (together with the prototype) to a conventional functional category, as in T={I,VI,III} (see Example 1); (3) associating with each categorized triad a *prototypicality index* corresponding to the triad's functional strength (e.g., the sense in which I is the strongest tonic triad, followed by both VI and III in the second place). First, however, some preliminaries are in order.

Let the notion *degree of triadic similarity* be defined for all distinct pairs of triads formed from tones of a given diatonic collection; in particular, let two (distinct) diatonic triads having two tones, one tone, or no tones in common be termed respectively *maximally similar*, *intermediately similar*, and *minimally similar*.

In Figure 1 the seven diatonic triads are ordered cyclically by third. In this representation, maximally similar triads occupy adjacent positions on the circle's circumference; if the shortest distance along the circumference of the circle connecting two triads passes through one or two intervening positions, the triads are intermediately similar or minimally similar, respectively.

Figure 1. The circle of thirds, representing degrees of triadic similarity

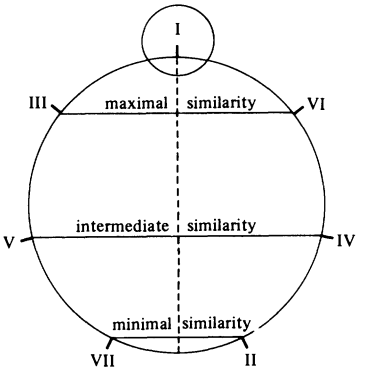


One might object that common tones are not the only possible criterion by which similarity between triads might be assessed; for example, triads may also be compared on the basis of their intervallic structure, in which case all triads of a given quality (major, minor, etc.) would be regarded as maximally similar. Yet there are compelling theoretical grounds for granting the common-tone criterion a privileged status in this case. After all, what makes a specific diatonic triad (say, IV) a unique object is its pitch content, not its intervallic structure. In other words, pitch content is the defining property of specific diatonic triads; it follows that pitch content must be the main criterion by which similarity between such triads is assessed.

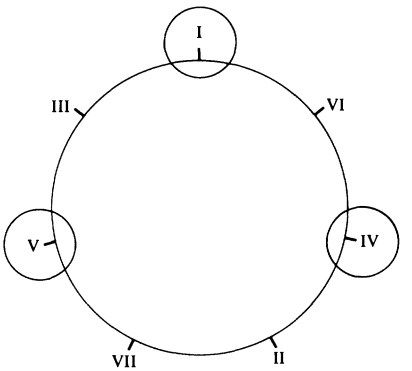
Figure 2a adds an important assumption to the content of Figure 1, namely, that the tonic triad is referential within the diatonic triadic set. Thus, if Figure 1 depicts degrees of triadic similarity in general, Figure 2a depicts, in addition, degrees of triadic similarity in relation to the tonic triad. There are

Figure 2.

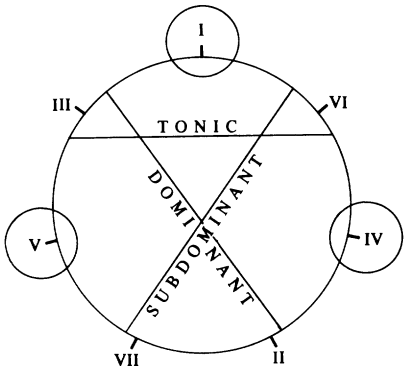
a) Degrees of triadic similarity in relation to the tonic triad



b) The selection of the three harmonic prototypes



c) The delineation of categories



three such degrees, namely maximally similar to the tonic (VI and III), intermediately similar to the tonic (IV and V), and minimally similar to the tonic (II and VII). The obvious symmetry of these relationships is highlighted in the figure.[10]

There are three principles on the basis of which the primary triads I, IV, and V may be selected as prototypes. The first principle is self-evident: the tonic triad, by virtue of its special, referential status, is a prototype. (*Referential* and *prototypical* are synonymous for all practical purposes.) The second principle may be termed *the principle of symmetry*. It states that the symmetrical structure depicted in Figure 2a must not be violated. In other words, if one selects any triad as prototype, one must also select its mirror image (e.g., the selection of VI entails the selection of III and vice versa, IV entails V). The principle of symmetry follows from the referential status of the tonic triad. A triad selected as prototype is compared to the tonic triad; the comparison necessarily evokes exactly one other triad, namely, the triad which corresponds to the selected prototype in terms of its degree of similarity to the tonic triad.

The third and last principle states that two maximally similar triads cannot, simultaneously, be selected as harmonic prototypes (in other words, no two prototypes may occupy adjacent positions on the circle of thirds depicted in Figure 1). Unlike the first two principles, which pertain solely to the theory of harmony, this third principle is more universal. Clearly, prototypes must be maximally dissimilar to each other if categorization in general is to serve any useful purpose; how could subjects benefit from categorization if it were difficult to differentiate one prototype from another? In the color domain, for example, to select both "yellow" and "yellow with a slight orange tinge" as prototypes is inconceivable; similarly in the harmonic domain, it is inconceivable to select as prototypes, say, both II and IV.[11]

These three principles uniquely select the triads I, IV, and V as prototypes of three harmonic categories (Figure 2b). Two self-evident propositions (P1 and P2, below) determine the additional members of each category and their respective prototypicalities:

P1. Additional triads can only be admitted into a given category in an order which corresponds to their degree of similarity to the

[10]Concerning the criteria by which the tonic is selected, see Eytan Agmon, "Tonicity and the Tritone: Beyond the Rarity Issue," *Proceedings of the First International Conference on Cognitive Musicology* (Jyväskylä, Finland: University of Jyväskylä, 1993), 74–87. Common tones also play an important role in Riemann's theory, and indeed, in many earlier as well as later harmonic theories.

[11]A "principle of maximal differentiation" has been proposed by André Martinet for the domain of phonemic structure: "if by accident a given phoneme is not as much differentiated from its neighbours in the system as the organs could achieve, one might expect the articulation of the phoneme in question to be modified until such maximal differentiation is obtained" (*Elements of General Linguistics*, trans. Elisabeth Palmer [London: Faber & Faber, 1964], 191). See also Eytan Agmon, "Towards a Theory of Diatonic Intonation," 154, for an application of a similar principle to the domain of pitch perception.

category's prototype (that is, triads maximally similar to the given prototype are admitted first, etc.); moreover, a triad's degree of similarity to the given prototype is synonymous to that triad's prototypicality.

P2. The process of admittance described in P1 must stop just short of another prototype, since only one prototype can be a member of any given category.

In applying these two propositions, it remains to be decided whether P2 is the sole constraint on admittance into a category according to P1, or whether the process of admittance might possibly stop before P2 becomes applicable. Although one could conceivably formulate some principle to stop admitting triads into a given category earlier than P2 dictates, parsimony urges us not to do so. Why burden the theory with an additional assumption, one whose rationale may be difficult to establish, if P1 and P2, which are self-evident, suffice? Thus, I propose that P1 and P2 complete the theory, as shown in Figure 2c.

A comparison of Figure 2c with Example 1 reveals that the proposed theory accords very well with the conventional view of harmonic functions. Yet the decision not to invoke a constraining principle on category membership other than P2 results in a somewhat curious feature: not only VI and III, but also II and VII, have dual citizenship. That is to say, in addition to the primary (and conventionally well-established) classification of II and VII as subdominant and dominant triads, respectively, the function of II emerges as weakly dominant, and correspondingly, that of VII as weakly subdominant (*weakly* in this context refers to the triad's prototypicality, for a relation of intermediate similarity, rather than maximal similarity, obtains between the triad and its category's prototype). The dual functional status of II and VII surely calls for separate discussion; however, since the issues involved are rather specialized, and moreover touch upon a number of intricate side issues, such discussion appears in Part 4 of this article. A more pressing question concerns the validity of the idea of harmonic functions in the first place, a question which has generated, as the reader is probably aware, some rather heated debate.

III. HARMONIC FUNCTIONS: EMPIRICAL FACT OR THEORETICAL FICTION?

It should be clear by now that the term "theory of harmonic functions" is used in the present article with a very specific meaning. "Function," "primary triad," and "functional strength" are reduced to "category," "prototype," and "prototypicality," respectively. Moreover, the theory is stripped of any chord-progressional connotations, and thus has no standing with regard to how the three functional categories may follow each other in time. Nonetheless, significant connections do exist between the proposed theory and the historical *Funktionstheorie*, usually attributed to Hugo Riemann. Riemann's theory has been severely criticized on several accounts, even to the point of questioning the existence of harmonic functions altogether. The present section addresses two of the most prominent criticisms of Riemann: one which stems from a rival approach to harmony known as *Stufentheorie*, and another which stems from a theory which purports to redefine altogether the notion of harmony, namely the Schenkerian approach with its emphasis on hierarchical structure and voice leading.

Stufentheorie versus Funktionstheorie. A historically important alternative to Riemann's *Funktionstheorie* is an approach to harmony known as *Stufentheorie* (literally, "theory of harmonic degrees," but more appropriately, "theory of degree progression").[12] *Stufentheorie* stresses the individu-

[12]Simon Sechter is usually considered the most prominent proponent of *Stufentheorie*. See Robert Wason, *Viennese Harmonic Theory from Albrechtsberger to Schenker and Schoenberg* (Ann Arbor: UMI Research Press, 1985), 33; Carl Dahlhaus, *Studies on the Origin of Harmonic Tonality*, trans. Robert Gjerdingen (Princeton: Princeton University Press, 1990), 33 ff.; William

ality and independence of the seven harmonic degrees. Moreover, unlike *Funktionstheorie*, where the primary harmonic model is the I–IV–V–I progression, *Stufentheorie* leans heavily on the cycle of descending fifths I–IV–VII–III–VI–II–V–I.

Both aspects of *Stufentheorie* figure prominently in Schenker's acrimonious attack on functionalism in the first volume of *Counterpoint*, echoes of which reverberate in the writings of some of his followers.[13] For example, Schenker questions the explanatory value of an account of the major system where the "individual scale degrees, except for I, IV, and V, are deprived of their independence and thus of their attractive capability of assuming various functions"; and in discussing harmonic progressions by descending fifths, he asks: "Considering that none of these passages manifests 'sequential character,' does it not follow necessarily that all scale-degrees—not only I, IV, and V—must be recognized as scale-degrees in their own right?"[14]

The Schenkerian approach: hierarchy and voice leading. While Schenker's 1910 critique of functionalism is of a clear, *Stufentheorie* origin, the subsequent development of his theories, with its well-known emphasis on voice leading and hierarchical structure, has inevitably led to friction of quite a different sort. Jonas, for example, states that functionalism "had to fail, because it neglected the fact that two occurrences of the same chord could be worlds apart in meaning, and that everything depended on context."[15] In a footnote to that statement, John Rothgeb concedes that functionalism allows a secondary chord, such as III, to assume different functions in different contexts, but nevertheless insists that "the theory fell far short of a recognition of the phenomenon of composing-out, and, as a result, failed to discriminate between vertically and horizontally generated chords."

My response to all of these important objections rests on three major points: (1) the proposed version of functional theory is not Riemann's; (2) the theory is not meant to exhaust the harmonic domain; and (3) the proposed theory is compatible with a hierarchical approach.

Departures from Riemann. Certain controversial aspects of Riemann's theory have no counterparts in the proposed theory. Most notably, the proposed theory abandons Riemann's

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Caplin, "Harmony and Meter in the Theories of Simon Sechter," *Music Theory Spectrum* 2 (1980): 74–89.

Ernst Kurth, who used the term *Fundamenttheorie* to refer to Sechter's system, seems to have been the first scholar to conceive of Sechter and Riemann as two major opposing figures in the theory of harmony. See Ernst Kurth, *Die Voraussetzungen der theoretischen Harmonik und der tonalen Darstellungssysteme* (Bern: Max Drechsel, 1913), 6 ff. and 89 ff. See also Lee Rothfarb, "Ernst Kurth's *Die Voraussetzungen der theoretischen Harmonik* and the Beginnings of Music Psychology," *Theoria* 4 (1989): 19–20. Needless to say, *Stufentheorie* as well as *Funktionstheorie* are, to a considerable extent, abstractions, for neither exists in the work of a single theorist in as pure a form as their hypothesized rivalry suggests.

[13]See especially Oswald Jonas, *Introduction to the Theory of Heinrich Schenker*, trans. and ed. John Rothgeb (New York: Longman, 1982), 127–28, and Rothgeb's review of Hellmut Federhofer, *Akkord und Stimmführung in den musiktheoretischen Systemen von Hugo Riemann, Ernst Kurth und Heinrich Schenker* (Vienna: Verlag der Österreichischen Akademie der Wissenschaften, 1981) in *Music Theory Spectrum* 4 (1982): 131–37, where "the recognition of only three principal functions" is dubbed "specious" (132). See also Federhofer, *Beiträge zur musikalischen Gestaltanalyse* (Graz: Akademische Druck, 1950) and *Akkord und Stimmführung*; and Matthew Brown, "A Rational Reconstruction of Schenkerian Theory" (Ph.D. diss., Cornell University, 1989), 192–99. Both Brown and Wason (*Viennese Harmonic Theory*, 134–35) present synopses of Schenker's arguments.

[14]Heinrich Schenker, *Counterpoint*, vol. 1, trans. John Rothgeb and Jürgen Thym, ed. John Rothgeb (New York: Schirmer, 1987), 23, 27. As John Rothgeb explains in a footnote on p. 348, "the application . . . [of the theory of tonal functions] is especially problematical in passages involving 'sequences' by descending fifths. This led Riemann to declare that 'as was recognized first of all by Fétis, however, the true harmonic movement—the cadential progression—remains stationary for the duration of the sequence. . . .' " The reference is to Hugo Riemann, *Handbuch der Harmonielehre*, 7th ed. (Leipzig: Max Hesse, n.d.), 202.

[15]Jonas, *Introduction*, 127.

notion of "apparent consonance" (*Scheinkonsonanz*), which truly deprives the so-called secondary triads, right from the start, of any potential independence.[16] More generally, the Riemannian sense in which a secondary degree is said to represent or substitute for a primary degree does not exist in the proposed theory. Unlike Riemann's somewhat ambiguous use of tonic, subdominant, and dominant to refer to both functions and/or chords, in the proposed theory these terms are used exclusively to refer to functions, that is, categories of chords; reference to individual chords is made by Roman numerals.[17] II, for example, represents an abstract category (namely the subdominant), which is also represented by IV; at the same time, IV is of course the more prototypical representative of that category.

The proposed theory largely bypasses another highly controversial aspect of Riemann's theory, namely dualism.[18] After all, there is no necessary connection between functionalism and dualism, however essential it might have seemed to Riemann to view the rules of harmony and the major/minor polarity as stemming from a single source. Indeed, there is no lack of evidence that functionalism can flourish quite apart from any attendant commitment to a dualistic doctrine.[19]

The scope of the theory. As already indicated, harmonic theory is viewed in the present article as a composite of two main subtheories: a theory of functions and a theory of chord progression. This view is indebted to the historical *Funktionstheorie/Stufentheorie* opposition; however, the correspondence is far from exact. Most notably, the proposed functional theory is static, in the sense that it merely describes the three harmonic categories and their internal structure; the T–S–D–T paradigm of functional succession (a venerable component of *Funktionstheorie*) is not within its scope. The exclusion of functional succession from functional theory might seem a bit odd. However, although excluded from functional theory, the T–S–D–T paradigm remains a part of harmonic theory in general—that is, the interaction of the theory of functions with a theory of chord progression.

Once the scope of functional theory is reduced, it cannot be faulted for failing to deal convincingly with the cycle of descending fifths. The priority of the descending-fifth relationship is clearly an aspect of the theory of chord progression, not the theory of functions. When Schenker and his followers point out, for example, that the II in II–V is not merely a IV-substitute because a descending-fifth relationship obtains between the II and the V, they are certainly correct; but their argument concerns the theory of chord progression (as it interacts with the theory of functions), not the theory of functions per se. It is surely senseless to reject a theory

[16]See Dahlhaus, *Studies*, 38: "the concept of functions can be separated from Riemann's method of demoting secondary degrees to dissonant variants of primary degrees, so that one can retain the concept of fundamental progressions without giving up the concept of functions." For Dahlhaus's elaboration of this statement, see especially pp. 57–59.

[17]Concerning the Riemannian chord/function ambiguity, see Dahlhaus, *Studies*, 50. In a paper entitled "An Idea and its Politics: Hugo Riemann's Treatment of Harmonic Function," delivered at the 1992 annual meeting of the Society for Music Theory, Daniel Harrison has argued that the chord/function ambiguity is not so much inherent in Riemann's theory (as Dahlhaus implies), as it is an unfortunate result of Riemann's attempts to make his theory more generally accessible.

[18]The closest counterpart in the proposed theory to Riemann's dualism is the principle of symmetry, discussed in connection with Figure 2.

[19]Since a number of American theorists have taken renewed interest in Riemann in general and dualism in particular, it might be clarified that the intention here is not to rekindle the dualism controversy; rather, the intention is merely to rebut criticisms of Riemann's dualism that might be addressed toward the proposed theory. An example of American Neo-Riemannism is David Lewin, "A Formal Theory of Generalized Tonal Functions," *Journal of Music Theory* 26 (1982): 23–60.

outright merely because its success is limited, to one degree or another, in terms of the total domain under consideration.[20]

The contextual role of hierarchy and voice leading. No obstacle bars combining a functional view of harmony with Schenker's important insights into the hierarchical nature of tonal pitch structure, a hierarchy expressed, to a significant extent, through voice leading. For example, when Federhofer observes that in the progression II–IV–V (soprano: $\hat{2}$–$\hat{1}$–$\hat{7}$) the metrically weak IV-chord is subservient to the II, and not vice versa, there is no conflict with functionalism, for as he himself points out, "undoubtedly the supertonic triad assumes in this context a subdominant quality."[21]

An altogether different (and much more loaded) question is whether the concepts of voice leading and hierarchical structure are so powerful as to render "harmony" as traditionally conceived more or less obsolete, except, perhaps, as the notion applies to some higher levels of tonal structure (Schenker's *Stufen*). The idea that harmony is reducible to counterpoint is surely connected in many people's mind with Schenker's name. In his review of Felix Salzer's *Structural Hearing*, for example, Milton Babbitt refers to "the more autonomous nature of contrapuntal discipline as opposed to harmonic discipline, the latter being almost completely inferable from the former—involving at most a shift of emphasis—while the reverse is not possible."[22] Leo Kraft states even more categorically that "the term *harmony* is virtually useless . . . If harmony books make any sense, it is because they deal with musical motion—that is, counterpoint."[23] A number of theorists have attempted to draw the full consequences from such a view—with disappointing results, in my opinion.[24] Moreover, as the appendix to this

[20]Cf. Brown ("A Rational Reconstruction," 192–99), who argues forcefully (after Schenker) against functionalism, while at the same time admitting that "the notion of harmonic functions certainly accounts for a large amount of tonal music" (195).

[21]". . . zweifellos nimmt der Dreiklang der II. Stufe in diesem Zusammenhang eine unterdominantische Färbung an," *Beiträge zur musikalischen Gestaltanalyse*, 13. See also his *Akkord und Stimmführung*, 17–18.

[22]*Journal of the American Musicological Society* 5 (1952): 264.

[23]Leo Kraft, *Gradus: An Integrated Approach to Harmony, Counterpoint, and Analysis*, vol. 1 (New York: W. W. Norton, 1976), 30. An extended reference to Schenker on p. 117 (under the heading "Why Study Counterpoint?") precedes the statement that "our definition of counterpoint, taking a broad view, includes most of what is taught in courses called 'Harmony'."

[24]Peter Westergaard's *An Introduction to Tonal Theory* (New York: W. W. Norton, 1975) is probably the most comprehensive and consistent attempt to date to implement a thoroughly linear, quasi-Schenkerian approach to tonal theory. In Westergaard's system not only is the seventh-chord conceptually non-existent as a harmonic entity (on p. 325 one finds a reference to "a collection of pitches—the so-called *dominant seventh*"), but also non-existent are the diminished and augmented triads (p. 41; however, see p. 105). In keeping with his thoroughly linear approach, Westergaard derives the V–I cadence from a set of melodic fragments ending on a member of the tonic triad, claiming that some combinations of these fragments "are more generally useful than others" (325). With a truly remarkable sleight of hand, though, Westergaard includes among his melodic fragments (which are otherwise exclusively stepwise) the succession $\hat{5}$–$\hat{1}$.

A less extreme attempt to approach harmony in contrapuntal terms is William Benjamin's "Pitch-Class Counterpoint in Tonal Music," in *Music Theory: Special Topics*, 1–32. In another article, "Models of Underlying Tonal Structure: How Can They Be Abstract, and How Should They Be Abstract?" *Music Theory Spectrum* 4 (1982): 28–50, Benjamin claims that "according to the theory [of pitch-class counterpoint], tonal harmonic progressions are counterpoints of four pitch-class voices, motion in each of which is determined by motion in one or more of the others. Therefore, it is the complex of lines in a progression which determines its identity, and not the chords of which it is comprised" (40). However, Benjamin's theory is far from being harmonically innocent. In particular, the voice-leading rationale underlying some of his rules is not apparent (e.g., Rule 8 on p. 7, and the special "spawning" status of the ascending fourth). As a result, the appearance of a dependency of harmony on counterpoint is deceptive.

The most recent work in this lineage is Arthur Komar, *Linear-Derived Harmony* (Boston: Ovenbird Press, 1992). However, Komar refrains from adopting a decisive theoretical stance on the harmony-versus-counterpoint issue, stating "it appears that the question of the priority of harmony or

article shows, contrary to existing belief voice-leading considerations do not suffice to account for certain well-known norms of doubling in four-part harmony.

Of course, Schenker did indeed canonize the horizontal dimension at the expense of the vertical, most notably in his highly polemic 1930 essay "Rameau oder Beethoven?"[25] But while one may sympathize with Schenker's own need to distance himself from many of his predecessors (and contemporaries) so as to highlight the originality and boldness of his ideas, today, when the significance of his achievement is hardly open to question, such a need no longer exists.[26] I am convinced that for many musicians today the choice between a Schenkerian approach and traditional harmonic theory is a painful one; and despite the ominous subtitle of Schenker's above-noted essay, intellectually (and artistically) speaking it is not a choice between life and death.[27]

In summary, harmonic functions are not easily dismissed as theoretical fiction. To be sure, neither is it easy to prove that harmonic functions empirically exist. But in as much as the burden of proof in this case seems to weigh heavier with those who question the existence of harmonic functions, I shall assume henceforth that harmonic functions exist, and turn to a number of more tangential theoretical issues associated with the present, prototype-theoretic approach.

IV. THE DUAL FUNCTIONAL STATUS OF II AND VII

As discussed at the end of Part 2 of this article, II and VII have a dual functional status in the proposed theory: the essentially subdominant II is also weakly dominant, and similarly, dominant VII is weakly subdominant. How can one substantiate such a view? Since a reliable method for determining the functional status of a given chord empirically does not seem to exist, ultimately one must rely on one's intuitions. These intuitions, however, are rather subtle, and may not be immediately available for introspection.

Before presenting examples from the literature of II and VII(7) in unconventional functional guises, it should be useful to draw a distinction between a given triad's functional potential (e.g., the potential of II to assume subdominant or dominant function, as opposed to its inability to assume tonic function), and the realization of that potential in context. For the most part, how a given functional potential is realized in context is irrelevant to present purposes; nonetheless, in the case of VII that question is tentatively addressed.

Consider first the claim that although the function of II is primarily subdominant, a weak dominant function nevertheless exists. Such a claim would be foreign to a functional

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counterpoint is comparable to the question of the precedence of the chicken or the egg" (12 n. 8).

[25]Heinrich Schenker, "Rameau oder Beethoven? Erstarrung oder geistiges Leben in der Musik?" *Das Meisterwerk in der Musik*, vol. 3 (Munich: Drei Masken Verlag, 1930; facsimile, Hildesheim: Georg Olms, 1974), 11–24; English translation by Sylvan Kalib in "Thirteen Essays from the Three Yearbooks *Das Meisterwerk in der Musik* by Heinrich Schenker: An Annotated Translation" (Ph.D. diss., Northwestern University, 1973), vol. 2, 492–518.

[26]See Harald Krebs, "Schenker's Changing View of Rameau: A Comparison of Remarks in *Harmony, Counterpoint,* and 'Rameau or Beethoven?'," *Theoria* 3 (1988): 59–72.

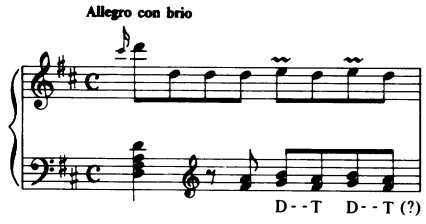
[27]I recall hearing a pre-eminent Schenkerian disciple describe the chord succession in the opening four measures of the C-major Prelude from Bach's *Well-Tempered Clavier*, Book I, solely in terms of neighboring motions. Should one deny the harmonic content of these measures? Could not one rather say that the emphasis on stepwise motion here (especially in the bass) is the means by which the opening progression's low hierarchical status within the overall harmonic structure is expressed?

Although I believe in the existence of an essentially independent harmonic domain, I also believe that a dependency of the vertical dimension on the horizontal dimension indeed exists at a very deep level, deeper, in fact, than that which Schenker posits. See Eytan Agmon, "Linear Transformations between Cyclically Generated Chords," *Musikometrika* 3 (1991): 15–40, where *triad* and *seventh chord* are defined on the basis of voice-leading considerations.

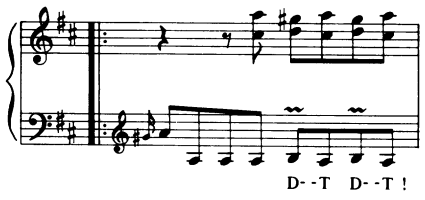
theory where dominant and subdominant are seen, in Dahlhaus's words, as "antithetical extremes."[28] Yet the dominant function of II, I believe, may be felt in certain contexts where II (or II^6) is followed by I (or I^6). An example in major, from the opening of a well-known piano sonata by Haydn, appears in Example 2a. Interestingly, at the beginning of the development section the opening idea is restated (in the dominant key) with VII^6 in the place of II^6 (Example 2b). One could argue, of course, that Haydn's reharmonization, necessitated by the transfer of the thematic material to the bass, amounts to a functional reinterpretation (that is, D–T instead of S–T).

Example 2. II as dominant in major: Joseph Haydn, Piano Sonata in D major, Hob. XVI:37

a) m. 1



b) m. 41



The VII^6, however, is so clearly a variant of the II^6 chord, that to hear the two chords as contrasting in function seems counterintuitive.[29]

[28]"The notion that ii before I should be taken as V^9, and vi before V as ii^9, is absurd, since it leads to a confusion of antithetical extremes—the subdominant (subdominant parallel) with the dominant, and the tonic (tonic parallel) with the dominant of the dominant" (Dahlhaus, *Studies*, 37). Dahlhaus is responding (in part) to Sechter's interpretation of $II–I^{(6)}$ as $II–V^9_7–I$, which, ironically perhaps, is a possible precedent to the idea that II is weakly dominant in function. See Wason, *Viennese Harmonic Theory*, 40–42, and Caplin, "Harmony and Meter," 76 (especially Example 2).

To the best of my knowledge, the closest Riemann ever comes to acknowledging a dominant quality in II is when he identifies (possibly after Hauptmann) the root of II or II^7 in major with the fifth of V. See for example his *Harmony Simplified*, trans. H. Bewerung (London: Augener, 1896), 55. To be sure, the theory of *Klangvertretung* (which Riemann credits to Helmholtz) allows Riemann to state that "each of the secondary triads of the key represent simultaneously two of the three primary harmonies, one primary harmony being comprehended as the main content (consonance), the other, the foreign addition (dissonance)" (Hugo Riemann, *History of Music Theory*, vol. 3, trans. and ed. William Mickelsen [Lincoln: University of Nebraska Press, 1977], 218). However, except for II in major, the principle of *Klangvertretung* does not seem to apply to II and VII. For Riemann, II in minor is the major triad $\flat\hat{2}–\hat{4}–\hat{6}$ (the *Leittonwechselklang* of IV) and VII in major is the minor triad $\hat{7}–\hat{2}–\sharp\hat{4}$ (the *Leittonwechselklang* of V), while VII in minor is the major triad $(\natural)\hat{7}–\hat{2}–\hat{4}$ (the *Parallelklang* of the natural dominant). In any event, I am not aware that Riemann ever actually analyzed II as dominant (even in major) or VII as subdominant. In particular, a VII triad (diminished, of course) is invariably analyzed by Riemann as a rootless dominant-seventh chord.

[29]Also relevant in this connection are mm. 5–6, a varied repetition of mm. 1–2. Replicating the II^6 chord would have sounded awkward with the new sixteenth-note figuration in the left hand, and therefore Haydn departs from mm. 1–2 harmonically by keeping the inner-voice a^1 stationary, thus implying the succession $V^4_2–I^6$ rather than II^6-I^6.

One could object that in comparing parallel passages in the Haydn Sonata I am confusing the question of functional parallelism with the independent question of thematic parallelism. Yet I make no claims whatsoever concerning a necessary connection between the two kinds of parallelisms. It is important to bear in mind that whereas thematic parallelism in the present case might seem to support the dominant interpretation of II, thematic parallelism could hardly support, say, a dominant interpretation of IV, for the simple reason that the latter possibility does not exist within functional theory.

An example in minor (from the opening of a Brahms intermezzo) appears in Example 3a. For reasons to be clarified shortly in connection with VII, the dominant function of II in minor (a dissonant, diminished triad) is even more evident than that of its major counterpart. (It is probably needless to remind the reader that the function of II, in minor as well as major, is first and foremost subdominant.) Note that in the consequent phrase, which begins in m. 9, the opening II^6 chord concludes the dominant prolongation which begins in m. 6 (Example 3b).[30]

With respect to the leading-tone triad, the question of dual functionality is even more delicate. A subdominant leading-tone triad is difficult to find.[31] Yet the leading-tone seventh chord (VII^7) is known to assume (in certain contexts) subdominant function. In what follows I suggest that although both VII and VII^7 possess a weak subdominant potential, in context only the latter chord's subdominant potential is likely to be realized. My explanation involves equally the successional paradigm T–S–D–T and the special status of VII as the only dissonant triad in the diatonic system. It should be emphasized that the T–S–D–T paradigm is evoked tentatively, by way of suggesting how function and chord progression might interact in a more complete harmonic theory.

VII is a dissonant, diminished triad (in minor, the harmonic form of the scale is assumed), and as such demands resolution. In addition, the dominant potential of the leading-tone triad is stronger than its subdominant potential. These two inherent attributes of VII are mutually supportive, since both the resolution of dissonance and the paradigmatic D–T functional succession are strongly goal-oriented. As a result, in context the dominant potential of the leading-tone triad is much more likely to be manifest than the weaker, subdominant potential.[32] Nonetheless, the leading-tone chord can assume subdominant function in the form of a seventh chord; this is readily explained, for the seventh contributes to the chord another element in common with IV or II. Various contextual factors such as inversion, doubling, and chord succession, can help in this respect, as the excerpts in Example 4 illustrate.

V. TWO ADDITIONAL THEORETICAL CONSIDERATIONS

Even though the proposed theory promotes an essentially symmetrical functional structure, the previous section suggests that contextual considerations can modify that symmetry to some extent; for example, the subdominant function of VII is considerably less prominent than is the dominant function of II. The present section considers two additional factors which interfere with the system's underlying symmetry.

The effect of roots. The so-called root of any triad or seventh chord is a tone of privileged status. The existence of roots disturbs the balance among the so-called secondary triads of each functional category, since those secondary triads in each category which contain the prototype's root possess an obvious advantage over those which do not. For example, VI has an advantage over III within the tonic category, and similarly, II over VI within the subdominant category. The dominant category is an exception, since VII is obviously a

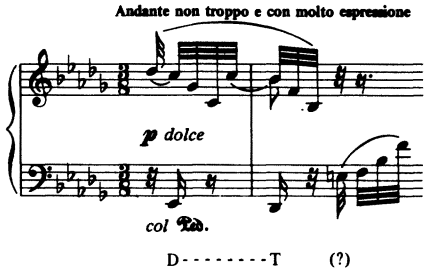
[30]Note also that in the intermezzo's contrasting middle section the opening motive is restated (in D♭ major) with V^7–I in the place of II^6–I^6 (e.g., mm. 22–23).

[31]See, however, Yizhak Sadai, *Harmony in its Systematic and Phenomenological Aspects*, trans. J. Davis and M. Shlesinger (Jerusalem: Yanetz, 1980), 149.

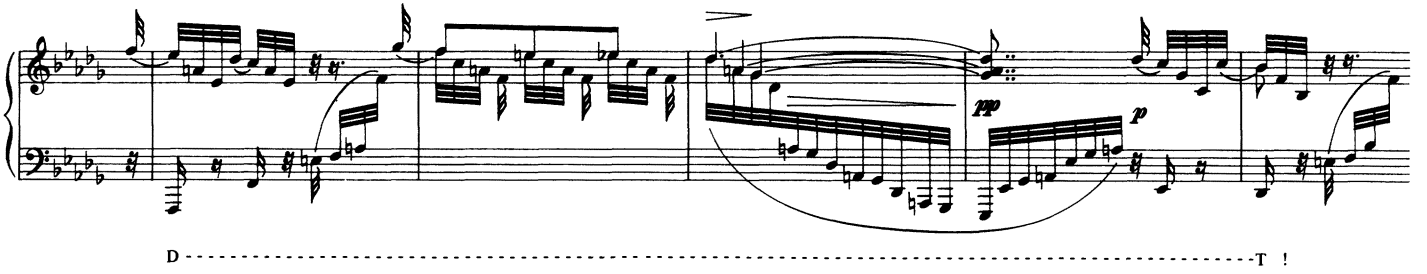
[32]I do not assume that the dissonant tritone contained in the leading-tone triad must resolve by stepwise contrary motion, or that the leading tone must proceed to $\hat{1}$. As argued in the appendix to this article, to assume the necessity of these linear behaviors is to assume a D–T functional succession. It is not difficult to see that the same factors which suppress the weak subdominant potential of VII enhance the (weak) dominant potential of II in minor, as argued in connection with the Brahms example.

Example 3. II as dominant in minor: Johannes Brahms, Intermezzo, op. 117 no. 2

a) m. 1



b) mm. 6–10



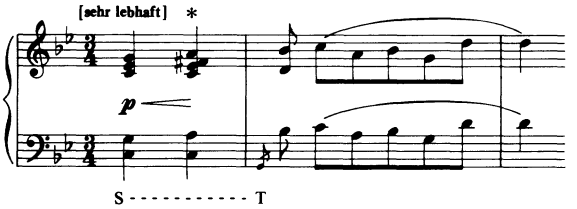
more characteristic dominant triad than III, even though III, and not VII, contains the prototype's root. As discussed above, context often enhances the dominant function of VII. Moreover, in comparison to VII–I, the progression III–I as D–T is not particularly effective, since III and I are maximally similar triads, and thus offer very little contrast.[33]

The norms of doubling in four-part harmony—e.g., the norms by which one doubles the third of the secondary triads

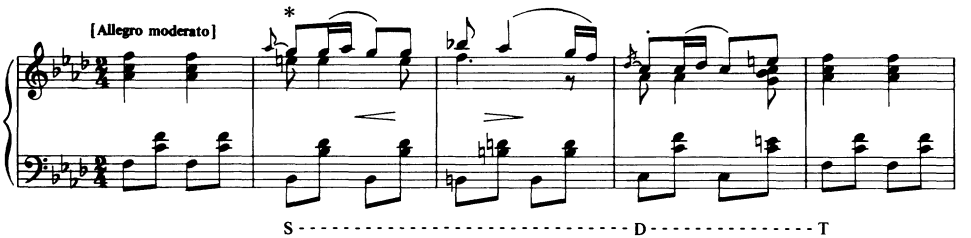
[33]It follows that III is functionally the most underprivileged of all triads: it is not only less of a tonic than VI, but also less of a dominant than VII. This conclusion, no doubt, is empirically well grounded. Lester (*Harmony*, vol. 1, 251), for example, has commented on the "degree of functional ambiguity inherent in III," noting that it is "greater than is the case with any other diatonic chord in the key system. As a result, [Lester continues,] III is the diatonic triad least frequently used. With the exception of a few clearly defined circumstances, most of its usages are dependent upon context to a greater extent than any other diatonic chord." In a similar vein, Smith ("The Functional Extravagance," 113) states that "the mediant triad is notorious, especially in major, where it has a leading-tone, but sounds perhaps too much like a tonic to be clearly heard as a dominant in most contexts. Mediants rarely have any straightforward function; sometimes they are followed by dominant preparation chords, sometimes by dominants, and sometimes by tonics." The dominant function of III can be enhanced through inversion and doubling, as in the progression III^6–I (as discussed below). In minor, the use of ♯7 is highly effective in enhancing the mediant's dominant function.

Example 4. VII^7 as subdominant. After Aldwell and Schachter, *Harmony and Voice Leading*, 2nd ed., Exx. 24–24 and 31–15 (pp. 392 and 534)

a) Robert Schumann, no. 5 from *Kreisleriana*, op. 16, mm. 51–53



b) Franz Schubert, *Moment Musical* D. 780 no. 3 (op. 94 no. 3), mm. 34–38



II (S), III (D), and VI (T)—are another empirical manifestation of the functional significance of the prototype's root. Given the common belief that these norms are better accounted for purely in terms of voice leading, the issue of doubling is examined more closely in an appendix to this article.

Seventh chords. The symmetrical structure depicted in Figure 2a is disturbed by adding a seventh to all six non-tonic triads, as shown in Table 1.[34] Particularly suggestive in Table 1 vis-à-vis Figure 2a is that whereas V^7, like V, shares only a single tone with the tonic triad, IV^7, unlike IV, shares two. Perhaps this helps explain why II^7, which has only one tone in common with the tonic triad (cf. V^7), almost seems to usurp the role of subdominant prototype in the domain of seventh chords.

VI. CONCLUSION

"The report of my death was an exaggeration," quipped Mark Twain after an American newspaper announced that he was dying in poverty in London.[35] Sometimes it seems as

[34]The tonic is by nature consonant, and thus would not normally appear as a seventh chord. See Agmon, "Tonicity and the Tritone."

[35]DeLancey Ferguson, *Mark Twain: Man and Legend* (New York: Russell & Russell, 1965), 272–73.

Table 1. The tonic triad versus the six non-tonic seventh chords: a common-tone hierarchy

Non-tonic seventh chord	Number of tones in common with the tonic triad
VI^7	3
III^7, IV^7	2
V^7, II^7	1
VII^7	0

though a similarly unfounded announcement concerning harmonic theory has been posted. To be sure, tonal theory in general has undergone a major reassessment in the past five or six decades, due primarily to the work of Heinrich Schenker; however, it is a mistake to believe that harmony is necessarily one of the main casualties of the process. Harmony is with us to stay; and with it, so it seems, is the idea of harmonic functions.

Harmonic function, in the present view, is only one of two essential ingredients which ultimately should form part of a theory of tonal harmony; the other ingredient is chord progression. A theory of chord progression is essential in order to account for the privileged status of certain root relationships, most notably by descending fifth. Although the question of chord progression lies outside the scope of the present article, some tentative suggestions have been made as to how harmonic theory in general may benefit from the interaction of such a (hypothetical) theory with the proposed theory of functions.

Considerable liberty has been taken here with Riemann's *Funktionstheorie*, not only for the sake of greater theoretical rigor and the removal of arbitrary features, but also for the sake of placing music-theoretic discourse within what I believe should be its proper intellectual context, namely cognitive science. Although Riemann himself developed *Funktionstheorie* from a rational perspective for the most part, late in life his general methodological outlook became overtly mentalistic. It seems only fitting, therefore, to bring the proposed, prototype-theoretic account of harmonic functions to a close with one of Riemann's most uncompromising statements in this regard:

> *The "Alpha and Omega" of musical artistry is not found in the actual, sounding music, but rather exists in the mental image of musical relationships that occurs in the creative artist's imagination—a mental image that lives before it is transformed into notation and re-emerges in the imagination of the hearer* . . . If one has grasped these fundamental ideas, then it is clear that *the inductive method of tone-physiology and tone-psychology is headed in the wrong direction from the very beginning when it takes as its point of departure the investigation of the elements of sounding music, instead of the examination of the elements of music as it is imagined.* In other words: *neither acoustics, nor tone-physiology nor tone-psychology can give the key to the innermost essence of music, but rather only a "Theory of Tonal Imagination"—a theory which, to be sure, has yet to be postulated, much less developed and completed.*[36]

APPENDIX

THE NORMS OF DOUBLING IN FOUR-PART HARMONY: A CRITIQUE OF THE VOICE-LEADING ARGUMENT

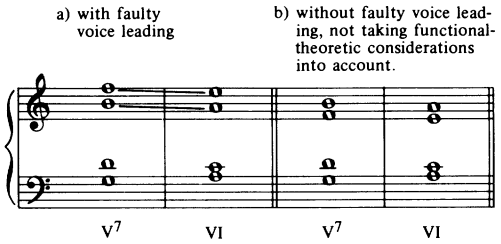
As is well known, it is customary to double the third of II, III, and VI, in their capacity as subdominant, dominant, and tonic triads, respectively. This finding, as already indicated, easily lends itself to a functional explanation. Indeed,

[36]Robert Wason and Elizabeth West Marvin, "Riemann's 'Ideen zu einer Lehre von den Tonvorstellungen': An Annotated Translation," *Journal of Music Theory* 36 (1992): 82–83.

Riemann stated very clearly that the doubled third in such cases is really the root of the primary triad which the secondary triad, presumably, represents.[37] Although it might be preferable to say that the secondary triad represents a functional category and the doubled third is the means by which the category's prototype is emulated, either way it seems that the norms of doubling in four-part harmony are compelling empirical evidence in support of the functional approach. The purpose of this appendix is to challenge the claim that these norms are better explained purely in terms of voice leading. The appendix thus supplements Part 3 of the article, particularly the discussion of whether the Schenkerian approach with its emphasis on hierarchy and voice leading renders functionalism, and possibly traditional harmonic theory in general, obsolete.

The essence of the argument by which characteristic doublings in four-part harmony are attributed to voice-leading constraints may be found in a 1949 paper by Knud Jeppesen.[38] Jeppesen's point of departure is the discussion of the deceptive cadence V^7–VI in Rameau's *Traité de l'harmonie*. Rameau makes a strikingly Riemannian statement that "it is preferable to place the octave of the third in the chord [of the sixth degree] rather than the octave of the bass . . . because the third implies the true fundamental sound, whose replicate cannot be displeasing."[39] In an attempt to replace this (presumably) functional explanation by a voice-leading one, Jeppesen seizes upon Rameau's subsequent reference to "gross errors" which may result from doubling the submediant's root, interpreting these to mean parallel fifths (actually, a diminished fifth followed by a perfect fifth), as shown in Example 5a.

Example 5. The progression V^7–VI: VI with doubled root



Even though Jeppesen's objectionable fifths may be removed through a different disposition of the upper voices (as in Example 5b), many would surely argue that from a voice-leading point of view the result remains objectionable since the tritone does not resolve properly, and, in particular, the leading tone does not move up to $\hat{1}$.

But should one assume a priori that a tritone must resolve by contrary stepwise motion, or that in any context $\hat{7}$ must be followed by $\hat{1}$? Surely not. In terms of dissonance treatment there are any number of possibilities besides contrary motion to resolve a tritone (as in Example 6a). There are even contexts (most notably, II^6–V in minor) where the resolution of a tritone seems hardly an important issue (Example 6b). Furthermore, there are many contexts where the leading tone properly moves down to $\hat{6}$ (Example 7).

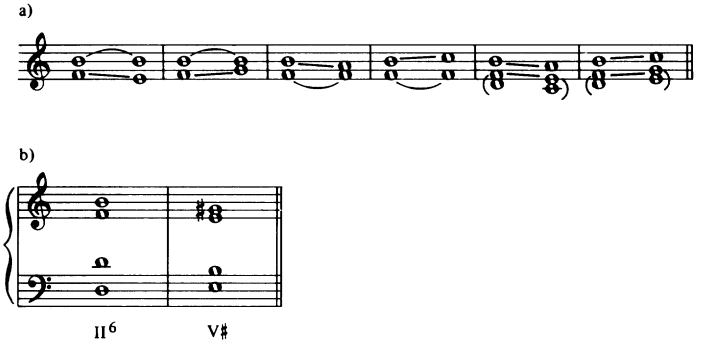
Therefore, when one speaks of the tritone's inherent tendency to resolve by stepwise contrary motion, or of the leading-tone's inherent tendency to move to $\hat{1}$, a particular context is intended, namely, the functional succession D–T. Outside the context of the D–T functional succession these voice-leading constraints simply do not apply. Thus, in

[37]Riemann, *Harmony Simplified*, 71 ff.

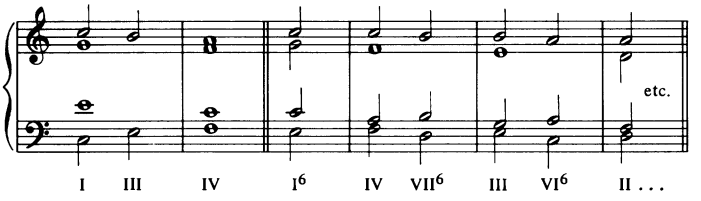
[38]Knud Jeppesen, "Zur Kritik der klassischen Harmonielehre," *Report of the Fourth Congress of the International Musicological Society* (Basel, Bärenreiter, 1949), 23–34.

[39]Jean-Philippe Rameau, *Treatise on Harmony*, trans. Philip Gossett (New York: Dover, 1971), 73.

Example 6. Some resolutions of a tritone



Example 7. The leading tone in descending contexts



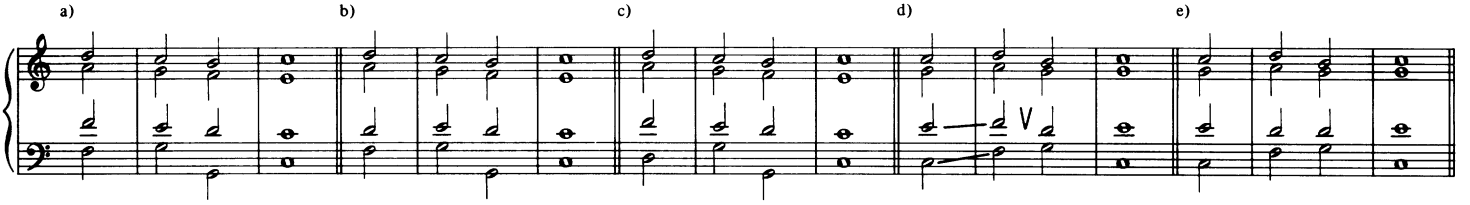
$V^{(7)}$–VI the sense in which $\hat{7}$ must go to $\hat{1}$ is contingent upon conceiving the progression functionally as D–T, that is, as referable to $V^{(7)}$–I (the functional prototypes); the voice-leading argument, in other words, tacitly concedes the functional point of view.

The functional explanation of the doubling norm in V^7–VI is therefore correct. This does not deny that voice-leading considerations here overlap with purely functional ones to a significant extent (especially in minor). Nonetheless, the doubling norm in V^7–VI cannot be explained solely by voice-leading considerations.

Jeppesen also purports to account in voice-leading terms for the normative doubled third in other instances; he considers in particular the II^6 chord, set in a cadential context. A cadential progression involving II^6, Jeppesen notes, has a much better tenor line if the third of the II^6, rather than the root, is the doubled tone (compare Example 8a with Example 8b).

Even though Jeppesen's point here seems rather moot, one may accept it for the sake of argument, noting the 6–6–6–8 intervallic relationship between soprano and tenor. Jeppesen, however, ignores an essential question. Why is II characteristically employed in the six-three position in the first place, in major as well as in minor (particularly at cadences)? If the tenor line (or the relation soprano-tenor) is really the main issue here, why not have a root-position II

Example 8. Progressions with II^6 and II



with a doubled root, as in Example 8c? Once again the answer does not concern voice leading. In fact, voice-leading considerations can even be sacrificed to some extent for the sake of achieving a doubled third in II^6. The voice leading in Example 8d, for instance, is inferior to that in Example 8e (there is a hidden octave between the bass and tenor, and the tenor leaps unnecessarily in moving to V). Yet Example 8d (II^6 with doubled third) is preferable to Example 8e (II^6 with doubled root), other things being equal.

In summary, an appeal to voice leading does not suffice in explaining characteristic doublings in four-part harmony. There is no basis for the claim that such an appeal renders the more traditional functional explanation dispensable.

ABSTRACT

From a prototype-theoretic point of view the three harmonic functions known as tonic, subdominant, and dominant are three (partially-overlapping) chord-categories; and the three primary triads, namely I, IV, and V, are prototypes of these categories, respectively. A theory is proposed, which accounts for these categories and prototypes.