The Analysis and Cognition of Basic Melodic Structures: The Implication-Realization Model
by Eugene Narmour
Chicago: University of Chicago Press, 1990
xiv, 486pp.

REVIEWER

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In the last of the many footnotes in *Beyond Schenkerism* Eugene Narmour wrote "My forthcoming book, *The Melodic Structure of Tonal Music,* will attempt to make explicit the principles of the implication–realization model" (1977, 214). The adjective Narmour used to describe his proposed book was somewhat misleading: it took him another thirteen years to move beyond *Beyond Schenkerism.* The explication of the implication–realization model will ultimately prove to be an ambitious and extended project, stretching to four volumes: *The Analysis and Cognition of Basic Melodic Structures: The Implication–Realization Model (ACBMS)* is but the first of these. Of the remaining volumes, the second will complete the consideration of melody; the third will take up the matters of higher–level melodic structures, aesthetic strategies in melodic composition, and idiostructural analysis; and the fourth will be given over to harmonic implication.

Narmour's goal in this series of books is essentially the same as that proposed in *Beyond Schenkerism:* to give an analytical account of music that starts at the musical surface and arrives at a hierarchical description of music through a rule–based model of implication and realization. What appears to be new is his alliance with the growing field of cognitive science. Although there has always been a strong psychological component to Narmour's approach to music, reflecting the influence of Leonard Meyer, the project here is bolder and more fundamental: Narmour seeks to ground the implication–realization model in subconscious activities and functions of human cognition. The principal goals of such grounding are to circumscribe the interference of style on musical analysis, to provide music theory a foundation in assertions about cognitive functions that in some manner can be proven true or false, and to lend credence to the implication–realization model by showing its function on a basic (in the sense of subconscious or preconceptual) cognitive level. His point of departure for this project is that aspect of music which has long been a focus of his work: melody.

Much of the conceptual groundwork for *ACBMS* was laid in Narmour's earlier work. In *Beyond Schenkerism* Narmour adopted

Leonard Meyer's theory of how meaning is generated in music (as presented in Meyer 1956 and refined in Meyer 1973) but strove to make it more rigorous through the analysis of the implications of separate parameters of music. Each parametric analysis yielded the basic material for a hierarchical description of one aspect of a work of music. To develop a complete account of a work of music (or of a passage from a work) the hierarchical structures of a number of parameters would be correlated, resulting in an intertwined network composed of relationships between the structures of a number of hierarchies (Narmour 1977, 127).

In a subsequent article Narmour clarified his notion of hierarchical structure and directly linked it with perception, proposing that hierarchical relationships exist empirically as psychological facts of cognition and perception (Narmour 1983, 133). Narmour believed that psychological mechanisms of the sort associated with hierarchical relationships reflect universal laws of some sort, and that these laws must imply the epistemological possibility of an analytical symbology yielding unique representations each time the symbology is applied to the analysis of an artwork (1983, 140–41). The analytical symbols are tokens for the psychological mechanisms which permit the understanding (in a comprehensive sense) of an artwork, and therefore are central to the analytical enterprise.[1]

This emphasis on symbology was clarified in a companion article that laid out the essentials of the theory later elaborated in *ACBMS*. Here Narmour proposed to show how a detailed analytical symbology could make the hypotheses of implication and realization operational with respect to the discovery of structural tones (Narmour 1984, 84). In laying the groundwork for this symbology, he introduced three main hypotheses of the implication–realization model: the implication of continuation; an implication that is the opposite of continuation (called *reversal*); and the notion of a parametric scale, which is conceived of as a graded cognitive matrix into which the syntactic elements of individual parametric patterns can be analytically distributed, fixed, and ordered so as to enable evaluation according to the hypotheses of continuation and reversal (1984, 84).

These three hypotheses signified an important shift in the function of the implication–realization model. In *Beyond Schenkerism* the implication–realization model offered a methodology for analyzing music in terms of a hierarchical structure generated from a musical surface. In Narmour's 1983 and 1984 articles the implication–realization model became a perceptual–cognitive model that sought to explain how we generate an understanding of music as we listen to it. The symbols are important because they correspond with specific cognitive functions; when applied, this symbology operates not as a sum-

mary or reduction, but is in effect an analytical translation of the work of music (1984, 113).

The key to the refinement of Narmour's analytical system was the refinement of his cognitive model; the groundwork for this was laid with the idiosyncratic conception of melody common to the 1983 and 1984 articles: the parameter of melody was defined as "bald pitch succession with no reference to rhythm, scale step, tonic, dominant, diatonicism, voice leading, or any of the other trappings of tonal style" (1984, 84, footnote 3). Melody, then, is simply successive pitches and the intervals between them, nothing more. Although this conception is at a variance with what is usually meant by "melody," it does isolate a species of musical event essential to what is commonly thought of as melody, yet cognitively basic enough to provide a starting point for a model of the cognitive processes involved in the apprehension of melody. The definition, which is adopted but unstated in *ACBMS,* can be a source of confusion: series of successive musical events that many readers would put into quite different categories—for example, the notes that open J. S. Bach's *Invention* in C (potentially categorized as melody) and the notes that open the first prelude from Book I of his *Well-tempered Clavier* (potentially categorized as arpeggio)—are classed together under this definition.

In *ACBMS* this conception of melody lead Narmour to theorize a cognitive system based on automatic modules that process melody and produce syntactic elements which combine to create archetypes of melodic structure. The model is refined with an account of memory function and the influence of other parameters on the parameter of melody, and the refined model, together with closural characteristics of the syntactic elements and melodic archetypes, leads to a hierarchical account of musical structure based on the implication–realization model. In the following I will take up each of the main components of Narmour's cognitive and analytical theory in turn.

Cognitive Modules. The isolation of bare pitch–succession as the essential melodic event permitted Narmour to theorize a cognitive agency given over to processing perceptual input in terms of successive intervallic relationships. This agency, or faculty, is taken to be "hardwired" in the brain: it is part of our genetically inherited equipment as human beings. The notion of such a faculty is consonant with the theory of mental modules proposed by Jerry Fodor (1983), and it is Fodor's theory of cognitive structure as modular that provides the conceptual underpinnings for the cognitive theory used in *ACBMS.*

Fodor's theory of cognitive structure is in part a resurrection of the theories of Franz Joseph Gall (1758–1828), who proposed that cognitive processes were functionally individuated: thus there were independent faculties for language, for music, for memory, and so on.[2]

This notion of cognitive structure is in contrast to the idea that cognitive processes reflect the interaction between different mental agencies. In his enthusiasm for Fodor's conception of faculty psychology, Narmour asserts that there is a large body of psychological and psychophysical evidence attesting to the existence of "hardwired" mental faculties (*ACBMS,* 81), but Fodor's theory is more accurately described as an *interpretation* of evidence gathered from a variety of sources; in Fodor's presentation this interpretation is not always compelling. In recent years, however, there has been a resurgence of interest in the idea that there are cognitive modules; Ulric Neisser, who is identified with an integrated approach to cognition, has noted that the fact the nervous system evolved through natural selection makes modular organization virtually inevitable (Neisser 1988, 368). Ray Jackendoff has presented a fairly well worked-out theory of modularity in *Consciousness and the Computational Mind;* in his chapter on music Jackendoff offers an interpretation of the implication–realization model that may save it from its deficiencies (Jackendoff 1987, 239–45).[3]

In *ACBMS* the central mental faculty specific to the cognition of melody is a revised version of the intervallic parametric scale introduced in Narmour's 1984 article. Narmour originally conceived of the intervallic parametric scale as having two independent forms, one ascending and one descending: there would thus be two separate matrices, one ordering ascending intervals, the other ordering descending intervals (1984, 87). In the present version there are two *different* parametric scales with distinct syntactic functions: one scale tracks registral direction, the other scale tracks intervallic size. These parametric scales reflect Narmour's theory of perception and cognition, which is based on a distinction between processing proper to percepts (bottom-up processing) and processing proper to concepts (top–down processing).[4]

The registral scale records directed motion of a general type in a pitch space similar to Robert Morris's contour space, or c-space. In c–space the size of interval between pitches is ignored—all that matters is whether a particular pitch is higher or lower than another pitch (Morris 1987, 23). The registral scale is an automatic system that evaluates successive pitches in terms of relative position in c–space and records the directed motion between the first and second as up, down, or, in the case of pitch duplication, no change. Narmour construes this measurement as a sort of vector drawn between the two notes and calls the scale the V–scale, with V as a mnemonic for vector.[5]

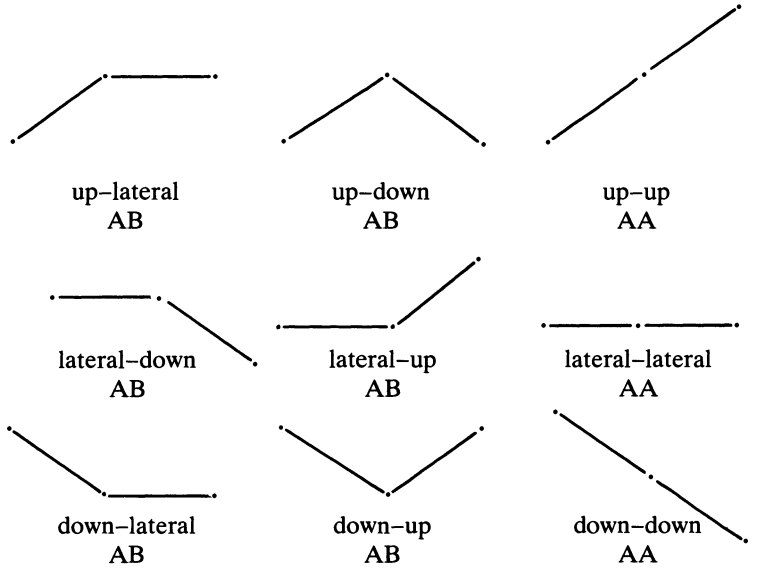
The intervallic scale (given the mnemonic I) records individual pitches in register–specific slots and evaluates the size of the interval

between successive pitches. The intervallic evaluation is usually in terms of the twelve-fold equipartition of the octave prevalent in Western music theory; this pitch space is equivalent to Morris's p–space. Other intervallic evaluations are possible as well, resulting in "pentatonic" or "microtonal" partitions of the octave; some such partitions would be equivalent to Morris's u–space (Morris 1987, 23). In all cases pitch intervals are taken as undirected, directed motion having been recorded by the V–scale.[6]

These two parametric scales accomplish the initial ordering of perceptual input. The properties that the individual parameters exhibit—directed motion or undirected interval—are called *style shapes* (*ACBMS,* 34). In Narmour's theory style shapes are the source of any musical style: musical style is based on *style structures,* which can be thought of as bundles of style shapes (*ACBMS,* 45). Style shapes are cognitive givens, the result of automatic processing of input by computational modules; as such, they are the stuff of bottom–up processing. In contrast, style structures are part of the conceptual and syntactic realm of top–down processing.

Style shapes are ordered into relations of similarity, proximity, and common direction by a program that automatically structures all input. In what he sees as a departure from conventional theories of Gestalt psychology Narmour proposes that this program is the source of the patterns of perceptual structure captured by the principles of Gestalt psychology: the relations of similarity, proximity, and common direction exist prior to the perceptual input which they structure (*ACBMS,* 65). The priority of this program consequently requires that the syntax of melody is a syntax of similarity, proximity, and common direction.[7]

The syntax of the V–scale can be understood to be organized by the principle of common direction: successive directed motions in c–space represent either continuation or change of direction (*ACBMS,* 75, 285). If *up* is followed by *up,* registral direction is continued and the implication of the first directed motion (its "upness") is realized by the second directed motion. If *up* is followed by *down,* registral direction is changed and the implication of the first directed motion is denied. Although the permutations of directed motion can be various because of the possibility of repeating a note (see figure 1) the syntax is basically binary (no–change–of–direction or change–of–direction); this is reflected in Narmour's symbology. If both intervals have the same directed motion Narmour symbolizes the successive intervals as AA (indicating syntactic similarity); again, see figure 1. If there is a change of direction, Narmour symbolizes the intervals as AB (indicating syntactic differentiation). Each realized implication is nonclosural



AA = syntactic similarity
AB = syntactic differentiation

Figure 1. Possible Directed Motions on the V–scale

(symbolized NCL) and itself implies continuation of the ongoing process. Each denied implication is closural (symbolized CL) and ends the ongoing process.

The syntax of the I–scale is somewhat more complicated than that of the V–scale[8]; it can be understood to be governed by the principles of similarity and proximity. The implications of any interval formed by successive pitches registered by the I–scale are determined by the proximity of the pitches to each other. The constituent pitches of small intervals (the unison, minor second, major second, minor third, and major third) are proximate to each other and the pitches have a similar (or in the case of the unison, identical) sound. This similarity of sound sets up an implication that similar pitches will follow: a small interval implies another small interval (see figure 2). The constituent pitches of large intervals (intervals larger than a perfect fifth) are distant from one another and the pitches have a different sound from each other. This difference in sound sets up an implication of differentiation for both directed motion and size of interval: a large interval implies a small interval and a change of directed motion. Narmour considers the intervals of a perfect fourth, tritone, and perfect fifth to be threshold intervals with equivocal implications; the fourth tends to imply similarity and continuation, the fifth tends to imply differenti-

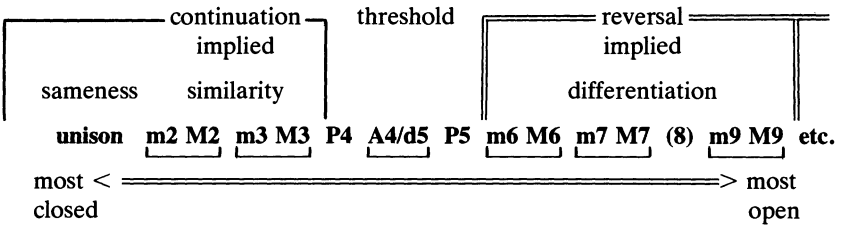


Figure 2. The Parametric Scale for Melodic Intervals

Case 1: given pitches x, y, and z, arranged in pitch space as follows:

z●

y●

x●

two intervals result: xy = α, yz = β
V-scale: $\alpha\beta$ = AA (syntactic similarity)
I-scale: if $|\alpha - \beta| \leq$minor 3rd, then AA (syntactic similarity)
if $|\alpha - \beta| >$ minor 3rd, then AB (syntactic differentiation)

Case 2: given pitches x, y, and z, arranged in pitch space as follows:

y●

x●

z●

two intervals result: xy = α, yz = β
V-scale: $\alpha\beta$ = AB (syntactic differentiation)
I-scale: if $|\alpha - \beta| \leq$ major 2nd, then AA (syntactic similarity)
if $|\alpha - \beta| >$ major 2nd, then AB (syntactic differentiation)

Figure 3. Cases of Intervallic Similarity and Differentiation

ation and reversal. Single intervals are also assigned closural attributes through an open–ended continuum which takes the unison to be the most closed interval and each successively larger interval to be successively more open (*ACBMS,* 297–98); the justification for these attributes is apparently the proximity of the pitches which constitute each interval.

Successive intervals on the I–scale are assigned syntactic and closural values in accordance with the principle of similarity. Given two successive intervals with the same directed motion, the second is considered similar to the first if it does not differ from it by more than a

minor third; let us call this Case 1 of intervallic similarity (see figure 3). If the directed motion between the two intervals changes, the second interval may differ from the first by no more than a major second to be considered similar; let us call this Case 2 of intervallic similarity. Similarity of interval is interpreted as syntactic similarity and is symbolized AA. Intervallic differentiation is interpreted as syntactic differentiation and is symbolized AB. The possibilities for syntactic similarity and differentiation on both the V–scale and I–scale for two successive melodic intervals are illustrated in figure 3.[9]

The closural attributes of intervallic successions are determined by motion on the parametric scales. In Narmour's diagram of the I–scale the most closed intervals are to the left, the most open are to the right (see figure 2). Evaluating the degree of closure between two intervals is a matter of noting whether the second interval is to the left or to the right of the first: if the second interval is to the left, the intervallic succession represents a motion toward closure; if to the right, the succession represents a motion toward nonclosure. Narmour adopts this method of evaluation for all of his discussions of closure: motion left (symbolized mL) is toward closure on either the V–scale or the I–scale; motion right (symbolized mR) is toward nonclosure. In the case of pitch duplication (V–scale) or intervallic duplication (I–scale) there is no change in closural level—this is symbolized mN for motion nil.

These cognitive faculties—the V–scale and I–scale and the structuring program that gives rise to Gestalt principles—are the source of the melodic archetypes which are the basis for Narmour's analysis of melodic structure. However, there are problems with some of the basic aspects of Narmour's psychological/cognitive theory that should be noted, since these problems complicate the understanding of the melodic archetypes. These problems concern (i) the application of Gestalt theory to music, (ii) the status of the unison on the V–scale, and (iii) the concept of interval that Narmour employs.

(i) Difficulties with Narmour's application of Gestalt theory to music are evident in the confusion surrounding his accounts of the syntactic structure of the parametric scales; let us consider two examples. (1) The principle of common direction is used to explain why any directed motion recorded by the V–scale implies continued motion in the same direction; however, it would seem that similarity could also account for a continuation of directed motion, *up* being similar to *up*. (2) The principle of proximity is used to explain the inherent structure of the I–scale but this is immediately translated into a similarity relation: pitches are either similar to or different from each other. Given this translation the notion of proximity seems to be superfluous; there

is also experimental evidence that evaluations of proximity are based on similarity of frequency (Deutsch 1982, 123).[10]

Some of the confusion attached to Narmour's use of Gestalt principles is caused by his failure to differentiate clearly between the structures of similarity, proximity, and common direction when they are introduced (*ACBMS*, 59ff). Some of the confusion is inherent in the application of Gestalt principles to music: although the notion of a Gestalt was originally proposed as a way to explain why successive pitches coalesce into a melody (von Ehrenfels 1890/1960), development of the theory proceeded almost exclusively in the spatial domain. To apply Gestalt principles to music is to project an account of our experience of spatial phenomena onto our experience of auditory phenomena, but it has yet to be demonstrated that these are the same thing. It seems more probable that in making this application we use an understanding of the spatial domain to understand the domain of pitch through a process George Lakoff and Mark Johnson have called metaphorical projection (1980). As with all cases of metaphorical projection the account generated by mapping an old explanation onto a new domain is at times approximate and represents only one of several possible descriptions of the new domain; hence it is not surprising that, without precise definitions, the notions of similarity, proximity, and good continuation may not always find targets in the realm of pitch.

(ii) The status of the unison on the V–scale is a somewhat peculiar one; this peculiarity is born of Narmour's theories of perception and parametric analysis. In the non–simultaneous, successive world of pitch to which Narmour has restricted himself the unison exists not as an interval of pitch but as an interval of time. There is no need to process the melodic unison in terms of directed motion in c–space since it is simply a repetition of pitch, and directed motion in pitch space need not be invoked—the notion of "lateral" motion on the V–scale is little more than an ill–disguised analog for interval in time. However, because Narmour construes pitch and duration to be separate parameters of music which are processed separately prior to the construction of percepts, he treats pitch as if it exists in the absence of time.[11] The consequence is that a computational module that processes the directed motion of input continues processing even when there is nothing to process. One must then question the ways in which modules discriminate between aspects of pitch.

(iii) Narmour's conception of interval appears to be that an interval is a composite object that can be decomposed into direction of measurement and intervallic distance. This leads him to hypothesize that we process these aspects of interval with separate "hardwired"

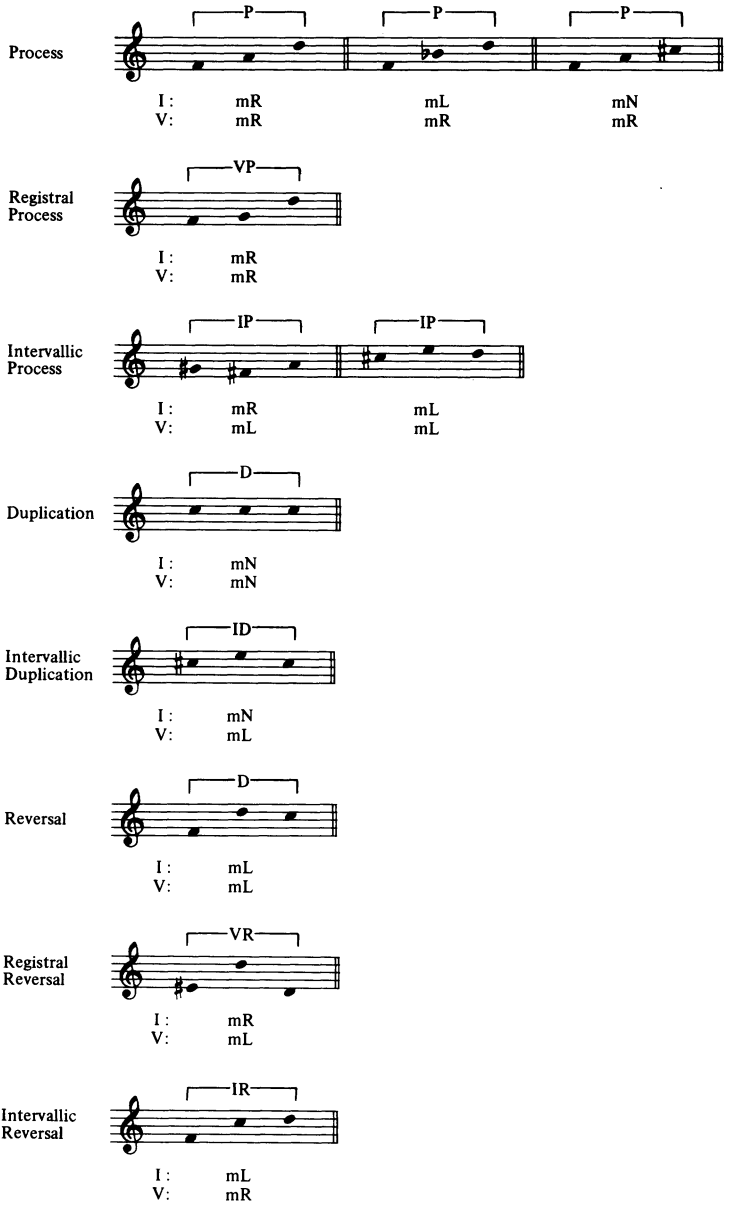
conceptual modules: the V–scale and I–scale. However, the notion of interval–as–absolute–quantity, stripped of directed motion, is a very strong abstraction from perceptual input and one that is never fully justified. Close consideration of the basic notion of an interval offers an alternative: it is possible to think of a musical interval as a metaphorical projection of a physical link. A physical link forms a connection between two things, and an interval can be thought of as an abstract "third thing" that connects two objects. Interval then is not a thing in itself but a relationship between two things.[12] David Lewin uses this sort of conception when he defines an interval as a characteristic directed measurement, distance, or motion between two points in musical space (1987, xi, 16). Under this conception of interval, directed motion and intervallic quantity are not separate aspects of the same object but different ways of describing the relationship between pitches: the V–scale and I–scale do not measure different aspects of melodic interval but instead measure the same interval with different degrees of refinement.[13]

Melodic Archetypes. In Narmour's theory the syntactic elements produced by the V–scale, I–scale, and the structuring program that gives rise to Gestalt principles combine to create archetypes of melodic structure. The primary archetypes are the same as those introduced in Narmour's 1984 article: process [P], duplication [D], and reversal [R]; all archetypes comprise at least two successive melodic intervals. Process involves small intervals (as measured by the I–scale) with the same directed motion; both intervallic and directed-motion implications are realized (*ACBMS,* 99) (see table 1 and example 1). Duplication involves the repetition of a pitch; again, both intervallic and directed–motion implications are realized as interval (the unison) and motion (lateral) are repeated (*ACBMS,* 97). Reversal involves a large interval followed by a small interval which has a different directed motion; because large intervals imply differentiation, both intervallic and directed–motion implications are realized (*ACBMS,* 150).

Each melodic archetype has a derivative or derivatives which deny the implications of one aspect of melodic interval while realizing the implications of the other. Registral process [VP] realizes the implication of directed motion to continue but denies the implication created by an initial small interval: in registral process a small interval is followed by a large interval with the same directed motion (*ACBMS,* 330). Intervallic process [IP] realizes the implication of a small interval to be followed by another small interval but denies the implication that the second interval will have the same directed motion as the first (*ACBMS,* 350).

		V-scale: Syntactic pattern	Closural motion on V-scale	I-scale: Syntactic pattern	Closural motion on I-scale	Closural type
Process	P	AA	mR	AA	mR, mN, mL	NCL
Registral Process	VP	AA	mR	AB	mR	NCL
Intervallic Process	IP	AB	mL	AA	mR, mL	CL/NCL
Duplication	D	AA	mN	AA	mN	NCL
Intervallic Duplication	ID	AB	mL	AA	mN	CL
Reversal	R	AB	mL	AB	mL	CL
Registral Reversal	VR	AB	mL	AB	mR	CL/NCL
Intervallic Reversal	IR	AA	mR	AB	mL	CL/NCL

Table 1. Primary Melodic Archetypes and Archetypal Derivatives: Prospective



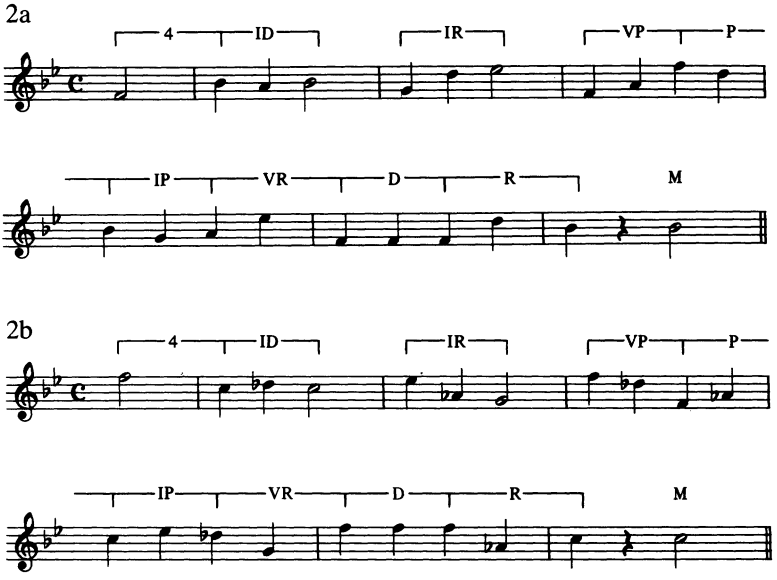
Example 1. Possible Instantiations of Melodic Archetypes

Intervallic duplication [ID] is closely related to intervallic process, the principle difference being that in the case of the intervallic duplication the intervals are exactly the same; the implication of directed motion to continue is again denied (*ACBMS,* 370). (Both intervallic process and intervallic duplication are related to exact and near registral return; these are discussed below.)

Registral reversal [VR] realizes one of the implications of differentiation created by a large interval, the implication of a change in directed motion. However, the other implication of differentiation, that the large interval will be followed by a small interval, is denied—the large interval is followed by an even larger interval which combines with the first to create a pattern of syntactic differentiation (*ACBMS,* 335, 340–42). With intervallic reversal [IR] the implication of change in the size of an interval engendered by a large interval is realized: the large interval is followed by a small interval. The implication of a change in directed motion, however, is denied, and the small interval continues with the same directed motion as the large interval (*ACBMS,* 178).

An analysis of a synthetic melody introduced early in *ACBMS* makes use of almost every melodic archetype and will serve to illustrate two important points concerning these archetypes (see example 2a). First, it is primarily metric emphasis or what Narmour calls durational cumulation (here, short to long note), or a combination of the two, that is responsible for the parsings (*ACBMS,* 7). In fact, two archetypes not discussed above, the dyad (symbolized numerically, as with the 4 in example 2) and the monad (symbolized with M), are almost exclusively the result of parsings due to rhythmic factors. Second, the archetypes represented in the analysis are at a cognitive level we are not conscious of; in a sense, we do not *hear* these melodic archetypes as such.[14] Proof is provided by the neutrality of the analysis with regard to registral direction: if the synthetic melody is inverted around F (see example 2b) the analysis is exactly the same.[15] The identical analyses reflect that, according to Narmour's theory, cognitive processing at the level where the symbols are applicable is exactly the same. Although Narmour would not deny that our complete processing of the melody and its mirror–inversion would cause us to hear the two as quite different things, the difference is attributed to the influence of style, which contextually affects the strength of the implications of the intervals of the melody (*ACBMS,* 8).

The identical analyses of the melodies of example 2 are not an accident but a direct product of the program by which Narmour hopes to liberate music theory from the constraining influences of style studies. This program depends on the distinction between style shapes and style structures.



Example 2. Analysis of a Synthetic Melody

Style shapes, which are the basis of the melodic archetypes, are cognitive imperatives produced by conceptual modules operating on separate parameters of music: within the theory, they are not open to interpretation. The roles style shapes play in our hearing of a given melody may be variously interpreted in light of our analyses of other works; however, Narmour does not see this as an *ad hoc* process.

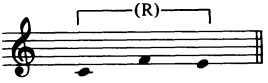
> In arguing how a hypothesized listener perceives melodic implication [of style shapes], we prove or falsify influence of top-down, style-structural processing by marshaling highly conformant, highly specific evidence from the musical literature. Without this, the invocation of style altering a listener's expectations becomes merely a matter of opinion, with all the negative ramifications that holds for the future of analytical music theory (*ACBMS,* 250).

Narmour's polemic against style studies, which is part of the warp and woof of *ACBMS,* could lead one to believe that he has finally freed music theory from style. However, style has been not so much vanquished from the field as it has had its influence circumscribed: an understanding of style is still useful for making parametric analysis efficient and is essential to the interpretation of the output of cognitive

modules. The reconceptualization of style as having to do with cognitive processes is an important contribution, the value of which is all too often obscured by Narmour's relentless hectoring of those who would impose a historical conception of style on the analysis of music; so reconceptualized, style has a great deal to do with the cognition and analysis of melodic structures. In Narmour's theory, one moves beyond analysis tied to the subconscious level through systematic explanations of the way style, as a set of schemata-like style structures,[16] influences our understanding of the implications of style shapes.

Unfortunately, Narmour's complete system for analysis can only be glimpsed in *ACBMS:* the influence of style and other parameters on melodic archetypes (other parameters will be discussed briefly below) is to be fully explicated in succeeding volumes. This makes the reading of Narmour's analyses of hundreds of examples a frustrating task: most of the analysis is on the level of subconscious cognitive processing (as with example 2) and what account Narmour does give of the influence of style and other parameters emerges in a piecemeal fashion. As a consequence, most of the analyses seem to be just as *ad hoc* as the analyses of those Narmour would criticize. Although Narmour states that "we design every rule of the implication–realization model to be falsifiable" (*ACBMS,* 325) the rules of systematic analysis are not always clear, and, at least in the first volume, much must be taken on faith. The complications with Narmour's notion of analysis as presented in *ACBMS* are both mitigated and exacerbated by two of the remaining aspects of his theory, which complete the essentials of his ideas about cognition and analysis.

Memory Function and Other–parametric Analysis. Memory function in Narmour's cognitive system is reflected in retrospective evaluations of melodic archetypes and the notion of registral return. The melodic archetypes discussed above were presented in terms of a prospective orientation in perception, but Narmour conceives that in the real–time processing of input this prospective orientation is coupled with a retrospective orientation as well. If the pattern of implication and realization is consistent, retrospection will simply confirm what was indicated in prospect. If an implication is followed by a less–expected event, retrospection will reinterpret the original implication (*ACBMS,* 203). An example is an ascending fourth (C4–F4) followed by a descending step (F4–E4), as in example 3. In prospect the fourth usually implies continuation, but as a threshold interval reversal is possible as well; Narmour indicates that a determination of reversal was made in retrospect by enclosing the symbol for reversal in parentheses—he adopts this symbology for all retrospectively–determined archetypes. The combination of prospection and retrospection represents a small buffer (although how small is unclear—most



Example 3. Retrospective Reversal

retrospective archetypes seem to involve two successive intervals) where input is evaluated before being committed to long-term storage. This evaluation is often influenced by intra- or extra-opus style (that is, patterns of musical material specific to a given work or shared by a body of works) or by events in other parameters of music (*ACBMS,* 204–5).

Registral return is represented on a small scale by the melodic archetype of intervallic duplication: because the first and third pitches are the same, there is an initial departure from and then return to the register of the original pitch. This sort of pattern can also occur over spans of music, such that the pitches involved are not connected by successive intervals. Registral return consequently embodies a memory for pitch separate from the memory functions associated with intervallic relationships; it is conceived of as an independent dimension "connecting sameness or similarity between individual pitch registers but not actually tied to intervallic sameness or similarity (A + A) for its emergence" (*ACBMS,* 378). From Narmour's examples it would appear that the memory function associated with registral return runs the gamut from short-term to long-term memory. Registral return can either be exact (as with intervallic duplication) or near (as with intervallic process); in the case of near registral return the first and third pitches must be within a major second of each other to count as similar (*ACBMS,* 377–78).

The notions of retrospectively determined melodic archetypes and registral return point toward a range of memory functions. Retrospection bridges the gap between short-term and working memory; the idea that input is evaluated before storage and that this evaluation may take into account information not immediately derived from input is part of theories of working memory (Baddeley 1986) and seems a realistic way to account for certain problems associated with the processing of input, not the least of which is the overload of long-term storage systems by the indiscriminate retention of all input. Registral return appears to encompass both short-term and long-term memory; where construed as operative over longer spans of music, registral return represents an important basis for hierarchical structure in music that is independent from the gestalt-based structures of the melodic archetypes. Within *ACBMS,* however, Narmour never coor-

dinates the various aspects of memory function; as a consequence, this intriguing and essential aspect of his theory is never developed beyond the introduction of these components.

In Narmour's theory of analysis a complete account of any work will involve an examination of not only melody but harmony, duration, register, dynamics, texture, timbre, meter, tessitura, and other factors. Of course, many of these parameters will interact and the thorough examination of any one parameter will entail an assessment of the influence of such other parameters as are relevant. For melody, the influence of the parameters of duration, metric emphasis, and harmony (both in terms of harmonic change and dissonance) often determines the character and articulation of melodic archetypes. In general, Narmour conceives all parameters to be governed by the same constraints which govern melody: all parameters initially generate an implication of continuation (as with process or duplication, which are ongoing and nonclosural) or an implication of reversal (which is closural on some level).[17]

The influence of these other parameters can clarify the parsing of a melody into archetypes (as with the dyad and monad in example 2) or determine whether an archetype is closural and what the character of closure is; the influence of other parameters dominates the determination of melodic closure and is represented in the first four of six conditions of closure Narmour lists.[18] However, parametric interactions are not actually formalized in *ACBMS* (this is to be accomplished in succeeding volumes), and some confusion about other–parametric influence results. Contradictions concerning the establishment and influence of meter abound.[19] Narmour's treatment of dissonance is also confusing; throughout most of *ACBMS* dissonance is in fact undefined. It is only in the second appendix that the distinctions between weak, moderate, and strong dissonance (first introduced on page 267) are placed within the harmonic context relative to which they are conceived (*ACBMS,* 439–40).[20] The symbols for and definitions of these different types of dissonance are given in figure 4.

An understanding of other–parametric influence is essential to the interpretation of many of the analyses presented in *ACBMS,* most importantly with respect to the determination of closure upon which the emergence of hierarchical levels is based. However, as with the influence of style, the systematization of the influence of these other parameters awaits formalization in succeeding volumes.

The Hierarchical Structure of Melody. As with earlier versions of Narmour's theory of implication and realization, the emergence of hierarchical structures is dependent on closure. In the theory presented in *ACBMS* distinctions in closure have become finer–grained: closural characteristics are ascribed to style shapes (for both the individual

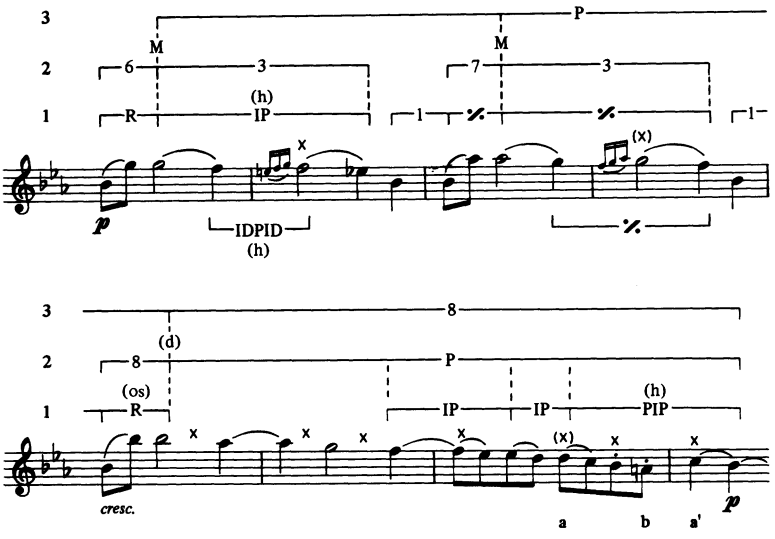
(×)	Weak dissonance; any dissonance over the same harmony or an essential dissonance belonging to a triadic harmony, including traditional sevenths, ninths, and thirteenths in all inversions
×	Moderate dissonance; nonchordal dissonance with change of harmony
⊗	Strong dissonance; nonchordal, contramodal dissonance with entrance of a new harmony

Figure 4. Symbols and Definitions for Dissonance (*ACBMS,* 439–40)

intervals of the I–scale and the direction of motion on the V–scale), individual parameters (both the I–scale and V–scale generate their own patterns of closure) and melodic archetypes (which can show combinations of closural and nonclosural attributes; see table 1). At the lowest level, closural attributes lead to the small articulations that divide a melody into archetypes; this lowest level of closure is called *articulation.* When closure is stronger, showing the influence of style or other parameters, *formation* may result; this level of closure portends a higher level of structure but remains wedded to the level of its occurrence (this definition of formation is somewhat changed from earlier versions of the theory, having acquired a quality of portent). At the strongest level of closure *transformation* occurs, and a new hierarchical level comes to pass (*ACBMS,* 11).

Hierarchical analysis is not emphasized in *ACBMS* (in keeping with the introductory nature of the volume) and examples rarely sketch more than two levels of structure. Narmour does occasionally extend his analysis, and two examples will illustrate the sort of analysis that is the goal of his theory.

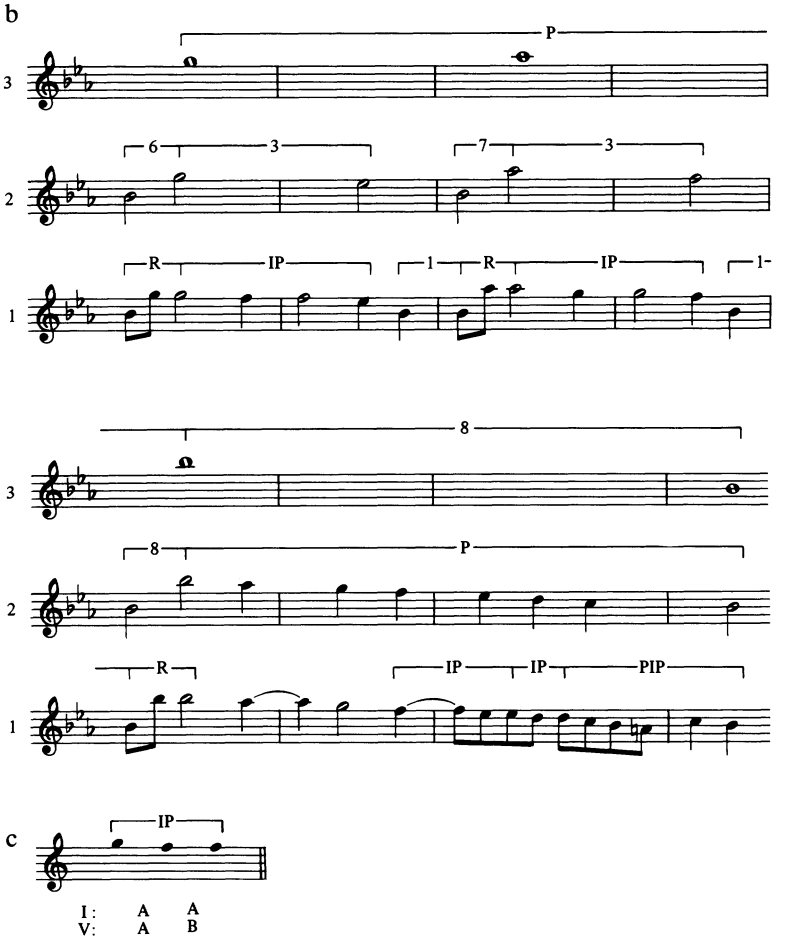
Narmour's analysis of a melody from one of the Beethoven op. 18 string quartets is given in example 4a. The example is introduced to illustrate the effect of intraopus style (symbolized os; extraopus style is symbolized xs) on melodic structure but shows levels of hierarchical structure as well, and it is on the latter I wish to concentrate. (The analysis also indicates the influence of the parameters of harmony [marked with an h] and duration [marked with a d].) Narmour indicates three levels of structure; however, in other analyses he would count two additional levels, one for the analysis shown below the staff and one between level 2 and 3 (where the monads occur). The analysis below the staff shows the melodic structure of the turn figures: an intervallic duplication (in mm. 43–44, F5-E5-F5) conjoined with a pro-



Example 4a. Beethoven, Quartet, op. 18, no. 4, I (Allegro ma non tanto), mm. 42–49

cess (E5-F5-G5) and another intervallic duplication (F5-G5-F5)—thus the pattern IDPID. A pattern of near registral return in mm. 48–49 (D5-A4-C5) is noted as well.

The analyses Narmour offers are oftentimes dense. To aid in reading example 4a I have created example 4b; this example departs from the analytical style of *ACBMS* and separates notation into separate levels, retaining only those pitches from the original melody that are applicable at the different levels. On level 1 the notation reflects the original meter signature of C; on level 2 I have indicated the beginning and ending notes of melodic archetypes with open noteheads, and on level 3 I have employed open stemless noteheads for the pitches that make up the archetypes on that level. Repeated notes are a feature of this melody: on level 1, they frequently combine to form intervallic processes (see example 4c for a breakdown of the syntactic elements). According to Narmour's rules of production, the initial and terminal notes of melodic archetypes of three or more notes most often generate dyads on the next level. This is reflected in the correspondence between level 1 and level 2: beginning and ending notes of the archetypes on level 1 make up the dyads of level 2. Dyads then go on to produce monads (indicating that the monads between level 2 and level 3 in example 4a should be construed as a separate level) and monads



Example 4: b. Interpretation of Narmour's Analysis of Beethoven op. 18/4/I, mm. 42–49; c. Syntactic Patterns in Intervallic Process

in turn generate archetypes of three or more notes: these production rules are illustrated in figure 5a and 5b.

Narmour's analysis of a melody from Verdi's *Traviata* is given in example 5a; it is specifically intended to illustrate his recursive rules of production, starting from the level of melodic archetypes produced by cognitive modules. As an aid to reading the example I have again sep-

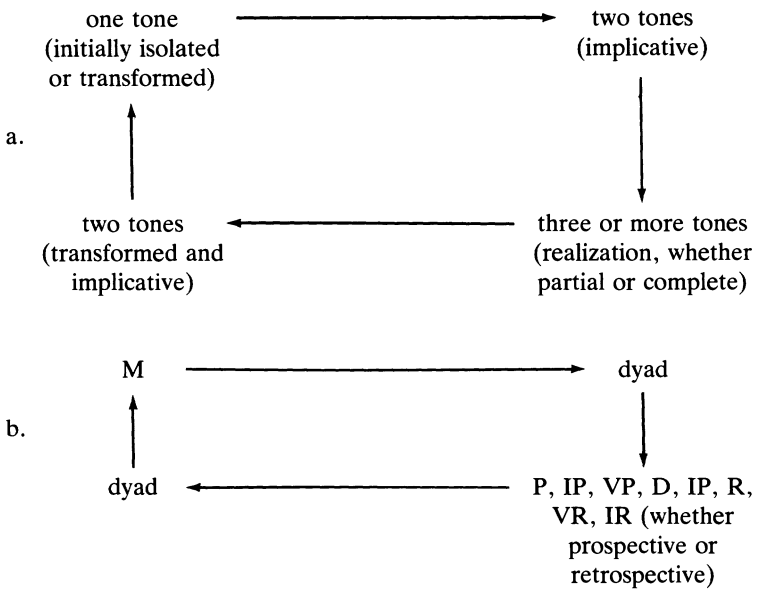


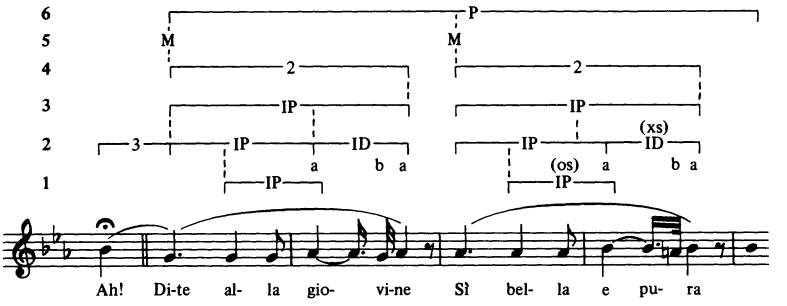
Figure 5. Production Rules of Structure—Two Versions

arated the analysis into separate levels; these are given in example 5b. As can be readily seen, three-or-more-note archetypes eventually lead to dyads (on level 4) and then to monads (on level 5) which join to form a process on the highest level given.[21]

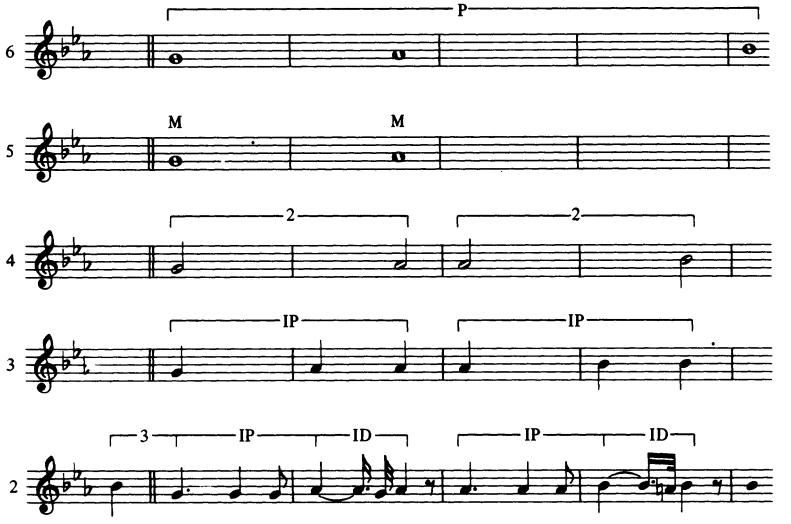
Implication and Realization. In the revised version of the implication-realization model presented in *ACBMS,* implication is taken to be a pervasive feature of our cognitive processes: each event recorded or created by our cognitive faculties implies some other event. Implication is not simply a way to describe how we process information—it is part of the very fabric of our information processing. The simplest events connected with the processing of music are style shapes; the style shapes of melody are directed motions (recorded by the V-scale) and undirected intervals (recorded by the I-scale). Each style shape implies a further event, and these implications, together with their realizations, denials, and attendant closural attributes, constitute the cognitive foundation upon which our understanding of melody is based.

Our understanding of music will also reflect the constraints of culture, both in terms of what sort of events constitute typical style

a



b



Example 5: a. Verdi, *Traviata,* act 2, sc. 2 (*Andantino; cantabile*); b. Interpretation of Narmour's Analysis of Verdi, *Traviata,* act 2, sc. 2

shapes and what sort of style shapes we most commonly hear grouped into style structures. The context of culture strongly influences our contextual understanding of individual musical events: if style shapes are the stuff of the foundation of our understanding, style structures inform every aspect of the structure of understanding we build on this foundation.

The combination of bottom–up and top–down processing gives rise to discontinuous hierarchical structures (the discontinuity of levels is evident in Example 4a—in mm. 46–47 B♭5, A5, and G5 are omitted from level 1 but included in level 2 of the hierarchy), and in these we see a model of our cognitive processes: a structure with networked connections between the most basic input and the most abstract concepts.

Conclusions. In *ACBMS* the theory of implication and realization is to be given salience by the interpretation of all aspects of the theory in terms of hypothesized cognitive modules (such as the parametric scales) and cognitive constructs (such as style shapes and style structures). What results is a model for cognition that serves as a justification for a theory of music. In general, I believe it would be a better idea to reverse the order of theorizing, and begin with a model for cognition; after all, processing music is only one thing we do with our cognitive faculties and, in terms of the environmental factors which might have affected the development of these faculties, is perhaps not the most important. Now, to ask for a complete model for cognition is unreasonable—at best, cognitive science is still at the stage of providing educated guesses about the nature of cognitive structure. However, with as far–reaching a study as Narmour proposes certain questions do cry out for attention. For example: how are cognitive modules connected? Is there any agency responsible for regulating communication between modules? Treatment of such questions could provide solutions to the problematic relationship between the V–scale and the I–scale, or the complications associated with the influence of other parameters on the perception of melodic structure. Further questions: how are low–level constructs (such as melodic archetypes) linked to abstract concepts? How is *information* different on different hierarchical levels? Consideration of these questions could explain the relationship between process [P] as a consequence of the structuring of style shapes by the innate program that gives rise to gestalt structures and process [P] as a way to understand the connections between the transformed pitches of a hierarchy. Although Narmour uses the same symbol for each of these, indicating that they are in some way equivalent, the cognitive processes involved in constructing low–level archetypes from continuous input and high–level abstractions from discontinuous events extracted from input seem quite different.

Some aspects of Narmour's theory might be better explained in terms of categorization; it has been proposed that categorization is a basic cognitive process (Rosch and Lloyd 1978, 1) and this position has been persuasively argued for by Lakoff (1987, especially Part I). The parametric scales could be replaced by an elementary system of categorization: directed intervals in c–space would represent a basic

level of categorization,[22] and intervals in p–space would be a learned subcategory. This system would account for the influence of culture on what an individual construes as elementary pitch material and the refinement of intervallic distinctions under the influence of style (what Narmour calls micro–parametric scales; *ACBMS,* 318) and overlearning (*ACBMS,* 278–79).[23]

Another reason the model for cognition that emerges in *ACBMS* is less than satisfactory involves Narmour's terminology, which is at times misleading. There lurks in his references to subconscious inference, perception, deduction, surprise and dialogue the specter of a homunculus, of whose inferring, perceiving, deducing, observing, and commenting we are not conscious.[24]

Although Narmour believes that the only way to arrive at a hierarchical theory of music is through an analytical methodology based on parametric analysis (1983, 197), parametric analysis seems to result in a process of reduction without limits: any isolated testable construct points toward a separate parameter of music, and (with the modularity hypothesis) a separate cognitive mechanism. For example, in considering the notion of registral return, Narmour writes

> since in general recognition of return is a well–accepted psychological phenomenon, we conclude that its perception in melodic pitch depends on cognitive mechanisms separate from those controlling registral continuation [P, D, VP, IR] or registral reversal [R, VR, IP, ID] (*ACBMS,* 378).

Parametric analysis appears to represent a never–ending spiral of refinement: there will always be some other parameter to consider. The necessity of parametric analysis can be understood to stem from Narmour's assumption that hierarchical structure inheres in music: discovering hierarchical structure requires tracing each aspect of the musical object and determining how it contributes to the structure of the whole. An alternative would be to regard hierarchical structure as a way we make *sense* of music.[25]

A final concern is the importance of tonality to Narmour's conceptualization of a model for cognition; this importance is manifested in a variety of ways. For instance, registral return is accorded its own cognitive mechanism; this in turn serves to buttress the centrality of pitch usually associated with tonality. However, in a broader view of cognition registral return might be thought of as an epiphenomenon, secondary to memory processes or systems of categorization that structure connections between like phenomena.[26] And then there are the examples themselves, over three hundred drawn from Western European art music of the eighteenth and nineteenth centuries, which reflect the importance of the tonal repertoire to Narmour's conception

of what counts as music, and consequently what is processed by our cognitive faculties.

Narmour's goal in *ACBMS* is "to comprehend the entire world of melody by constructing tokens, internal representations that capture melodic structure accurately, reliably, and efficiently" (xiv). However, he has become somewhat enamored of his system, failing to realize that, as Ronald Langacker suggested in the first volume of his *Foundations of Cognitive Grammar,* analysis and description inevitably distort their subject matter, since they cannot *be* their subject matter (1987, 14). Any analysis represents only a portion of what a work of music is about: even the most thorough analysis must fall short of realizing the immediacy and processive temporality proper to the work of music.

In striving for complete, unequivocal analyses Narmour at times takes the position that he presents the *only* way to analyze a passage or phenomena; for instance, he writes "one understands the aesthetic significance of anticipation or delay only by embracing a theory of implication and realization" (*ACBMS,* 346). Statements such as these exemplify what Langacker has called the exclusionary fallacy.

> The gist of this fallacy is that one analysis, motivation, categorization, cause, function, or explanation for a linguistic phenomena necessarily precludes another. From a broad, pre–theoretical perspective, this assumption is gratuitous and in fact rather dubious, in view of what we know about the multiplicity of interacting synchronic and diachronic factors that determine the shape and import of linguistic expressions (1987, 28).

Music appears to be every bit as complex as language; hence it is doubtful that one theory provides the only possible explanation of musical phenomena.

Narmour's belief that it is possible to construct exhaustive analytical representations of a work of music based on defeasible propositions and his belief that this constitutes the only adequate way to describe the work are hardly new to music theory. These beliefs reflect the questionable challenge music theorists have set themselves again and again in this century: that of developing a scientific account of music structured along the lines of logical positivism. The persistence of this approach will no doubt seem quaint to those outside the discipline, even if it is an understandable reaction to the intangibility and power of music; critical theory as a whole has moved beyond the sort of structuralism that still holds music theory in its thrall. However, without the safe haven of structure the very prospect of describing music can seem chaotic, absurd, and doomed to failure. David Burrows speaks to the elusiveness of music when he writes

> Music's own precisions of pitch and rhythm lie apart in a domain of relentless emergence that represents the threat of vagueness and dissolution to that tropism of the mind that seeks fixity and delimitation in the world, the tropism that has its fullest musical realization not in music itself but in music's metamorphoses into words and pictures (1990, 107).

Accounts of music, no matter how detailed or how painstaking, will never replace music. However, such accounts are not necessarily inimical to the prospect of music. Perhaps music is more than simply the sum of testable stimuli, or pitches and rhythms in relentless emergence; perhaps we can embrace music as a cultural artifact, and accept that all descriptions of music are also connected to and restrained by the web of culture. We could dispense with structure as a set of timeless relationships inhering in the musical object and think of structure as a means by which we make sense of the work of music.

Coming to terms with what music is and is not is the ultimate task of music theorists, and one that transcends self-affirming methodologies. With his recognition of the importance of culturally informed style structures to our understanding of music Narmour has gone some distance towards engaging this task, and toward developing a cognitive theory adequate to music. With his insistence on an approach rooted in an outdated conception of scientific method he has made completing the task that much more difficult.

NOTES

1. In Narmour's words, "Theories are revealed most fundamentally through their analytical symbols rather than just through the often quite irrational natural-language interpretations, intuitions, and beliefs that accrete to them over their life." (1983, 139) The notion that analytical symbols represent tokens that correspond to internal representations of melodic structure is reaffirmed in *ACBMS:* xiv, 6, 342–46, and 420.
2. In Gall's work, functional individuation of mental faculties was the premise on which he founded phrenology.
3. Although Narmour is aware of Jackendoff's work he does not engage refinements of the modularity hypothesis; his alliance with faculty psychology is somewhat fuzzy, and even though he claims it as the basis for his model of cognitive function he does not work out any of its entailments within *ACBMS.*
4. Narmour writes, "By *bottom-up processing* I mean that the listener subconsciously constructs her musical perception solely out of the individual parametric features presented to her, with no help from the next level above. By *top-down processing* I mean that the listener calls into play all kinds of prior hierarchical experience to aid in mapping out the continuation of the context" (*ACBMS,* 36).

5. Although V is Narmour's preferred symbol, he consistently refers to this scale as the registral scale. This can be confusing, since what is tracked by the scale is not pure register but relative registral position expressed as directed motion. In the following I shall refer to this scale as the V–scale.
6. The concept of undirected or unordered pitch intervals as part of a family of intervallic measurements is discussed by Rahn 1980, 23; and Straus 1990, 6.
7. Although the basic ordering of style shapes is construed in terms of similarity, proximity, and common direction (relations determined by a genetically inherited structuring program) Narmour also indicates that syntax reflects environment (*ACBMS,* 317).
8. The V–scale is taken to be the more primitive of the two scales (*ACBMS,* 295); this does not, however, mean that it is subservient, since under certain circumstances processes of directed motion can envelop intervallic processes (*ACBMS,* 307–8).
9. The arithmetical descriptions in Figure 3 are my own. Narmour's formulation is as follows (where interval X is equivalent to my α and Y is equivalent to my β):

   > If interval X is followed by interval Y in the same registral direction, and if X − Y = m3 or less, then intervals XY are relations of similarity ($A + A^{0,1,2,3\ldots}$). If X − Y = M3 or greater, then intervals XY are relations of differentiation (A + B). (*ACBMS,* 87)

   However, the formula as stated will not work with his examples; for instance, in Example 5.1 on page 88 of *ACBMS* he indicates that the intervals of the note succession C5-D♭5-F5 (m2-M3) should be considered to be similar. Subtracting Y from X yields a negative interval (m2 − M3 = −m3) which cannot be accounted for on the I–scale; this result can be accounted for only if the residue of the subtraction is taken absolute value. See also page 426, where the equation for differentiation is given as Y − X = −M3.
10. On the other hand, Narmour cites work by Shepard 1962 that indicates that similarity is interpretable as a relation of proximity (*ACBMS:* 75).
11. On the construction of percepts from separate parameters of time and pitch see *ACBMS,* 36; for the treatment of pitch in the absence of time see *ACBMS,* 76.
12. This interpretation of an interval is given in a little more detail in my dissertation (1991, 189–90); it draws upon the LINK schema proposed by Mark Johnson (1987, 119). A fuller account of the use of metaphor as an aspect of the conceptualization of music can be had in my dissertation, 89–97.
13. Morris's c–space and p–space are linked in just this way, through a continuum of increasing refinement of measurement (1987, 24). And it should be noted that Narmour himself cannot always keep the two scales separate: in a summary of formulas he in fact conflates the two (*ACBMS,* 275).
14. There is some evidence that Narmour conceives of "cognition" as subconscious; he writes "the theory hypothesizes that (1) the brain subconsciously operates cognitively and deductively on style shapes (simplexes) from the bottom up and (2) that it consciously and inductively activates style structures (complexes) from the top down" (*ACBMS,* 433).
15. Although the analysis of archetypes for the synthetic melody and its mirror–inversion is the same the closural attributes of the two are slightly different.

Narmour distinguishes between the closural qualities of directed motion that results in an increase in frequency and directed motion that results in a decrease in frequency. Because the frequency of each pitch increases logarithmically with ascent, each higher pitch can be thought of as more complex than the previous pitch; the increase in complexity is taken to be an indication of the nonclosural character of successions of ascending pitches. Successions of descending pitches move toward closure. (*ACBMS,* 87, 100, 362–64, and passim)

16. Narmour's notion of style structures appears to be analogous to Gjerdingen's notion of schemata; see Gjerdingen 1988, 3–10. I use a rather different notion of schema for a similar purpose in my dissertation; see Zbikowski 1991, 169–72.
17. *ACBMS,* 429. For duration, a highly countercumulative durational pattern (such as a half note followed by a quarter note) implies a reversal back to a long note. In the parameter of harmony, a consonant chord followed by a highly dissonant chord implies a reversal back to a consonant chord.
18. The conditions, as given by Narmour, are as follows:

    "Melodic closure occurs
    1. when simple stopping takes place, that is, when a rest, an onset of another structure, or a repetition interrupts an implied patterning;
    2. when metric emphasis is strong;
    3. when consonance resolves dissonance;
    4. when duration moves cumulatively (short note to long note);
    5. when intervallic motion moves from large interval to small interval; and
    6. when registral direction changes (up to down, down to up, lateral to up, lateral to down, up to lateral, or down to lateral).

    Of course, any of these six may appear in combination" (*ACBMS,* 102–3).

    A similar list is given on pages 11–12 of *ACBMS.*
19. For example, somewhat early in *ACBMS* Narmour states that the listener will not construe the meter and initial upbeat of the subject of the B major fugue from the first book of Bach's *Well-tempered Clavier* (BWV 868) until after the first four or five notes (*ACBMS,* 126–27, 354). Somewhat later, however, he indicates that after only the first three or four notes of the subject of the fugue from Bach's a minor sonata for unaccompanied violin (BWV 1003) duple meter is "well established" (*ACBMS,* 248). A little before this a discussion which concerns the interpretation of a sequence of notes as either a reversal conjoined with a process or a dyad followed by a process hinges on the assumption that meter is established after only two notes (*ACBMS,* 226).
20. On occasion Narmour also analyzes notes of an unaccompanied melody as dissonant, as with the subject of Bach's fugue for lute in E♭ major (BWV 998), where the notated C4 is analyzed as dissonant (*ACBMS,* 227).
21. It must be noted that both of the analyses considered are incomplete, and not only in that the analysis is limited to excerpts from longer works. Decisions about the emergence of hierarchial levels are often made with reference to the influence of style or other parameters, neither of which should be assumed to be completely represented in the symbology of these analyses. In addition, the generalized symbols for process, duplication, reversal, and their derivatives hide a full symbology which can show the nuance of implication and realization; for the sake of clarity this is usually left out, but can be called upon to make analytical decisions explicit (*ACBMS,* 441).

22. On the basic level of categorization see Rosch et al. 1976. There are provocative connections between the notion of a gestalt and the basic level; see Lakoff 1987, 47.
23. One of Lakoff's main points is that culture influences *all* aspects of categorization; this view motivates his allusion to a Dyirbal system of classification in his title.

    For an account of the influence of expert status on categorization see Tanaka and Taylor 1991.
24. On subconscious inference and subconscious perception see *ACBMS,* 3; on subconscious deduction see 320; on subconscious surprise connected with a subconscious dialogue, 122.

    The assumption that there is a subconscious interpreter also seems a part of Narmour's account of the contribution of automatic systems to the understanding of melody. In the theory, each style shape is the product of a cognitive module; a style shape is an automatic response to the stimulus of input. However, it is also a part of the theory that each style shape implies something. This implication is not completely explained by the introduction of another system which structures style shapes into patterns of similarity, proximity, and common direction, since these patterns are in turn simply an automatic response to the emergence of each style shape. Such patterns, because they are so pervasive and on such a low cognitive level, would seem to be resistant to interpretation: they simply *are.* Some other agency is required to move from the genetically programmed conditioned response represented by these patterns to an evaluation of the potentialities of a given situation and a determination that the patterns imply anything.
25. Parametric analysis also conforms to the theory that we construct our percepts by combining sensory cues; the ecological approach to perception proposed by James J. Gibson suggests an alternative by means of which the notion of musical parameters could be transformed from an instantiation of theoretical dogma into an analytical heuristic. See Gibson 1979, 2; and Shepard 1984.
26. Narmour's convoluted discussion of scale step (*ACBMS,* 81ff) also seems a manifestation of the importance of tonality: scale step is construed as a style structure, but other than individual pitches it is difficult to imagine from what style shapes it is constructed.

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