Scale-Degree Function: A Theory of Expressive Meaning and Its Application to Aural-Skills Pedagogy

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This paper describes aspects of a theory of expressive meaning in common-practice tonal music and its implications for the teaching of aural skills. The theory is inspired by Rudolf Arnheim's applications of laws of perceptual organization (derived from principles of Gestalt psychology) to the perception of visual art.[1] The theory is also supported by the results of empirical studies in music perception and corroborated by computer models of music cognition.

According to this theory, we tend to experience music as action within a field of musical forces. It is the often purposeful quality of this action that led Schenker to speak of the "will of the tones," but such a feeling of purpose does not require that these actions be attached to a specific agent.[2] Drives that we experience in listening—especially a tendency toward simplicity—lead us to feel the "will of the tones" operating in a field of musical forces that I call *gravity, magnetism,* and *inertia.* We tend to be unaware of these forces (just as we tend to be unaware of forces that we experience in the physical world), but they shape our perceptions so that musical sounds seem to embody directed tensions or goals.

One goal of aural training is to encourage a listener to experience and identify these directed tensions, both because they help us recognize the functions of musical notes or patterns and because conveying their expressive meanings is central to good musicianship. Current work in music theory, cognitive science, and music perception allows

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[1]Rudolf Arnheim, *Art and Visual Perception: A Psychology of the Creative Eye,* new version, expanded and rev. ed. (Berkeley and Los Angeles: University of California Press, 1974). For more on the implications of Arnheim's work for research and teaching in music, see Steve Larson, "On Rudolf Arnheim's Contributions to Music Theory," *Journal of Aesthetic Education* (Special Issue devoted to the work of Rudolf Arnheim) 27/4 (1993): 1-7.

[2]Fred Maus, "Music as Drama," *Music Theory Spectrum* 10 (1988): 56-73.

us to explain directed tensions in terms of musical forces; recognizing these forces can help us to improve aural-skills pedagogy.

Internal Representations of Musical Relationships

The terms *audiate, hear as,* and *trace* are important for understanding the internal representation of musical relationships. *Audiate* means to hear internally sounds that are not physically present.[3] *Hear as* means to give meaning to a sound by (subconsciously) assigning it to a category, and *trace* means the internal representation of a note that is still melodically active. These and other terms used in this paper are summarized in Figure 1.

FIGURE 1. List of definitions

Internal Representation
audiate. To hear internally sounds that are not physically present.
hear as. To give meaning to a sound by (subconsciously) assigning it to a category.
trace. The internal representation of a note that is still melodically active.
unstable. To hear a note as unstable means to audiate a more stable note to which it tends to move and a path that would take it there, displacing its trace.

Steps and Leaps
step. Half-steps and whole-steps. The second note in a melodic step tends to displace the trace of the first.
leap. Thirds and larger intervals. The second note in a melodic leap does not tend to displace the trace of the first.

Musical Forces
gravity. The tendency of an unstable note to *descend* to a more stable note.
magnetism. The tendency of an unstable note to move (up or down) to the *nearest* stable pitch. (Magnetism is affected by distance—the closer we get to a goal, the more it attracts us.)
inertia. The tendency of a pattern of musical motion to continue in the *same* direction. (What is meant by "same" depends on how that musical pattern is represented in our internal hearing.)

[3]Edwin E. Gordon, *Learning Sequences in Music: Skill, Content, and Patterns* (Chicago: GIA Publications, 1993), 3. "Audiation takes place when one hears *and comprehends* music for which the sound is no longer or may never have been physically present."

These terms allow us to distinguish between stable and unstable notes. To hear a note as unstable means to audiate a more stable note to which it tends to move and a path (usually involving step-wise motion) that would take it there, displacing its trace.

The distinctions consonant/dissonant and stable/unstable should not be confused. Consonant and dissonant depend on notation and interval names, while stable and unstable refer to the perceived tendencies of individual notes (or of harmonies) in context. Consonant and dissonant create mutually exclusive categories, while stable and unstable can be used only comparatively. Roger Graybill has commented on the importance for theory instruction of making the differences between these pairs of terms clear. David Butler makes a similar distinction between "sensory consonance and dissonance" and "musical consonance and dissonance."[4]

Steps and Leaps

This definition of unstable suggests that intervals may be divided into two classes: steps and leaps. Augmented unisons, minor seconds, and major seconds are called steps. (A diminished third is a step whose name suggests that it is heard as a leap.) Minor thirds and larger intervals are called leaps. (An augmented second is a leap whose name suggests that it is heard as a step.)

In a melodic step, the second note tends to replace the trace of the first, leaving one trace in musical memory. In a melodic leap, the second note tends to support the trace of the first, leaving two traces in musical memory. Experiments in music perception and published discussions in music cognition often support this distinction between steps and leaps, or they seem to depend implicitly on such a separation.[5] What Hindemith calls a "step-progression" seems analogous to what, in visual perception, the Gestalt psychologists call the "phi phenomenon." Several recent theoretical discussions also build explicitly upon this distinction of steps and leaps.[6]

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[4]Roger Graybill, "Pedagogically Speaking: Consonance and Dissonance in the Freshman Theory Class," *In Theory Only* 9/5-6 (1987): 51-56. David Butler, *The Musician's Guide to Perception and Cognition* (New York: Schirmer Books, 1992). Butler's book is reviewed later in this volume.

[5]A comprehensive summary of these experiments and discussions can be found in Albert S. Bregman, *Auditory Scene Analysis: The Perceptual Organization of Sound* (Cambridge, MA: The M.I.T. Press, 1990).

[6]Peter Westergaard, *An Introduction to Tonal Theory* (New York: W.W. Norton, 1975); Steve Larson, "Questions about the Ursatz: A Response to

Musical Forces and Scale-Degree Function

When we listen to tonal music, we experience certain musical forces, including gravity, magnetism, and inertia. They are responsible for some of the dynamic tendencies we experience in listening to music. Each may be explained in terms of the principles of perceptual organization articulated by Gestalt psychologists. Together, they afford necessary and sufficient conditions for the emergence of "scale-degree function."

Musical gravity is the tendency of an unstable note to descend to a *lower*, more stable pitch. For example, in a context where C is heard as stable and the D above it is heard as unstable, listeners experience gravity as a tendency of the D to descend to C. Whether it is learned or innate, our perception of musical gravity is immediate, and it is central to expression in tonal music. Gravity arises in part because we hear musical motion taking place in musical space. This metaphor is a natural one. Several spatial models have been proposed in the music cognition literature,[7] but the metaphor is clear in earlier writing, too (as just one example, consider Schenker's idea of *Tonraum*). Musical space is clearly asymmetrical—it has an "up and down." Arnheim discusses this "anisotropy of musical space" and argues that we experience dynamic tendencies in both visual art and music that parallel the tendencies of gravity in physical space.[8]

Musical magnetism is the tendency of an unstable note to move (up or down) to the *nearest* stable pitch. Furthermore, magnetism is affected by distance—the closer we get to a goal, the more it attracts us. For example, in a context where D and G are heard as stable and the F between them is heard as unstable, listeners experience musical magnetism as a tendency of the F to ascend to G (because F is closer to G than it is to D). If that F should then move to F#, the magnetic

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Neumeyer," *In Theory Only* 10/4 (1987): 11-31; and Stephen Dembski, "Steps and Skips from Order and Content: Aspects of a Generalized Step-Class System," paper presented at the meeting of the Society for Music Theory, Baltimore, Maryland, November 1988.

[7]Roger N. Shepard, "Structural Representations of Musical Pitch," in *The Psychology of Music*, ed. Diana Deutsch (Orlando, FL: Academic Press, 1982), 343-390, summarizes earlier spatial models. See also Carol L. Krumhansl, *Cognitive Foundations of Musical Pitch* (New York: Oxford University Press, 1990) and Fred Lerdahl, "Tonal Pitch Space," *Music Perception* 5/3 (1988): 315-349.

[8]Rudolf Arnheim, "Perceptual Dynamics in Musical Expressions," in *New Essays on the Psychology of Art* (Berkeley and Los Angeles: University of California Press, 1986), 214-227.

force drawing us to G will intensify (because F# is now closer to G than F was). Magnetism appears to influence intonation and intonation judgments.[9] Arnheim discusses analogous forces operating in visual art.

Musical inertia is the tendency of a pattern of musical motion to continue in the *same* fashion. What is meant by "same" depends upon how that musical pattern is represented in our internal hearing. For example, if a pattern of musical motion begins "C-D-E, D-E-F," listeners may experience musical inertia as a tendency to continue the pattern "E-F-G," etc. Gestalt psychology calls this tendency "the law of good continuation."[10] Meyer's work on emotion in music and Narmour's implication-realization theory grant an important role to what I call inertia.[11]

Each of the musical forces acts on notes at all times. The less stable a note, the more that note will convey to the listener the effects of these forces.[12] The combination of these effects in a given context contributes to the expressive quality of a note, and is sometimes called "scale-degree function." However, even though scale-degree function plays a central role both in music and in discussions of music, the term is often not explicitly defined. When used to describe an aspect of melody, it seems to refer to the characteristic qualities that distinguish one tone of a scale from the others. These melodic tendencies are often represented with diagrams such as that in Example 1.[13]

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[9]Robert Frances, *The Perception of Music*, trans. W. Jay Dowling (Hillsdale, NJ: Lawrence Erlbaum Associates, 1988).

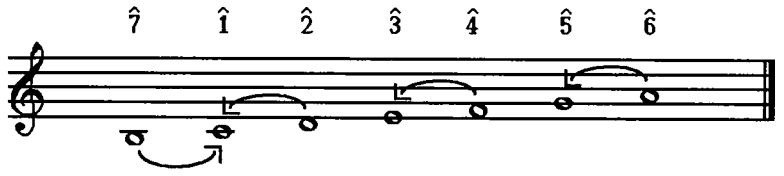
[10]Wolfgang Koehler, *Gestalt Psychology: An Introduction to New Concepts in Modern Psychology* (New York: Liveright Pub., 1947).

[11]Leonard Meyer, *Emotion and Meaning in Music* (Chicago: University of Chicago Press, 1956); Eugene Narmour, *The Analysis and Cognition of Basic Melodic Structures* (Chicago: The University of Chicago Press, 1990); Eugene Narmour, *The Analysis and Cognition of Melodic Complexity* (Chicago: The University of Chicago Press, 1992).

[12]A computer program based on the operation of these forces predicts melodic continuations that resemble those of trained listeners. See Steve Larson, "Modeling Melodic Expectation: Using Three 'Musical Forces' to Predict Melodic Continuations," *Proceedings of the Fifteenth Annual Conference of the Cognitive Science Society* (Hillsdale, NJ: Lawrence Erlbaum Associates, 1993), 629-634. This report is available from the Center for Research on Concepts and Cognition; Indiana University; 510 North Fess Street; Bloomington, IN 47408 as CRCC Technical Report #70.

[13]Example 1 is similar to Example 1-7 in Edward Aldwell and Carl Schachter, *Harmony and Voice Leading*, 2nd ed. (San Diego: Harcourt Brace Jovanovich, 1989), 9.

EXAMPLE 1. Some tendencies of individual scale degrees in the context of major tonic harmony



Example 1 captures some important aspects of the perceptual dynamics of musical expression. Heightening students' attention to these tendencies improves their ability to identify correctly which scale degree they are hearing and can help focus listening skills in general. Furthermore, Example 1 can help to explain certain aspects of common-practice harmony (such as rules for doubling and voice leading) and summarizes the magnetic and gravitational pulls exerted on the diatonic major scale degrees in the context of tonic harmony. However, such a diagram does not depict the influence of inertia. Nor can it show the differing contexts established by tonic triads in different positions—let alone the different contexts created by other harmonic environments.

Three- and Four-Note Patterns

While Example 1 provides students with useful information, teaching students about the operation of the musical forces within the context of prototypical patterns is also valuable. These forces generate a set of three- and four-note patterns, shown in Tables 1 and 2. These patterns meet the following conditions (where "stable note" means a member of a tonic-triad frame): (1) each pattern begins on a stable note, (2) each pattern moves by step, and (3) each pattern ends on a stable note.[14]

[14]These patterns also meet an additional condition—that none contains both $\hat{3}$ and $\flat\hat{3}$. That this condition seems less "necessary" in terms of the assumptions outlined above may explain why it seems one of the first conditions to be relaxed in music of the late nineteenth and early twentieth centuries, music which makes use of patterns that not only meet the three numbered conditions but that also mix $\hat{3}$ and $\flat\hat{3}$.

TABLE 1. The three-note patterns

scale degrees	*letter names in C*	*forces which predict the third note*		
$\hat{5}$-$\hat{6}$-$\hat{5}$	GAG	gravity	magnetism	
$\hat{5}$-b$\hat{6}$-$\hat{5}$	GAbG	gravity	magnetism!	
$\hat{5}$-#$\hat{4}$-$\hat{5}$	GF#G		magnetism!	
$\hat{5}$-#$\hat{4}$-$\hat{3}$	GF#E	gravity		inertia
$\hat{5}$-$\hat{4}$-$\hat{5}$	GFG			
$\hat{5}$-$\hat{4}$-$\hat{3}$	GFE	gravity	magnetism!	inertia
$\hat{5}$-$\hat{4}$-b$\hat{3}$	GFEb	gravity	magnetism	inertia
$\hat{3}$-#$\hat{4}$-$\hat{5}$	EF#G		magnetism	inertia
$\hat{3}$-#$\hat{4}$-$\hat{3}$	EF#E	gravity		
$\hat{3}$-$\hat{4}$-$\hat{5}$	EFG			inertia
$\hat{3}$-$\hat{4}$-$\hat{3}$	EFE	gravity	magnetism!	
$\hat{3}$-#$\hat{2}$-$\hat{3}$	ED#E		magnetism!	
$\hat{3}$-$\hat{2}$-$\hat{3}$	EDE		magnetism?	
$\hat{3}$-$\hat{2}$-$\hat{1}$	EDC	gravity	magnetism?	inertia
b$\hat{3}$-$\hat{4}$-$\hat{5}$	EbFG		magnetism?	inertia
b$\hat{3}$-$\hat{4}$-b$\hat{3}$	EbFEb	gravity	magnetism?	
b$\hat{3}$-$\hat{2}$-b$\hat{3}$	EbDEb		magnetism!	
b$\hat{3}$-$\hat{2}$-$\hat{1}$	EbDC	gravity		inertia
b$\hat{3}$-b$\hat{2}$-b$\hat{3}$	EbDbEb			
b$\hat{3}$-b$\hat{2}$-$\hat{1}$	EbDbC	gravity	magnetism!	inertia
$\hat{1}$-$\hat{2}$-$\hat{3}$	CDE		magnetism?	inertia
$\hat{1}$-$\hat{2}$-b$\hat{3}$	CDEb		magnetism!	inertia
$\hat{1}$-$\hat{2}$-$\hat{1}$	CDC	gravity	magnetism?	
$\hat{1}$-b$\hat{2}$-b$\hat{3}$	CDbEb			inertia
$\hat{1}$-b$\hat{2}$-$\hat{1}$	CDbC	gravity	magnetism!	
$\hat{8}$-$\hat{7}$-$\hat{8}$	CBC		magnetism!	
$\hat{8}$-b$\hat{7}$-$\hat{8}$	CBbC		magnetism	

TABLE 2. The four-note patterns

scale degrees	*letter names in C*	*forces which predict the fourth note*		
$\hat{5}$-$\hat{6}$-$\hat{7}$-$\hat{8}$	GABC		magnetism!	inertia
$\hat{5}$-$\hat{6}$-b$\hat{7}$-$\hat{8}$	GABbC		magnetism	inertia
$\hat{5}$-b$\hat{6}$-b$\hat{7}$-$\hat{8}$	GAbBbC		magnetism	inertia
$\hat{8}$-$\hat{7}$-$\hat{6}$-$\hat{5}$	CBAG	gravity	magnetism	inertia
$\hat{8}$-b$\hat{7}$-$\hat{6}$-$\hat{5}$	CBbAG	gravity	magnetism	inertia
$\hat{8}$-b$\hat{7}$-b$\hat{6}$-$\hat{5}$	CBbAbG	gravity	magnetism!	inertia

Table 1 catalogues the three-note patterns. The first column describes the pattern as it would be understood in the context of its tonic-triad frame. The second column gives letter-name equivalents in the key of C. The third column indicates which forces predict the actual third note. An example may make this clearer. In the pattern $\hat{5}$-#$\hat{4}$-$\hat{3}$, gravity pulls the unstable #$\hat{4}$ down, to $\hat{3}$; thus, gravity does predict the third note of the pattern $\hat{5}$-#$\hat{4}$-$\hat{3}$. In the same pattern, magnetism pulls the unstable #$\hat{4}$ to the nearest stable note, $\hat{5}$; thus, magnetism does *not* predict the third note. And in the same pattern, the inertia developed by the first two notes tends to continue the line in the same direction, to $\hat{3}$; thus, inertia does predict the third note. Where the final motion is a half-step, the magnetic pull is strongest; this strength is indicated by an exclamation point after the word magnetism. When stable notes can be found both a whole-step above and a whole-step below a pattern, we may experience motion to either note as a giving in to a magnetic pull; this ambivalence is indicated by a question mark after magnetism. For two of the patterns, no force appears to predict the third note. Table 2 catalogues the four-note patterns. The patterns that end with the half-step (the upper tetrachords of the ascending and descending melodic minor scale, marked with an exclamation point after magnetism) are most strongly directed toward their goal. Table 3 classifies the three-note patterns by shape (in columns) and by starting note (in rows).

Since goal direction is an important aspect of tonal music, the patterns in which the final note is most strongly predicted by the musical forces are those that are most fundamental to the structure of tonal music. In these patterns the unstable notes have their most characteristic tendencies and their clearest scale-degree function emerges. A ranking of the patterns can thus be suggested. Table 4 first groups each three-note pattern under the unstable scale degree that it includes (in two somewhat artificial columns—one for major and one for minor). Within each such group, the patterns are listed in the order of their strength—the degree to which the final note is predicted by a combination of gravity, magnetism, and inertia.

By focusing on the forces themselves (which operate in all musical contexts) instead of just memorizing the tendencies of selected notes in one context (such as in Ex. 1), students may learn to generalize their knowledge to other contexts. Such instruction in the operation of musical forces further improves students' listening skills. Understanding how the musical forces operate within these patterns also makes harmony and counterpoint easier to explain, since students understand the principles instead of memorizing rules and their apparent exceptions.

TABLE 3. The three-note patterns, classified by shape (columns) and starting note (rows) (U = Up; D = Down)

UU *(asc passing tone)*	*UD* *(upper neighbor)*	*DU* *(lower neighbor)*	*DD* *(desc passing tone)*
	$\hat{5}$-$\hat{6}$-$\hat{5}$ $\hat{5}$-b$\hat{6}$-$\hat{5}$	$\hat{5}$-#$\hat{4}$-$\hat{5}$ $\hat{5}$-$\hat{4}$-$\hat{5}$	$\hat{5}$-#$\hat{4}$-$\hat{3}$ $\hat{5}$-$\hat{4}$-$\hat{3}$ $\hat{5}$-$\hat{4}$-b$\hat{3}$
$\hat{3}$-#$\hat{4}$-$\hat{5}$ $\hat{3}$-$\hat{4}$-$\hat{5}$	$\hat{3}$-#$\hat{4}$-$\hat{3}$ $\hat{3}$-$\hat{4}$-$\hat{3}$	$\hat{3}$-#$\hat{2}$-$\hat{3}$ $\hat{3}$-$\hat{2}$-$\hat{3}$	$\hat{3}$-$\hat{2}$-$\hat{1}$
b$\hat{3}$-$\hat{4}$-$\hat{5}$	b$\hat{3}$-$\hat{4}$-b$\hat{3}$	b$\hat{3}$-$\hat{2}$-b$\hat{3}$ b$\hat{3}$-b$\hat{2}$-b$\hat{3}$	b$\hat{3}$-$\hat{2}$-$\hat{1}$ b$\hat{3}$-b$\hat{2}$-$\hat{1}$
$\hat{1}$-$\hat{2}$-$\hat{3}$ $\hat{1}$-$\hat{2}$-b$\hat{3}$	$\hat{1}$-$\hat{2}$-$\hat{1}$ $\hat{1}$-b$\hat{2}$-$\hat{1}$	$\hat{8}$-$\hat{7}$-$\hat{8}$ $\hat{8}$-b$\hat{7}$-$\hat{8}$	

Combining and embellishing the patterns

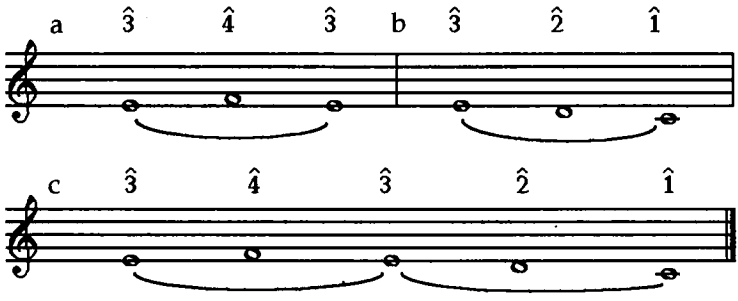
These three- and four-note patterns may be combined successively or simultaneously. Successive combination is an important basis of tonal melody. If the last note of a pattern is the same as the first note of a following pattern, their combination elides that note (for example, joining two three-note patterns to form a five-note pattern). Example 2 illustrates this successive combination of patterns. Example 2c is a five-note combination ($\hat{3}$-$\hat{4}$-$\hat{3}$-$\hat{2}$-$\hat{1}$) of two three-note patterns (Ex. 2a and 2b).

Such elided patterns create smoothly directed melodic motion. If the inertia of the second to third note (the last two notes of the first pattern) predicts the direction of the third to fourth notes (the first two notes of the second pattern), the result is even smoother. Example 3 shows a string of elided patterns, each introduced by the inertia of the preceding pattern. The string in Example 3 is canonical in two senses: (1) the melodic patterns that occur most frequently at all levels of melodic structure are embellishments of portions of this string, and (2) the string may be sung as a canon so that adjacent patterns are sung simultaneously.

TABLE 4. A ranking of three-note patterns

unstable note	major	forces which predict the third note			minor
$\hat{6}$	$\hat{5}$-$\hat{6}$-$\hat{5}$	gravity	magnetism		
b$\hat{6}$		gravity	magnetism!		$\hat{5}$-b$\hat{6}$-$\hat{5}$
#$\hat{4}$	$\hat{3}$-#$\hat{4}$-$\hat{5}$		magnetism!	inertia	
	$\hat{5}$-#$\hat{4}$-$\hat{5}$		magnetism!		$\hat{5}$-#$\hat{4}$-$\hat{5}$
	$\hat{5}$-#$\hat{4}$-$\hat{3}$	gravity		inertia	
	$\hat{3}$-#$\hat{4}$-$\hat{3}$	gravity			
$\hat{4}$	$\hat{5}$-$\hat{4}$-$\hat{3}$	gravity	magnetism!	inertia	
		gravity	magnetism?	inertia	$\hat{5}$-$\hat{4}$-b$\hat{3}$
	$\hat{3}$-$\hat{4}$-$\hat{3}$	gravity	magnetism!		
		gravity	magnetism?		b$\hat{3}$-$\hat{4}$-b$\hat{3}$
	$\hat{3}$-$\hat{4}$-$\hat{5}$			inertia	
			magnetism?	inertia	b$\hat{3}$-$\hat{4}$-$\hat{5}$
	$\hat{5}$-$\hat{4}$-$\hat{5}$				
			magnetism?		$\hat{5}$-$\hat{4}$-$\hat{5}$
#$\hat{2}$	$\hat{3}$-#$\hat{2}$-$\hat{3}$		magnetism!		
$\hat{2}$	$\hat{3}$-$\hat{2}$-$\hat{1}$	gravity	magnetism?	inertia	
		gravity		inertia	b$\hat{3}$-$\hat{2}$-$\hat{1}$
			magnetism!	inertia	$\hat{1}$-$\hat{2}$-b$\hat{3}$
	$\hat{1}$-$\hat{2}$-$\hat{3}$		magnetism?	inertia	
	$\hat{1}$-$\hat{2}$-$\hat{1}$	gravity	magnetism?	inertia	
		gravity			$\hat{1}$-$\hat{2}$-$\hat{1}$
			magnetism!		b$\hat{3}$-$\hat{2}$-b$\hat{3}$
	$\hat{3}$-$\hat{2}$-$\hat{3}$		magnetism?		
b$\hat{2}$		gravity	magnetism!	inertia	b$\hat{3}$-b$\hat{2}$-$\hat{1}$
		gravity	magnetism!		$\hat{1}$-b$\hat{2}$-$\hat{1}$
				inertia	$\hat{1}$-b$\hat{2}$-b$\hat{3}$
					b$\hat{3}$-b$\hat{2}$-b$\hat{3}$
$\hat{7}$	$\hat{8}$-$\hat{7}$-$\hat{8}$		magnetism!		$\hat{8}$-$\hat{7}$-$\hat{8}$
b$\hat{7}$			magnetism		$\hat{8}$-b$\hat{7}$-$\hat{8}$

EXAMPLE 2. The successive combinations of patterns

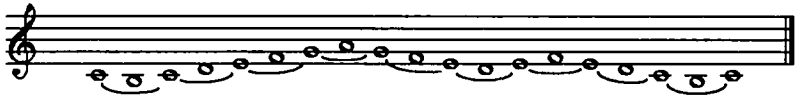


The simultaneous combination of patterns forms an important basis of tonic prolongation. Consider three-element tonic prolongations in which the three elements are: (1) a tonic in root position or first inversion, (2) an inversion of V7 or vii, and (3) another tonic in root position or first inversion. The most common outer-voice frameworks for such prolongations may be described as pairs of patterns (usually step-step, but sometimes leap-step) that give in to one or more of the musical forces (these patterns include the stronger ones in Table 1 and the incomplete-neighbor patterns $\hat{1}$-$\hat{4}$-$\hat{3}$ and $\hat{3}$-$\hat{7}$-$\hat{8}$).[15] Prolongations of other harmonies rely on similar principles of resolution (giving in to the forces) and combination.

Several fruitful combinations of simultaneous patterns, which I call solfège drills, are given in Example 4. Each of these combinations meets the following criteria: (1) each unstable note in the combination appears in one and only one of the patterns, and (2) the patterns (together with an appropriate bass line) imply a prototypical harmonic progression (the Roman numerals beneath each drill both describe the implied progression and suggest the appropriate bass line). Singing one of these upper voices while playing the suggested bass line on the piano is an effective way to internalize the sound and meaning of active tones in the scale. These combinations (with minimal adjustments for proper doubling and voice leading) also help students with part-writing skills.

[15]The most common of these combinations are listed in Aldwell and Schachter, *Harmony and Voice Leading*, 2nd ed., 116-117.

EXAMPLE 3. Elided patterns, each introduced by the inertia of the preceding pattern



These patterns provide shapes that are simple and directed. This directed quality is a source of what we call scale-degree function. The organizing power of these simple shapes also makes them ideal sources for improvisation. They are easy to embellish because they provide a secure path that is easy to hear and return to. And they teach embellishment by example because they themselves are simple embellishments. These specific three- and four-note patterns enjoy a privileged status in the structure of tonal music. Tonal melody relies heavily on the combination and embellishment of these patterns.

The progressions created by the solfège drills in Example 4 not only provide ideal backgrounds for learning to improvise, but also provide the best environments for studying the operation of musical forces in harmonic contexts other than simple tonic prolongations.

Recommendations for teaching aural skills

This theory of expressive meaning in music suggests that the construction, identification, combination, and embellishment of basic tonal patterns should be a central part of the training of musicians. Many of the following recommendations for teaching aural skills are followed by brief commentary suggesting how or why these suggestions might be implemented.

1. *Play a perfect fifth on the piano with your left hand. Above this* $\hat{5}$/$\hat{1}$ *frame, improvise a brief piece with a clear beginning, middle, and end. Be sure to do this exercise in various keys. (No additional explicit constraints.)* The piano is a central tool for developing musicianship skills. To improvise, the student must audiate something and then produce it. The natural desire to improve one's own creations is pressure enough to encourage students to audiate more clearly and to translate more precisely that audiated sound into decisions about which keys to strike.

EXAMPLE 4. Simultaneous combinations of three- and four-note patterns—solfège drills

three-note patterns in major

$\hat{5}$	$\hat{4}$	$\hat{3}$
$\hat{3}$	$\hat{2}$	$\hat{1}$
$\hat{8}$	$\hat{7}$	$\hat{8}$
I	V^7	I

three-note patterns in minor

$\hat{5}$	$\hat{4}$	$b\hat{3}$
$b\hat{3}$	$\hat{2}$	$\hat{1}$
$\hat{8}$	$\hat{7}$	$\hat{8}$
i	V^7	i

four-note patterns in major

$\hat{5}$	$\hat{6}$	$\hat{7}$	$\hat{8}$
$\hat{5}$	$\hat{6}$	$\hat{5}$	$\hat{8}$
$\hat{5}$	$\hat{4}$	$\hat{4}$	$\hat{3}$
$\hat{3}$	$\hat{2}$	$\hat{2}$	$\hat{1}$
$\hat{8}$	$\hat{8}$	$\hat{7}$	$\hat{8}$
I	ii^6_5	V^7	I

four-note patterns in minor

$\hat{5}$	$b\hat{6}$	$\hat{5}$	$\hat{1}$
$\hat{5}$	$\hat{4}$	$\hat{4}$	$b\hat{3}$
$b\hat{3}$	$\hat{2}$	$\hat{2}$	$\hat{1}$
$\hat{8}$	$\hat{8}$	$\hat{7}$	$\hat{8}$
i	$ii\text{ø}^6_5$	V^7	i

2. *Play another improvisation above a $\hat{5}$ / $\hat{1}$ frame, but with one or more of the following constraints: (a) sing each note as you play it, (b) sing each gesture after you play it, (c) sing each gesture before you play it, (d) sing each gesture with solfège after you play it, (e) sing each gesture with solfège before you play it, (f) sing each gesture with solfège as you play it, (g) use one or more three- or four-note patterns as the basis of all or part of your improvisation.* These graded constraints provide both an extremely efficient method of assessing a student's musicianship skills and a well-tested method for improving aural skills.

3. *Given the first two notes of a pattern and a musical force, sing and then write the notes predicted by that force.* Example 5 provides the beginning of an exercise blank to facilitate this assignment and to record comments for further discussion. Students could complete a three- or four-note pattern, following the guidelines of Tables 1 and 2.

4. *Play a perfect fifth on the piano with your left hand. Above this $\hat{5}$ / $\hat{1}$ frame, sing each of the three- and four-note patterns given in Tables 1 and 2. Looking only at the first column, determine which musical forces predict the final note. Check your answer against the columns on the right. As you sing each pattern, feel the effects of the combined forces—perform the pat-*

tern in a way that reflects the changing tension in it. Repeat, omitting the first note of each pattern. When students integrate their felt kinesthetic and emotional responses with the directed tensions of musical motions, they most quickly learn the identification of scale degrees that solfège is intended to teach. This approach also helps students to see the relevance of their theory courses for their performing, composing, and listening activities.

5. *Have a friend establish a tonal center (possibly by playing a* $\hat{5}/\hat{1}$ *frame) and then perform one or more patterns. Sing back the pattern(s). Sing them back with solfège. Echo the pattern(s) on the piano or on your instrument. Identify them by pointing to Tables 1, 2 or 3.* Skill at this exercise may appear to be a prerequisite to beginning work on Exercise 9, but I've encountered students for which the "unnatural" order of Exercise 9 and then Exercise 5 works better.

6. *Make up a game involving the elision of patterns. (One of the rules might concern how the direction of the last two notes of one pattern influences the direction of the first two notes of the following pattern.) Play your invented game.* An inventive sense of play is a central musical skill that should be cultivated and nurtured whenever possible.

7. *While playing the bass line indicated by the Roman numerals in Example 4, sing one of the upper voices with solfège syllables. Let your performance of these patterns reflect the dynamic tendencies created by the musical forces that shape it.* Frequent practice of this exercise is a cornerstone of my aural-skills teaching.

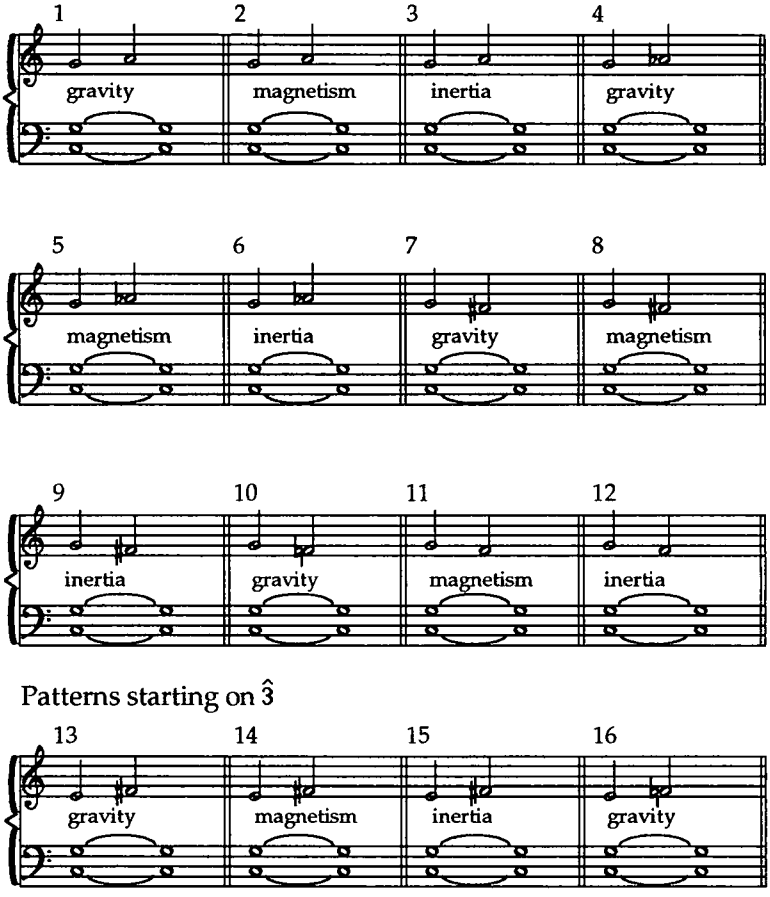
8. *Sing one of the patterns from a solfège drill given in Example 4 while playing another.* Playing one voice while singing another is easier to learn that it may seem (especially if one begins to learn this skill with simple combinations like those in Exercises 7 and 8), and is an essential part of making the study of counterpoint a part of aural-skills development.

9. *Practice singing and playing a combination of two patterns from Table 1 that create the outer framework of a tonic prolongation (for example,* $\hat{8}$-$\hat{7}$-$\hat{8}$ *and* $\hat{1}$-$\hat{2}$-$\hat{3}$*).* Let your performance of these patterns reflect the dynamic tendencies created by the musical forces that shape it. Write out several of these combinations and use them as the basis of Exercises 10-11.

10. *Have a friend perform one of the pattern combinations in Exercise 9.* Sing back the separate voices of the pattern combination. Sing back the separate voices with solfège. Echo the pattern combination on the

EXAMPLE 5. Exercises in pattern completion

Patterns starting on $\hat{5}$



Patterns starting on $\hat{3}$

piano or on your instrument. Identify the two patterns by pointing to the appropriate patterns in Table 1.

11. *Have a friend perform one of the patterns from Exercise 9 twice (either a soprano or bass part).* On the second performance, add an appropriate second part (bass or soprano). Point to the patterns you have used in Table 1.

12. *Make up a game that is a variation on Exercises 8, 9, 10, or 11.* Exercises 8-11 are relatively new for me, and I would enjoy hearing about others' experience with them.

13. *Before and/or after sightsinging or practicing a passage of music, find three- and four-note patterns and/or their embellishments in the passage. Suggest ways in which a performance could reflect the dynamic tendencies created by the musical forces that shape it.* Making this a central task of courses in sight singing will improve both students' accuracy and the expressive quality of their performance.

14. *With a group, sing each of the patterns in one of the combinations given in Example 4 in turn. Begin at different times to create a round*

15. *Alternate performances of patterns as in Exercise 14 with improvised embellishments of the same patterns (preserving the underlying harmonic rhythm).*

16. *Have each member of a group sing a different pattern contained in one of the combinations given in Example 4. Repeat the pattern rhythmically. Each group member may embellish some or all of the repetitions of his or her pattern. Or do the pattern sequentially, beginning at different times to create an embellished round.* Some students will be slow to "get into" Exercises 15 and 16, but patience and support here will lead to great improvements in their musicianship skills.