Journal of Music Theory Pedagogy

Volume Twenty-Four 2010

Journal of Music Theory Pedagogy

Volume Twenty-Four 2010

SCHOOL OF MUSIC
THE UNIVERSITY OF OKLAHOMA

JOURNAL OF MUSIC THEORY PEDAGOGY

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Journal of Music Theory Pedagogy
School of Music
University of Oklahoma
Norman, OK 73019

Subscription Rate (1 issue/yr.)

Individual	$35.00
Student/Emeritus	$15.00
Library/Institution	$40.00
(International: $5.00 additional)	

Information about back issues and special rates available through the business office

The Gail Boyd de Stwolinski Center
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ISSN 0891-7639

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From the Editor

Over the past twenty-four years, the *Journal of Music Theory Pedagogy* has helped to shape the teaching of music theory both here in the United States and abroad. The Journal continues to thrive, most recently under Timothy Smith of the University of Northern Arizona. For the past five years, Tim has been an extraordinary editor, and I am honored to follow him. I hope to maintain the high quality he has established. From the Journal's inception, James Faulconer, Director of The Gail Boyd de Stwolinski Center for Music Theory Pedagogy at the School of Music, University of Oklahoma, and Alice Lanning, Managing Editor of the Journal, have provided guidance and vision throughout the various stages of publication. The Editorial Review Board, chaired by Mary Arlin (Ithaca College) has been of inestimable value, painstakingly vetting each submission.

As editor, I will make every effort to continue this tradition of excellence while attempting to serve what I believe are two very different readerships. The first, the non-specialist, is typically a performer, saddled with teaching the various theory courses offered by his or her institution. This may include not only two or even three years of written theory in the core curriculum (along with the accompanying aural skills courses), but also fundamentals, remedial theory, and even upper-division courses such as form and analysis and counterpoint. The second reader, the specialist, may also be a performer, but has also received the benefits and experience provided by a terminal degree in music theory.

As it stands, the non-specialist is responsible for the majority of curricular design and instruction – some would say as high as 80% -- throughout this country's two and four-year colleges, and even universities. Further, not every theorist with a Ph.D. has years of teaching experience. The performer/teacher and newly-minted specialist would benefit from innovative pedagogical ideas, from effective strategies for introducing twentieth-century music theory through the lens of Stravinsky's *Rite*, to a new way of

presenting set-class analysis, both of which are explored in the current issue of the Journal by Jena Root and Stanley Kleppinger, respectively. Even the veteran specialist instructor will be interested in the issues addressed concerning musicianship, such as the history and benefits of employing various types of solfége syllables in sight-singing, explored by Joshua Pallki and by Stacey Davis' contribution, which plumbs the perceptual and cognitive depths of error detection. Finally, all theory instructors will surely find inspiration in Bruce Campbell's study of model composition through the lens of ragtime.

Lest anyone assume that music theory pedagogy is the sole province of the United States, there will be a new feature in each issue of the Journal from now on entitled "Global Perspectives on Music Theory Pedagogy," in which leading figures in the field from around the world and within the United States reflect on the current state of pedagogy and offer their insights, gained through years of experience in the classroom. We learn, for instance, from Luciane Beduschi and Nicolas Meeus that they are in the midst of implementing a course in Schenkerian analysis (and creating an accompanying textbook) at Paris' Sorbonne. Nicholas Bannan, an expert on teaching musicianship at the University of Western Australia, provides an introduction to "harmony signing" in his article entitled "Embodied Music Theory: New Pedagogy for Creative and Aural Development." Jonathan Dunsby, from the Eastman School of Music, explores technology and pedagogy in his "Reflections on Music Theory Pedagogy: Virtual and Archeological Known Unknowns." Anyone invested in teaching music theory will find these articles illuminating.

It is crucial that there be a force in the field that strives to improve the quality of and accessibility to cutting edge and high-level teaching ideas and materials, and that disseminates best-practice models for both the non-specialist as well as the specialist. I encourage everyone dedicated to the enterprise to share their teaching ideas and experiences with other educators by submitting their work for publication in the *Journal of Music Theory Pedagogy*.

In Memorium

Dorothy Payne, Professor Emerita of Music Theory and former Dean of the School of Music at the University of South Carolina, passed away on March 11, 2010, in Cincinnati. She was 75 and had suffered from Parkinson's disease for several years.

Dorothy and I met in 1969, when I arrived at the Eastman School, a freshly minted Ph.D., to join the faculty. Dorothy was already teaching there, and she and a few other colleagues helped me to get through a tough first year. It was soon obvious to me that Dorothy was enormously respected as a teacher and loved by her students, many of whom kept in touch throughout their careers.

After four years I left Eastman for the University of Texas at Austin, and Dorothy came down as well a few years later. I watched as she immediately won over her students, who loved her for her humor, her humanity, and her musicianship. Those were good years for all of us at Texas.

Around 1982, Dorothy gamely agreed to take on the writing of the final two, long chapters of my *Tonal Harmony* book. It was a long, difficult birth of that first edition, but, with her pluck, we got it done. She stayed with those chapters in subsequent editions, for which I am very grateful.

At some point Dorothy began to cast an eye toward administration, and she eventually left us for the University of Connecticut, followed by stints at the University of Arizona and at the University of South Carolina, where she served for many years. The Dorothy K. Payne Music Library Endowment was established there in the fall of 1999 by an anonymous donor to honor her life and work.

Dorothy and I met in person only for a few pleasant dinners after she left Texas, and sometimes years would pass even between e-mails. But she left me with many happy memories, as I am sure she did all who knew her, and all who are devoted to music theory pedagogy

Above all, Dorothy should be remembered and honored for the way she listened so well. Her musical ear was wonderful. But more than that, she really listened with nurturing patience and helpfulness to her colleagues and students. She gave of herself tirelessly to those around her. She is missed.

Stefan Kostka
Professor Emeritus
University of Texas at Austin

In Memorium

Dorothy Katherine Payne

(6 February 1935 – 11 March 2010)

Dorothy K. Payne was born to teach. As the recipient of numerous awards—including the first Eisenhart Teaching Award (with co-winner David Craighead) at the Eastman School of Music, the Fine Arts Student Council Award for Teaching Excellence at the University of Texas at Austin, the Michael J. Mungo Undergraduate Teaching Award at the University of South Carolina, as well as the Gail Boyd de Stwolinski Prize for Lifetime Achievement in Music Theory Teaching and Scholarship—Dorothy set a high bar in the art of teaching. Her remarkable musicianship, superb aural skills, keen sense of humor, sharp wit, and genuine and abiding interest in her students were among the keys to her remarkable pedagogical success. And students—of all different backgrounds and abilities—loved her in return, as reflected in the massive and varied outpouring of affection and support in their letters to her on the Caringbridge web site that was set up during the last year of her life (these may still be accessed under "dpayne" at www.caringbridge.org).

Dorothy's unique teaching style was surely influenced by her early musical experiences and environment. She must have assimilated her nurturing and patient approach from her mother, Dorothy Stolzenbach Payne, who was a highly revered piano teacher and an accomplished artist, serving for twenty years as the pianist with the Cincinnati Symphony Orchestra. Dorothy believed in positive reinforcement, in holding out carrots (as opposed to sticks) to her students. This philosophy was manifested in many ways—from her flexibility in the classroom, continually adapting to her students' needs, to literally providing them with refreshments (especially chocolate). Motivation was never an issue in Dorothy's classroom; her students jumped through hoops to please her.

As a student herself at Eastman in the 1950s and 1960s, Dorothy honed her skill as a pianist with legendary teachers such as Cecile Genhart, Frank Glazer, Eugene List, and

David Burge. She received her BM with Distinction in 1956 and an MM in 1966. Completion of her master's degree was delayed by two years of piano study in Vienna and Rome (with Carlo Zecchi), additional private lessons with Victor Babin and Vitya Vronsky, and her acceptance of a teaching position at Pacific Lutheran University in Tacoma, Washington. Dorothy's musical interests subsequently led her down intellectual paths; in 1974, she completed her PhD in Music Theory at Eastman, writing a dissertation, advised by Robert Sutton, on *The Accompanied Wind Sonatas of Hindemith: Studies in Tonal Counterpoint*. Her superb musical training prepared her well for the multi-faceted career that she would ultimately experience. She could learn scores very quickly, whether for classroom study, a church service, or a performance of a contemporary work hot off the press. And she lived the life of a comprehensive musician, bridging quite naturally and effortlessly between the sometimes artificially disparate worlds of performance and analysis.

The same qualities that brought Dorothy such spectacular success in the classroom stood her in good stead as an administrator and leading music educator in North America. She served as Chair of the Division of Theory and Composition at the University of Texas at Austin (1979–1984), as Head of the Department of Music at the University of Connecticut in Storrs (1986–1992), and as Director of the School of Music at the University of Arizona in Tucson (1992–1994), as well as the first Dean of the School of Music of the University of South Carolina (1994-1998). She shared her leadership gifts with the National Association of Schools of Music, tirelessly serving on countless evaluation teams over the years and as a member of the National Commission on Accreditation as well as on the Board of Directors. She worked with the College Board and the Educational Testing Service, generously chairing the Test Development Committee for the Advanced Placement Examination in Music Theory (1987–1991), and often lending her considerable pedagogical and personal skills to the team of readers for the exam. Her remarkable ability to harness the good will and energy of

others, to draw out their best, and to enjoy the process (not just the product) of collaborative work, stood her in good stead in all of these positions and perhaps even more so in the various parish positions she held, primarily as church organist, throughout her life.

Dorothy's global impact on the world of music education, and on music-theory pedagogy in particular. is marked by these various leadership positions as well as by the highly successful theory text, *Tonal Harmony and An Introduction to Twentieth century Music* (McGraw-Hill), which she co-authored with Stefan Kostka. Considered a "classic" undergraduate theory textbook, *Tonal Harmony* is now in its sixth edition. After nearly twenty years of working in academic administration, Dorothy decided, as she put it, to "doff her deanly duds" and to return to her deeply satisfying musical life in the classroom as "a theory teacher in sneakers." Ultimately, teaching is what she enjoyed doing more than anything else, and she was thrilled to get back in the trenches with the freshmen at the University of South Carolina. She also reveled in the opportunity to prepare annual three-piano extravaganzas with her siblings, Karl Payne and Rebecca (Becky) Shockley, not surprisingly both renowned piano teachers in their own right. Audiences in Minnesota, Cincinnati, and Columbia, South Carolina were treated to their concerts, which presented repertoire from Bach and Rachmaninoff to Griffes and Percy Grainger (who was a lifelong friend and mentor to their mother).

As teacher and administrator, both in public and in private conversations, Dorothy prided herself on her quick wit and command of the *bon mot*, qualities which Parkinson's disease cruelly robbed from her during the last years of her life. One of the ways in which Dorothy often gave of herself to those around her was by writing a poem or a contrafactum to mark a special event. These creative gifts were at times downright corny, but they were always witty and delivered from the heart. Many of her students and colleagues were the lucky recipients of these cleverly crafted paens of praise. I vividly recall a blushing Charles Warren Fox, as Dorothy regaled him with a poetic tribute on the occasion of his birthday. After a visit to my home one

summer, Dorothy left one of her compositions, this to a tune that every self-respecting church organist knows: Aurelia. And so I offer the following in return, with apologies for the occasionally awkward prosody, in memory of our beloved teacher and friend:

Aurelia in Memory of Dorothy

One lovely June in summer of 1954,
A student from Ohio entered the Gibbs Street door.
She stayed and studied longer,
Came back for more and more,
Earned three degrees and, stronger,
Finished in '74.

She taught the honors sections of music the-o-ry
Where students thought they knew all, til meeting Do-ro-thy.
She humbled them quite quickly
With humor and with glee.
They changed their tune and listened,
In awe, to their DP.

Though "payne" was what she called it, class never made them sore.
Her students stopped and listened like nevermore before.
Her teaching was infectious,
Class never was a bore.
And students loved her dearly;
She touched them to the core.

Her fingers and her ears were most legenda-ry,
From Bach to Percy Grainger, she knew it all, you see,
Her students begat students
Who've left a legacy.
We owe it all to someone,
A teacher named DP.

Marie Rolf
Associate Dean of Graduate Studies and
Professor of Music Theory
Eastman School of Music

Memorial contributions in Dorothy Payne's memory may be made to any of the following: 1) The Dorothy K. Payne Scholarship Fund, c/o The Greater Cincinnati Foundation, 200 West Fourth Street, Cincinnati, OH 45202, 2) Hospice of Cincinnati, Inc., P.O. Box 633597, Cincinnati, OH 45263, 3) The Dorothy K. Payne Music Library Endowment, c/o the University of South Carolina, Columbia, SC 29208, and 4) The "Dorothy Payne Prize for the Best Graduate Student Paper" of the Music Theory Society of the Mid-Atlantic, c/o Professor David Zimmerman, Treasurer, 5597 Seminary Road, Apt. 2411, Falls Church, VA 22041.

Stravinsky's "Spring Rounds": Primer for a Twentieth-Century Musical Aesthetic[1]

By Jena Root

When first assigned to teach an undergraduate twentieth-century theory course in the early 2000s, I decided to begin the semester with an informal, anonymous survey: I gave each student an index card and asked them to write a few words that would describe their notions about twentieth-century music. Many of the responses were discouraging, though hardly surprising: "ugly," "chaotic," "can't be analyzed," and "no rules" were among the most common. Some students went so far as to express fearfulness, while others conveyed a more positive--though still unhelpful--attitude: "Now we can write whatever we want and call it 'music!'"

Even with the perspective of a full century, the dissonant musical language of the early 1900s can prove difficult to the undergraduate music theory class. Biases and preconceptions may afflict even the most open-minded of students, followed closely by trepidation in the face of music they may perceive as ungoverned by any established syntax. After several semesters immersed in the conventions of the common-practice period, many will find themselves perplexed when the harmony and voice leading principles they have worked so hard to learn have seemingly vanished and they are left with few guidelines to explain a baffling new language. The fact that core music theory is in essence taught chronologically further contributes to the problem. In even the best scenario, the twentieth century falls in the final semester of theory where it is subject to the tonally-biased ears we have worked so hard to create in the preceding courses. At worst, it is condensed into a few weeks and relegated to the end of a semester of nineteenth-century chromatic harmony.[2] In either case, it is a key challenge for the teacher to find

[1] An earlier version of this paper was presented at the annual conference of the College Music Society in Portland, Oregon on 22 October 2009. The author wishes to thank Prof. Steve Laitz for his guidance through the review and editorial process, and also Prof. David Morgan, who, from his unique perspective as both an accomplished jazz musician and Stravinsky scholar, provided valuable insights to this article.

[2] In a 2002 survey conducted by the College Music Society, 55% of respondents reported that one term of twentieth-century music was

musical examples that provide an aesthetically pleasing entry point while exemplifying some of the basic techniques that characterize the musical language.

No study of twentieth-century theory, however brief, can easily overlook Igor Stravinsky's *The Rite of Spring*. And while a meaningful study of the entire ballet is not likely to be undertaken within the time constraints of an undergraduate theory course, the hauntingly lyrical "Spring Rounds" movement is an ideal primer for students' understanding and acceptance of a dissonant musical language:

- The movement has a clear formal structure consisting of two principal sections bracketed by an introduction and coda.
- Its brevity allows for meaningful exploration within one or two class periods.
- Its textural and rhythmic unity make it easy for less-experienced score readers to follow, and Stravinsky's own piano four-hand version is readily available.[3]
- Perhaps most importantly, the movement incorporates aspects of diatonic language and is for the most part centered on E♭. In fact it is one of only three passages in the entire ballet to use key signatures.[4]

The Rite of Spring may be the most examined work of the twentieth century, despite the composer's own assertion that he "was guided by no system" in its construction.[5] In 1963 Arthur Berger brought attention to "the fact that no significant body of theoretical writing

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required at their institutions; 27% reported between zero and one term, and 13% reported zero terms required. Richard B. Nelson, "The College Music Society Music Theory Undergraduate Core Curriculum Survey," *College Music Symposium* 42 (2002), 69.

[3] http://www.cdsheetmusic.com/products/disk_contents.cfm?product=27, accessed September 30, 2009.

[4] The other two passages are: "The Augurs of Spring" 13-31 (three flats), and "Mystic Circle of the Young Girls," 91-93, in the solo violas only (five sharps).

[5] Stravinsky and Craft, *Expositions and Developments*, 147.

has emerged to deal with the nature of twentieth-century music that is centric (i.e., organized in terms of tone center) but not tonally functional" and went on to call for "a new branch of theory… starting from what this music itself is, rather than dwelling upon its deviation from what music was previously."[6] Nearly fifty years on, the scholarly community remains deeply divided about how best to deal with the musical language of Stravinsky's early period.[7] Various studies have been predicated on octatonicism[8] (and by extension, interval cycles[9]), pitch class sets,[10] polarities,[11] pattern-completion,[12] and more recently, modal rotation of non-diatonic (i.e., harmonic and melodic) minor scales.[13]

That scholars have yet to come to a consensus for analyzing this music will prove all the more troubling to the theory teacher in search of a sound pedagogy suitable for undergraduates who are at best unfamiliar with the concepts listed above, and at worst, still on shaky ground with common-practice syntax. This article will suggest a lesson plan that introduces "Spring Rounds" as a vehicle wherein students may begin to explore Stravinsky's musical aesthetic intuitively and aurally, before confronting more

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[6] Berger, "Problems of Pitch Organization in Stravinsky," *Perspectives of New Music* 2 (1963), 11.

[7] Straus and Tymoczko both summarize this very complex debate rather concisely, albeit each with an eye toward his own reading. Straus, "Stravinsky's Tonal Axis," *Journal of Music Theory* 26 (1982), 261-264; Tymoczko, "Stravinsky and the Octatonic: A Reconsideration," *Music Theory Spectrum* 24 (2002), 69-70.

[8] A wealth of examples may be cited; perhaps the most representative (and most specific to *The Rite*) is Van den Toorn, *Stravinsky and the Rite of Spring: The Beginnings of a Musical Language*, 115-213.

[9] Antokoletz, "Interval Cycles in Stravinsky's Early Ballets," *Journal of the American Musicological Society* 39 (1986), 578-614.

[10] Forte, *The Harmonic Organization of "The Rite of Spring"*. New Haven and London: Yale University Press, 1978.

[11] Straus, "Stravinsky's Tonal Axis," 261-290.

[12] Straus, "A Principle of Voice Leading in the Music of Stravinsky," *Music Theory Spectrum* 4 (1982), 106-124.

[13] Tymoczko, "Stravinsky and the Octatonic: A Reconsideration," 68-102.

challenging conceptual issues.[14] The discussion presumes that students have a foundational understanding of common-practice tonality and are familiar with the seven diatonic modes; no further knowledge of twentieth-century techniques is assumed. As such, it is suitable for the early sessions--perhaps even the first class meeting--of an undergraduate twentieth-century theory course.[15] In the spirit of this first-day encounter, the concept of octatonicism is largely avoided, and set theory referenced only casually.[16] (One would of course assume that these topics are to be covered later in the course, either revisiting this piece or using a different one.) Rather, the piece will be presented in a way that "warms" students to a new aesthetic while at the same time providing an opportunity for the consideration of new terminology ("collection" vs. "scale," "tone center" vs. "tonic", etc.).

Finally, it should be noted that for all the scrutiny that the rest of the ballet has undergone, "Spring Rounds" seems to provoke only cursory discussion among theorists,[17] and in some cases is barely mentioned at all in the standard literature. Perhaps this lack of attention is attributable to the very same traits that make the movement such an appealing choice for undergraduate study in the first place. To scholars interested in decoding the complex web

[14] John Rahn does this beautifully with an even more "aesthetically challenging" work, Webern's *Symphonie, Op. 21.* Rahn, *Basic Atonal Theory*, 4-18.

[15] The movement is also an ideal starting point (in contrast to the more complex Introduction and "Augurs of Spring") for upper-division and graduate seminars focusing on the *Rite of Spring* as a whole.

[16] Craig Cummings makes the excellent point that basic integer notation may be introduced very informally without disrupting the flow of the lesson. Cummings, "Three Introductory Miniatures for an Undergraduate Twentieth-Century Analysis Course," *Journal of Music Theory Pedagogy* 8 (1994), 168.

[17] Forte's analysis, true to its title, focuses almost exclusively on the dissonant vertical sonorities beginning at m. 32, and its language is a bit advanced for beginning undergraduates. Forte, *The Harmonic Organization of the "Rite of Spring"*, 52-55. Turek, by contrast, provides only four discussion questions, addressing mode, orchestration, and texture in a very general way. Turek, *Accompaniment to the Analytical Anthology of Music,* 211-218. Taruskin and Van den Toorn both discuss the folk song sources for the movement, but the latter's technical analysis skips the movement altogether. Taruskin, *Stravinsky and the Russian Traditions*, 890, 895, 900, 906-911; Van den Toorn, *Stravinsky and the Rite of Spring*, 10, 12-13; Van den Toorn, *The Music of Igor Stravinsky*, 121.

mm	Section	What did you hear?	Ear-Training Questions
1-6	Intro	• Melody in double octaves accompanied by trill (winds)*	1. What is the interval of the trill? (M2) 2. What is the interval between the first and last notes of the melody? (m7) 3. What solfege/scale degrees do you hear for the first five notes? (Ambiguous, but probably $\hat{1}$-$\hat{6}$-$\hat{1}$-$\hat{6}$-$\hat{5}$ or $\hat{5}$-$\hat{3}$-$\hat{5}$-$\hat{3}$-$\hat{2}$) 4. Based on the phrasing you hear, sketch a rhythmic/metric scheme for the section. (See score)
7-31	A1	• Syncopated ostinato (low pizzicato strings). • Repeated chords (strings). • Melody #1: 5-note "interruption" (winds). • Melody #2: 4-note melody (horns trading with soli violins). • Melody #3: oscillating melody embellished with trills (high winds).	5. What is the interval bewteen the lowest note of the ostinato and the top note of the repeated chords? (M2 or M9) 6. What is the harmonic interval created by the moving pizzicato line of ostinato? (Parallel perfiect fifths [!]) 7. What is the intervallic range of each melody you hear? (Melody #1: P5; Melody #2: P4; Melody #3: P4)
32-42	A2	• A-section melody re-harmonized with dissonant chords, expanded register (orchestral *tutti*; brass and percussion predominate).	8. What is the interval between soprano and bass in the last chord of the section? (m2 or m9) 9. Based on the phrasing you hear, sketch a rhythmic/metric scheme for the section.
43-54	B	• Pedal point accompanied by "arcing" figures (strings and winds). Punctuating chords (orchestral *tutti*).	10. Listen to the uppermost voice of the pairs of punctuating chords. What is the melodic interval? (M3)
55-62	CODA	• Similar to the introduction. (The most astute listeners may hear a change in orchestration.)	11. What is the interval between the first and last notes of the melody? (m6)

*The instrumentation indicated in this chart is not meant to constitute a full analysis of the orchestal forces of the movement. These are simply the instruments that students listening without a score are likely to pick out of the overall texture.

Example 1: Form Chart with ear-training questions. Leftmost column to be filled in last.

of sounds that characterize most of the *Rite*, "Spring Rounds" is so comparatively transparent as to warrant little or no comment. Richard Taruskin goes so far as to describe the opening music of the movement as "one of the tamest pages in the Rite."[18]

Students will benefit first from listening to the work several times without the score and tracking the form aurally. (If computer projection is available and the piece is played in iTunes or a similar media player, they might even make note of the elapsed time at the beginning of each section they hear.) Sub-groups of the class may be assigned different tasks: Group 1 might listen for changes in orchestration while Group 2 tracks the entrance of new melodies, etc. As the formal structure is established, students can then be called upon to answer specific ear-training questions for each section (see Example 1, right-hand column). Once the movement has settled into students' ears and minds, locating formal markers in the score should be a simple matter. The class might fill out a form chart such as the one in Example 1, with the leftmost column of measure numbers to be added *last*, once the score is consulted.

The opening measures of "Spring Rounds," coupled with the preceding bars that conclude the "Ritual of Abduction," provide the opportunity for a foundational discussion of relative dissonance and resolution, as the half-step tremolo E♭/E♮ (48 - 4) gives way to the more consonant whole step E♭/F at 48.[19] The students who were previously charged with finding the interval between the starting and ending pitches of the introduction will likely be the first to realize that mm. 1-6 simply represent a "composing downward" of the trill, inverting the major second (E♭-F) to a minor seventh and filling in the space with a simple folk melody. E♭ and F thus emerge as "significant" pitches in the absence of a clear tone center.

At this point it will be important to distinguish (both to readers and their students) between the terms "tone center" and "tonic," as the latter implies a functional tonality with traditional hierarchical relationships.[20] Hence the terms "tone center (tc)," "pitch center," or

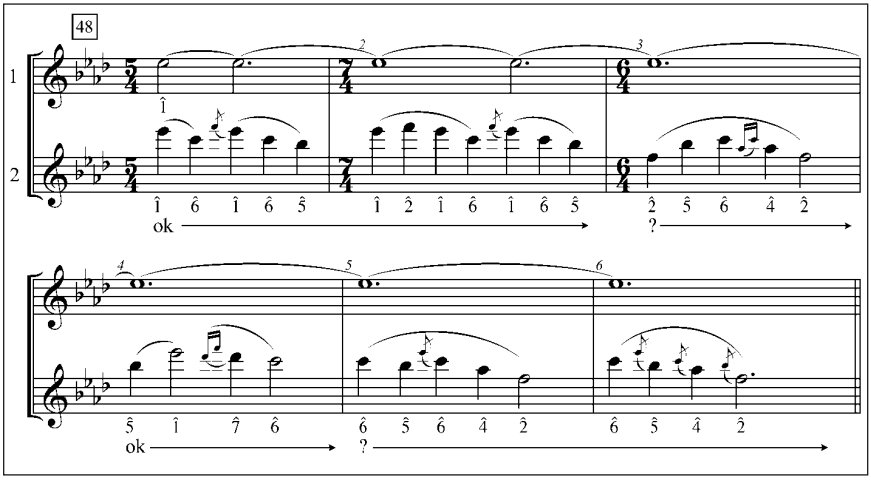
[18] Taruskin, *Stravinsky and the Russian Traditions*, 2:999.

[19] Hereafter, 48 will be designated as m. 1, and remaining measures numbered sequentially (1-62) throughout the movement.

[20] Berger, as noted earlier, refers to music "organized in terms of tone center but not tonally functional." He later adopts "priority" as a "more noncommittal term." Berger, "Problems of Pitch Organization in Stravinsky," 11-12. Straus's analyses, which are predicated on tonal axes, naturally embrace the term "tone center." Straus, "Stravinsky's Tonal

"centric pitch" will be used throughout. Since avoidance of "tonic" necessarily excludes terms such as "supertonic," "mediant," etc., the relative positions of tones within a scale will be designated by scale-degree numerals, or as "second degree," "third degree," and so on.

To fully grasp the ambiguity of the introduction, E♭ and F (as well as other pitches), may be vetted as potential tone centers: Dividing the class in half, Group 1 will sustain the E♭, calling it Î,[21] while Group 2 sings the melody with E♭ as Î. At first, E♭ will make aural sense as a tc, with F acting as an upper neighbor. But by m. 3, they will begin to find the numbers awkward to sing--which is exactly the point (Example 2).



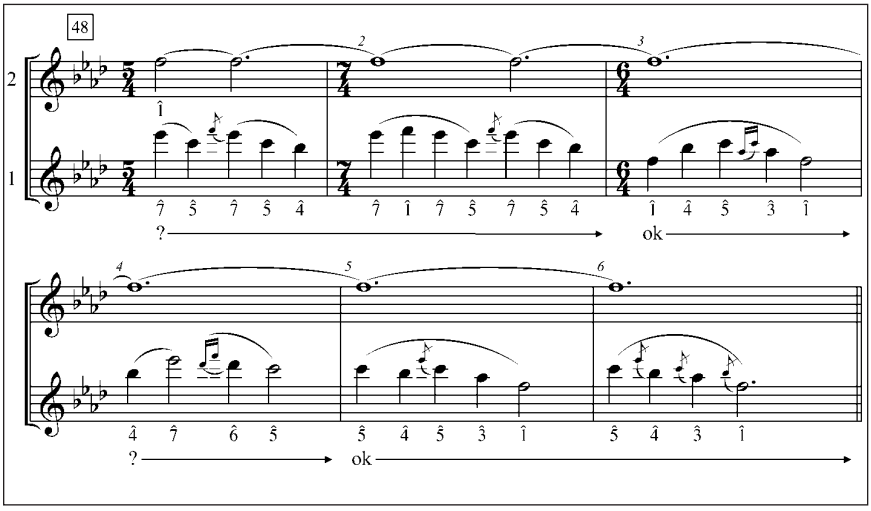
Example 2. mm. 1-6 sung with Eb as tone center.

The activity may then be repeated with Group 2 sustaining the F and Group 1 singing the melody with F as Î (Example 3). This

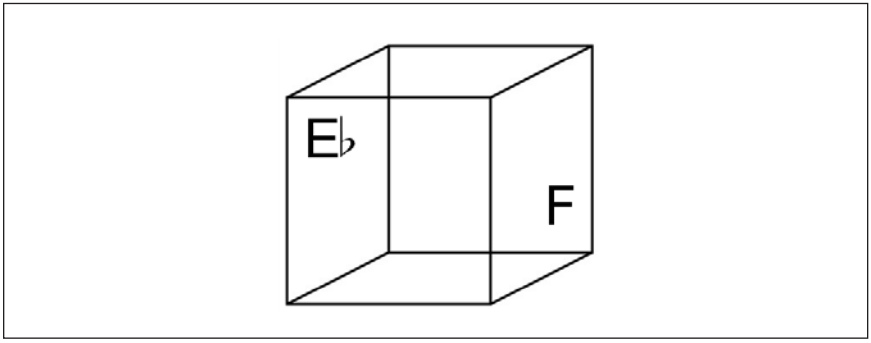
Axis," 261-266; "A Principle of Voice Leading in the Music of Stravinsky," 106, 124. In a more recent and more pedagogical context, Clendinning and Marvin distinguish between "centric" music (where a hierarchy of relationships is established around a single pitch class in nontonal music) and music with a "focal point" (where a pitch class "is emphasized through repetition or motivic use but [does] not...imply any hierarchy among the remaining pitches of the collection.") The authors take great care to communicate that the terms "tonal" and "tonic" are subject to the norms of common-practice conventions. Jane Piper Clendinning and Elizabeth West Marvin, *The Musician's Guide to Theory and Analysis*, 617-618.

[21] Moveable-*do* solmization is equally appropriate for this piece. If it is used, the examples in this movement are best-suited to *do*-based minor.

will necessitate a rather clumsy start on $\hat{7}$, giving way to a more pleasant situation as the F minor triad emerges in m. 3. Once again, the "uncomfortable" spots only serve to highlight the difficulty of pinning down a single tc. Other pitches may be attempted as well: A♭ ($\hat{5}$-$\hat{3}$-$\hat{5}$-$\hat{3}$-$\hat{2}$) might seem plausible, especially given the key signature of the passage, but it never quite assumes the role as $\hat{1}$ in the passage--all three of its appearances are as the third of an F-minor triad. Students might also try C ($\hat{3}$-$\hat{1}$-$\hat{3}$-$\hat{1}$-$\hat{7}$) or even B♭ ($\hat{4}$-$\hat{2}$-$\hat{4}$-$\hat{2}$-$\hat{1}$), but none of these is quite as satisfying to the ear as E♭ or F, both of which originate from the trill.



Example 3. mm. 1-6 sung with F as tone center.



Example 4. Necker Cube

A visual analog may be found in the structure of the Necker Cube (Example 4), where the mind may reverse the figure by "willing" one or the other square face of the structure into the front-most position. In this case the faces are represented aurally by E♭ and F.

It would be inaccurate to call this a "bitonal"[22] or even "bi-centric" phenomenon; E♭ and F cannot be perceived as simultaneous tone centers, just as we cannot focus on both faces of the cube at the same time. (If we attempt this, the figure "flattens" into a hexagon and the illusion of a third dimension vanishes. This is quite difficult, if not impossible, to accomplish.) Instead, E♭ and F alternate as pitch centers. Further discussion questions will help students examine the passage to find support for each pitch:

- *How are local hierarchical relationships established in support of each pitch?*
  In mm. 1, 2, and 4, E♭ (Î) is supported by B♭ (Ŝ), while mm. 3, 5, and 6 clearly outline an F minor triad (Ŝ-M̂-Î).

- *What are the boundary pitches of the melody, with and without grace notes?*
  With grace notes, its boundaries are an octave, F to F. Without them it spans a minor seventh, F to E♭.

- *How do the grace notes contribute to the tone-center ambiguity of the introduction?*
  In an elegant melodic paradox, the grace note F appears as the highest tone in the bars that support E♭ (mm. 1, 2, and 4). Conversely, E♭ grace notes embellish the F minor triads in mm. 5 and 6.

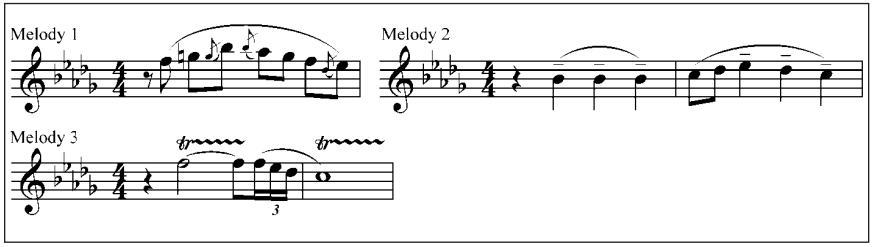
- *A pitch inventory of the introduction will show that the notes in use come just short of a complete diatonic collection.*[23] *What pitch is missing, and how does its absence affect our perception of the tonic?*
  G (or possibly G♭) is the missing pitch. Rotating the collection to begin on E♭ results in an absent third degree (E♭-F-[?]-A♭-B♭-C-D), and foreshadows a

[22] Tymoczko discusses "polytonality" at some length as a term burdened by "much undeserved abuse," questioning the notion that humans are incapable of hearing two key areas simultaneously. Tymoczko, "Stravinsky and the Octatonic," 84-85.

[23] It should be pointed out to students that "collection" is used in favor of "scale" or "mode" in this case, because a tone is missing and because the tone center is unknown. This particular *collection* forms the basis for the Dorian *scale* in the following section.

> modal ambiguity that will pervade the following section (G♮ versus G♭). Beginning on F simply results in a collection without a second degree (F-[?]-A♭-B♭-C-D♭-E♭); its absence is hardly noteworthy in that case. Incidentally, when the melody is restated in its transposed form in the coda, G then appears as the final pitch of the movement.

The matter of a tone center seems to be settled at m. 7, where E♭ asserts itself as the lower boundary tone in the Dorian ostinato that will pervade most of the movement. Here, the whole step previously established in the introduction's trill is expanded to a major ninth and softened by the intervening tones of the E♭ minor add-9 chord.[24] (The same ninth is expressed melodically on beats one and two of the bass ostinato.) Additionally, G♭ dispels any modal questions by taking its place in the key signature as the mode's rightful third degree.[25] The movement's main section (*Sostenuto e pesante*) includes three principal melodic ideas, hereafter Melodies 1, 2, and 3 (Example 5, also see the form chart in Example 1):



Example 5. Melodic materials in use for *Sostenuto e pesante* (mm. 7-42).

The interjection of Melody 1 at m. 10, along with its elaboration in mm. 13-15, immediately undermine the established Dorian mode by introducing the movement's first G♮. The shift from Dorian to Mixolydian provides an opportunity to discuss the parallel nature of the two modes, identical except for their third degrees. Here it is important to point out that G♭ and G♮ create a *linear* dissonance;

[24] Instructors are reminded not to call this chord "E♭ minor 9," which would imply that a minor seventh (D♭) is present, when it is not.

[25] A related class activity might involve a drill where key signatures are combined with non-traditional tone centers to yield a mode. For example: "The diatonic scale starting on A with two sharps is…?" (Mixolydian). "The Phrygian scale with four flats begins on…?" (C).

that is, they are used in tandem, but for the time being are never heard simultaneously. It is as though Stravinsky is "auditioning" both inflections of $\hat{3}$, in order to prime our ears for their simultaneous deployment in the passage beginning at m. 32.

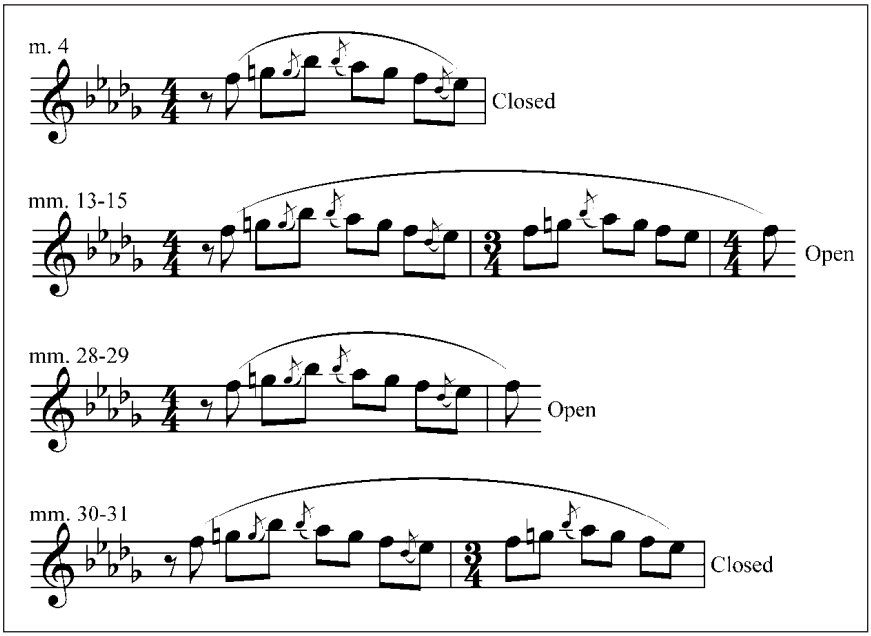
All four instances of Melody 1 (mm. 10, 13-15, 28-29, and 30-31) recall the tc ambiguity set forth in the introduction: As before, students may be instructed to sing the motive with E♭, then F as $\hat{1}$, and discuss which version "sounds right" in context. Once again the answer is inconclusive: On one hand, the relentless downbeats of the surrounding ostinato naturally guide the ear toward E♭, and the melody's highest note (B♭) provides further support for this hearing. On the other, F is never far from our consciousness, coloring the E♭ texture as the uppermost note in the add-9 chord. Furthermore, all four iterations of Melody 1 begin on F. (Jazz musicians in the class may be quick to point out that the F minor triad is an upper extension for chords based on E♭ in the jazz syntax.)

The following class-discussion questions refer to the melodic structure of this passage. In order to achieve consensus for the purposes of the discussion, let us assume for now that E♭ is the predominating tc ($\hat{1}$) with F acting as the second degree ($\hat{2}$).

- *How does the melody's interaction with the ostinato support E♭ as a tc?*
  All four melodic statements begin with F on the "and" of beat 1, preceded immediately by the bass pitch E♭ on the downbeat. This metric positioning guides us to hear **E♭**-F-**G**-B♭, etc. In statements 2 and 3, the melody's ending pitch F is sounded at the same time as the E♭ bass note, creating a harmonic major ninth on the downbeat, likely to be interpreted as $\hat{1}$ in the bass and $\hat{2}$ above.

- *Examine the end-point of each statement of the melody. Which statements seem conclusive ("closed") and which are inconclusive ("open")?*
  In this case, the first and fourth iterations of the melody convey a sense of closure by ending on E♭, while the inner statements ending on F are left open (See Example 6).

- *What classical structure is brought to mind by the four iterations of this melody?*
  Although a common-practice syntax is not at work here, the melodic structure resembles that of a double period (closed-open-open-closed).



Example 6. Four iterations of Melody 1 as analogous to a double-period structure.

The relentless E♭ minor add-9 chord that begins in m. 7 will be a familiar sound to most students, due to any number of examples to be found in jazz and popular music. It is doubtful that the sound of the major ninth that outlines the chord, nor the slightly more dissonant major seventh (G♭/F) contained therein will bother them. Indeed, they will probably not even hear the sonority as a "discord" at all. In this case, the principal impediment to a meaningful

harmonic analysis is the fact that the chord *doesn't go anywhere*. Too often, in teaching tonal music we inadvertently predispose students to equate "analysis" with "chord-labeling" as determined by pitch content. In this passage, pitch content is a static canvas--all seven diatonic pitches are present in each measure of the ostinato. In the absence of any functional harmony, momentum must be created through other, more subtle means, namely boundary tones and degrees of dissonance. The lower boundary, E♭, is of course unchanging until just before the *Vivo* section beginning at m. 43. Using the four-hand piano score, students may easily track upper boundary tones throughout the movement (see Example 11).

The mild dissonance created by the E♭/F boundaries of the foundational add-9 chord is neutralized almost immediately by the upward reach of Melody 1 to the fifth degree, B♭ (m. 10 and m. 13). As if taking a cue from the melody, the chord structure shifts at m. 15 so that B♭ now assumes the top position in the sonority. With boundary tones now temporarily stabilized at the perfect fifth (E♭/B♭), a new degree of dissonance appears within the chord: G♭ and F, initially expressed as a major seventh, now share more intimate quarters as a minor second.[26] Melody 2 follows, accompanied by a series of parallel diatonic seconds that provide another excellent ear training opportunity: With three lines in parallel motion (beginning on F, G♭, and B♭), the class may be divided into groups and called upon to sing (1) any one of the three lines by itself; (2) any two lines together (creating either parallel seconds, thirds, or fourths); (3) all three lines together. (Notice that when the octave doublings are removed, the pitch-class span of the melody is F to E♭--the same as that of the introduction (See Example 7)).

The limited pitch materials in this passage allow virtually any voice range to be accommodated. Stronger classes should be able to sing the lines unaccompanied; weaker students may have trouble with the parallel seconds, but will still benefit by singing along as the parts are played, or even singing with the recording. In either case, students are encouraged to listen for dissonant seconds softened by the thirds above.

Even as it is accompanied by parallel seconds, Melody 2 simultaneously establishes the most consonant boundary tone yet: that of the upper E♭. It is, however, immediately supplanted by F

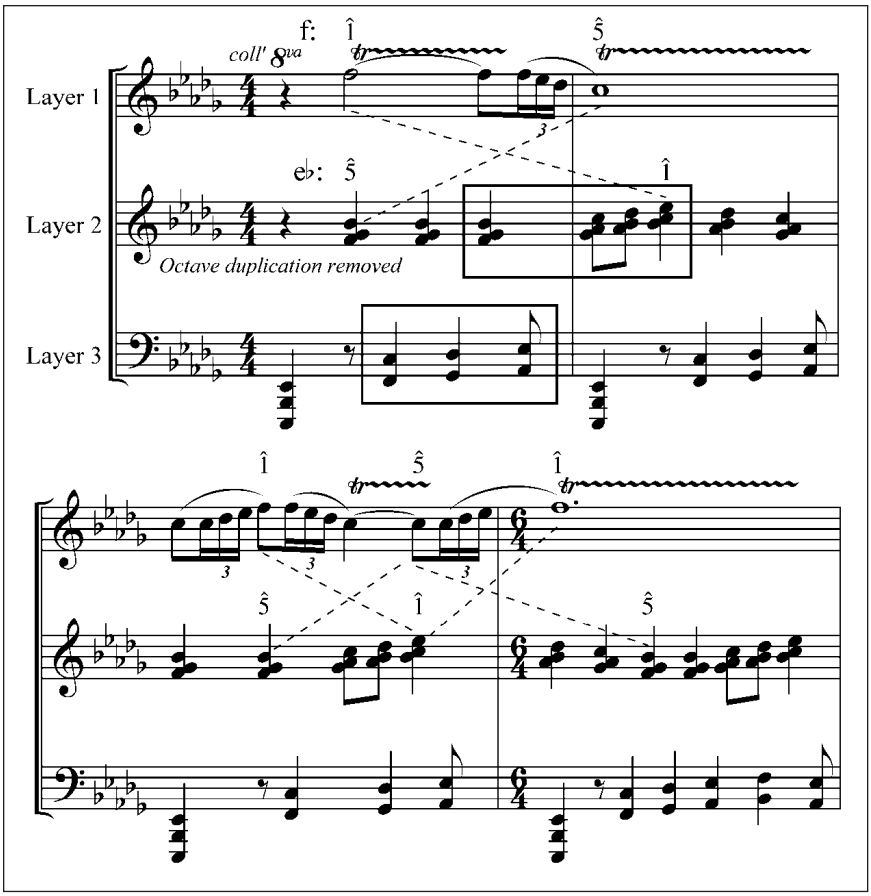
[26] This is also the horns' first significant entrance in the movement. If class time allows, the orchestration of this passage is a worthwhile topic of discussion.

in a new melodic figure (Melody 3) at m. 22. Oscillating between F and C, this very simple line is a fertile source for class discussion:

- *How does Melody 3 introduce tension into the existing texture?*
  The melody's boundaries, F and C, create mild dissonance (whole steps, to be precise) against the recently established stable boundary tones E♭ and B♭.

- *How many distinct layers of sound are present at this moment? What similarities are shared among the layers, and how do they interact?*
  There are three layers present; let us number them 1, 2, and 3 from the top downward. Layers 2 and 3 are both characterized by parallel motion. If the bass-note downbeat is removed from Layer 3 the remaining "tenor" line shares the same pitch-class span (F to E♭) with Layer 2, and with the melody of the introduction. Layer 1 might be considered a remnant of the alternate F tc of the introduction, with F and C acting as $\hat{1}$ and $\hat{5}$ in their own right. If scale-degree numbers are applied to both Layer 1 and the topmost voice of Layer 2, the contrary motion between the voices recalls that of a classical voice exchange, with the top voice a whole step "too high"[27] (See Example 7).

[27] Once again, Tymoczko's "polytonality" discussion might be invoked and summarized as a discussion point (see note 22): "Do we hear this passage in two "keys" at once? Is this even possible? In what contexts *could* it be possible? Or do we hear F and C as $\hat{2}$ and $\hat{6}$, respectively, of the Dorian scale?"

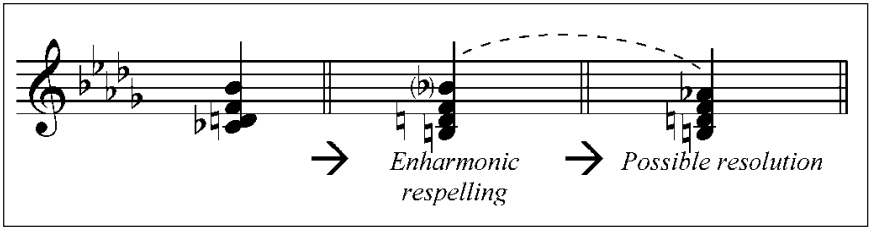


Example 7. mm. 22-25. Layers 1 & 2 move in contrary motion, analogous to a voice exchange; Layers 2 and 3 share the same pc span (shown in boxes).

As Melody 3 asserts F as the new upper boundary, the chord structure at m. 26 follows suit by reverting to its original form, also with F in the uppermost voice. The boundary is subsequently raised to B♭ once again with the final appearance of Melody 1 just before m. 32.

The students exemplified in our hypothetical first-day survey might well point to m. 32 as support for their negative responses. Even those with the best of intentions may feel confounded in their attempts to understand this suddenly dissonant--one might even say ferocious--passage. First, the "offending" sonority should be discussed on its own terms: Taruskin describes it as a diminished triad with an added diminished octave derived from an unresolved

appoggiatura to a would-be diminished seventh chord[28] (Example 8). Tonally-oriented undergraduate students might more readily see it as a major triad with an added half step against the root. (In this example, B♮ is added against a B♭ major triad.) But divorced from any common-practice context, as a sonority in itself, the chords accompanying the melody are all comprised of the same pitch set class (0,1,4,7). To reiterate, this article presumes that students have no prior experience with pitch-class set theory, but at this point, the set-class name might be casually introduced so that the sonority is easily referenced later (See note 16).

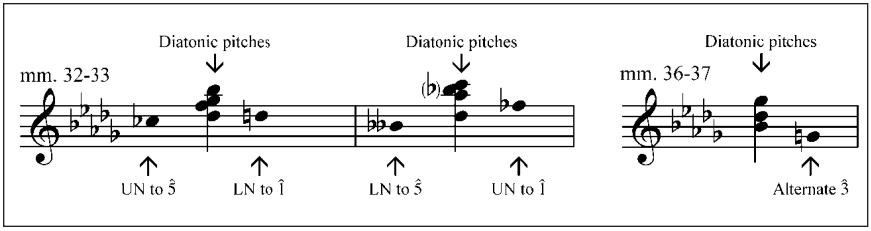


Example 8. The (0,1,4,7) sonority as unresolved diminished seventh.

To call the sonority "0,1,4,7" is fine--even encouraged--but to make sense of it *sonically*, students should be directed to consider its context. Up to this point, Stravinsky has gone to great lengths to create a sound canvas that is almost entirely diatonic, and to present new dissonance in an orderly fashion. Assuming the listener is now inured to any dissonance occurring among pitches of the diatonic scale, this passage (mm. 32-42) simply continues on the same trajectory, adding chromatic half steps on either side of the first and fifth degrees (Example 9). Pierre Boulez elegantly explains this phenomenon as a "horizontal diatonicism [in opposition] to a vertical chromaticism."[29] Students may discover this for themselves by charting the chromatic tones within the measures that contain only a single sonority (Example 9):

[28] Taruskin, *Stravinsky and the Russian Traditions*, 2:944.

[29] Boulez, *Notes of an Apprenticeship*, 74.



Example 9. Diatonic and chromatic pitches in mm. 32-33, and 36.

Having undermined the first and fifth scale degrees in the first two measures of the passage, Stravinsky proceeds to do likewise with the third, G♭, by pitting it against G♮ in mm. 36-37. (Students will recall that G♮ was first introduced in Melody 1 as an alternate mediant to G♭.) Here, the two modal inflections are simply verticalized into a split-third triad. As students begin to discover just how carefully Stravinsky chose his "discordant" notes, Stephen Walsh's observation on the composer's chordal language rings especially true: "We cannot argue, in the presence of so beautifully constructed a dissonance, that any old crash would have done just as well."[30]

Lest we overlook the horizontal aspects of this passage, let us again consider three layers, numbered from the top (Example 10):

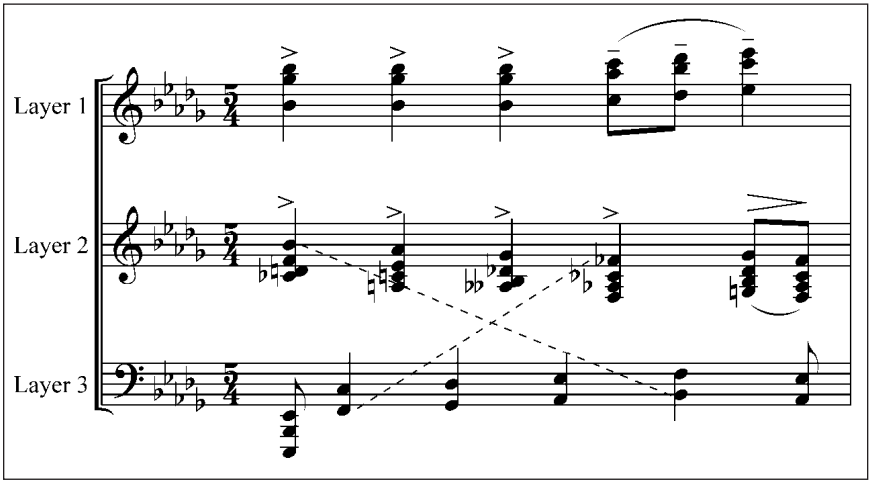
- *What do all three layers have in common?*
  They all consist of some type of sonority moving in parallel motion: Parallel thirds in Layer 1, parallel (0,1,4,7) chords in Layer 2, and parallel perfect fifths in Layer 3.

- *What is the relationship of the "outer" layers, 1 and 3?*
  Both layers are diatonic (with the exception of C♭ in m. 38, and F♭ in m. 42; these are addressed later.) Both are similar to their counterparts in the previous passage, except for orchestration.

- *Compare the linear motion of Layer 2 with that of Layers 1 and 3.*
  In Layer 2, the (0,1,4,7) chords are connected by chromatic planing, moving in contrary motion to Layers 1 and 3.

[30] Walsh, *The Music of Stravinsky*, 49. (This quote refers specifically to the "Augurs of Spring" chord.)

- *How does this relationship recall the previous passage?*
  It echoes the "voice exchange" idea heard in mm. 22-25. In m. 35 specifically, the outer voices of Layers 2 and 3 form cross-related exchanges: B♭ to F/F♭ (see Example 10).



Example 10. Cross-related voice exchanges in m. 35.

When discussing the questions above, it is likely that a student will say--incorrectly--that each line is "harmonized" with thirds, fifths, etc. This particular wrong answer is desirable if it presents the opportunity for a further clarification of the terminology. "Harmony," in its narrowest sense, refers to the functional, goal-oriented process of chord ordering that underlies tonal music. In a broader sense, it may connote any progression of chords that functions within a composer's self-defined syntax. (e.g., there is harmonic function in Prokofiev's music, even though it is not in the strictest sense "tonal" music.) But neither of these conditions exists in this passage (nor, for that matter, in the entire movement). There is no harmony here, only three lines of counterpoint, each thickened by planing--diatonic on the outside and chromatic in the middle. Again, this is the time when good habits should be forged: The terms "sonority," "chord,"[31] or even the popular (if unwieldy) "simultaneity" should be encouraged, but the treatment of this

[31] While it can be argued that "chord" implies common-practice harmony, it also prepares the class for the subsequent introduction of "trichord," "tetrachord," etc.

passage is most definitely *not* a "harmonization."[32]

Before leaving this passage, a final set of discussion questions may be explored:

- *What are the only two chromatic pitches present in the outer layers and how do they relate to the E♭ Dorian scale?*
  They are C♭ in m. 38 and F♭ in m. 42. These pitches are half steps above scale degrees $\hat{1}$ and $\hat{5}$, respectively. The C♭ may be heard as a chromatic passing tone connecting the diatonic pitches B♭ and C♮. In the culminating chord of the passage (m. 42), the lower boundary tone E♭ is superseded by F♭.[33]

- *How is the presence of these two pitches (F♭ and C♭) foreshadowed in the previous section?*
  Their diatonic counterparts, F♮ and C♮, are the boundary tones of Melody 2. (See Example 7). The mild whole-step dissonance against scale degrees $\hat{1}$ and $\hat{5}$ in the previous passage is now replaced with half-steps against the same scale degrees.

At this point the entire *pesante* may be summarized as a metaphorical tug-of-war between boundary tones and structural dissonance. Where dissonance appears, boundary tones respond by reaching to the tonic or dominant, offering the listener a temporary sense of harmonic stability. The counter-maneuver at m. 32 is emphatic: Chromatic neighbors in the orchestral *tutti* provide even sharper dissonance against $\hat{1}$, $\hat{5}$, and $\hat{3}$. Here the melody again reaches for the first and fifth degrees, this time in a higher register. At the same time, the overall diatonic structure begins to fail, first in the melody (C♭ at m. 38), then in the bass (F♭ at m. 42), causing the impasse that ends the section.[34]

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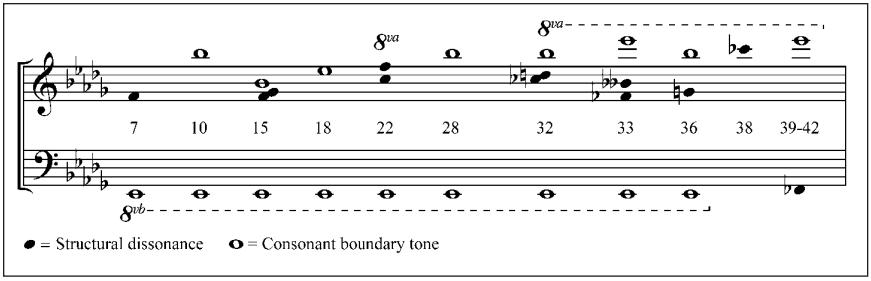
[32] To muddy the terminology a bit further, "harmonic" is perfectly acceptable (as evidenced by Forte's book title) to describe two or more tones sounding together (e.g., a harmonic interval versus a melodic one).

[33] In the context of a course on the entire *Rite of Spring*, the relationship of this sonority to the F♭/E♭ "Augurs of Spring" polychord cannot be overlooked.

[34] Hill, *Stravinsky: The Rite of Spring*, 67.

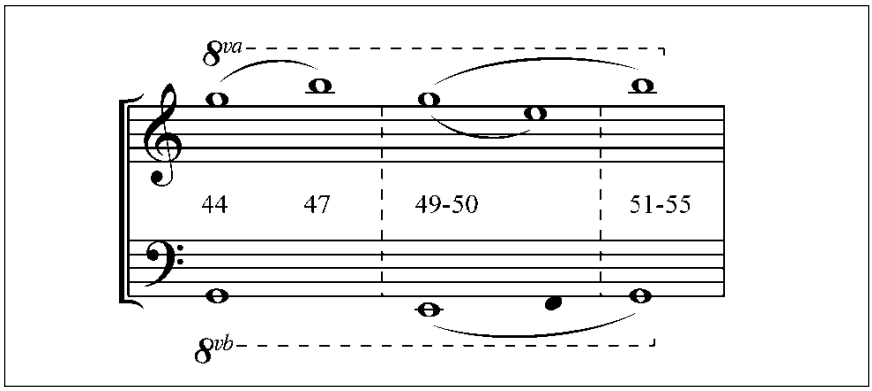


Example 11. Overview of boundary tones and structural dissonance in the *pesante* section (mm. 7-42).

The *Vivo* section (mm. 43-54) is quite short in proportion to the rest of the movement (depending on the recording one uses, it accounts for about seven percent of the total time), and my remarks about it will be correspondingly brief. The section is characterized by a G pedal tone, embellished by arcing figures in the strings and high winds. If students are using the orchestral score, they will easily see two layers, recalling the same technique that has been at work throughout the movement. There is a diatonic line (in this case, all "white notes") in the flute, second violin, and cello, and a chromatic line divided among the remaining instruments in motion. (In the piano-four-hand score, these two "lines" are, for the most part, divided between the hands of the *secondo* player.) The orchestral *tutti* chords that punctuate the section might well serve as a foundation for the further exploration of set theory: The entire chordal collection yields two (0,1,3,4) sets: C-D♭-E♭-E and G-A♭-B♭-B. Once students encounter this tetrachord, ubiquitous in Stravinsky's early work, the path is clear to introduce octatonicism, as well as Stravinsky's technique of diatonic/octatonic superimposition.[35] Of course, no serious discussion of the *Rite* is well-served by overlooking the octatonic scale, but it is doubtful that the instructor will have sufficient time to get there in a single class period. A carefully written homework assignment will get students thinking about these concepts--and presumably prepared to discuss them in the subsequent class meetings.

To conclude our first-day analysis let us examine the most prominent pitches of the *Vivo*. The boundary tones of the punctuating chords reveal a focus on G, reaching outward to B above and E below (Example 12):

[35] Two (0,1,3,4) tetrachords separated by a whole step will yield a Dorian scale (e.g., C-D-E♭-F / G-A-B♭-C). If the upper tetrachord is shifted down a half step, the result is an octatonic collection (C-D-E♭-F / F♯-G♯-A-B). A beautifully clear example of this technique may be found in Bartok's "Song of the Harvest," No. 33 of *Forty-Four Violin Duets*.



Example 12. mm. 44-55 Boundary tones in the *Vivo* section.

The resulting E minor triad, articulated over the duration of the passage, recalls the three principal chromatic interpolations of the previous section:

E (F♭) - The lower boundary of the closing chord of the *pesante* section (m. 42)

G - The alternate third scale degree to G♭

B (C♭) - The only chromatic pitch to infiltrate Melody 2 (m. 38)

Another inroad to octatonic language may be found in the bass motives for each section: The ostinato of the *pesante* begins with E♭-F-G♭ (0,2,3), while the principal bass pitches of the *Vivo* are E-F-G (0,1,3). Either of these trichords (whole-half or half-whole) may form the basis for an octatonic collection. The overall transformation from the first trichord to the second is echoed in the movement's coda: The last four bars of the melody are transposed up a whole step from the introduction so that the melody now ends on G instead of F.

By beginning in familiar territory and proceeding logically and incrementally through increasing layers of dissonant color, Stravinsky's "Spring Rounds" has the power to gain students' aesthetic trust as it equips them with a basic frame of mind for confronting the twentieth-century canon. As each new level of dissonance is introduced, it is mitigated by a consonant boundary tone, in a system of musical checks and balances. Moreover, the movement is a clear example of Stravinsky's contrapuntal techniques, specifically the interaction of the diatonic and the chromatic (representing the human and supernatural realms[36]) that defines the composer's Russian period. Arguably the most accessible movement of the *Rite*, "Spring Rounds" is an ideal

[36] Hill, *Stravinsky: The Rite of Spring*, 45.

gateway for further study of twentieth-century musical language. Granted, as long as there are music theory classes, there will be students who remain unconvinced that this or any other analysis can make aesthetic sense of dissonant sounds. But for many, it can be the first step toward understanding and appreciating the works of the twentieth century.

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Error Detection in the Aural Skills Class: Research and Pedagogy

By Stacey Davis

The past thirty years have seen a rapid increase in research on music perception and cognition, including the establishment of academic societies, research conferences, and scholarly journals. In general, this research focuses on exploring the mental processes involved in listening to, remembering, understanding, performing, and responding to music. These topics are inherently interdisciplinary, with scholars emerging and collaborating from a variety of research fields, including cognitive psychology, neuroscience, psychoacoustics, music theory, and music education.

In the field of music theory, aural skills pedagogy is a natural place to apply the findings of this perceptual research. The typical ear training activities of identification, sight-singing, dictation, and error detection are clearly dependent upon hearing, perception, and memory. But perceptual research has yet to significantly affect our pedagogical approaches, teaching materials, and classroom activities. Butler and Lochstampfor commented on these "bridges unbuilt" in a 1993 article.

> A cursory examination of references cited in the literature of aural training pedagogy suggests that there is very little correspondence between research activities in music cognition and pedagogical activities in aural training: although there are important individual exceptions, there does not seem to have been a widespread effort to identify, gather, evaluate, and synthesize experimental results from the research area of music cognition so that they may be applied directly to aural training in our college music programs.[1]

The following seven years brought little change, with Karpinski stating that "very little aural skills training has been informed by the explosion of research in music perception and cognition during the past quarter century. Important findings about perception and

[1] David Butler and Mark Lochstampfor, "Bridges Unbuilt: Comparing the Literatures of Music Cognition and Aural Training," *Indiana Theory Review* 4 (1993): 6.

cognition . . . seem to have been unexamined or ignored by the authors of nearly every aural skills text in current use."[2]

Another ten years have passed since Karpinski's comment, but a review of current aural skills research and pedagogical resources yields similar results. Although there are a number of important contributions, many aural skills instructors are not familiar with the findings of music perception research.[3] This results in the creation of pedagogical materials that lack a perceptual foundation. Likewise, some music perception researchers are not aware of the issues of teaching aural skills, thus making it difficult to generate research questions that are most pertinent to pedagogy. As a starting point for linking these two fields, this paper focuses on the important skill of error detection. After a brief review of the components of this skill and its status in the aural skills class, focus is placed on surveying a selection of perceptual studies that reveal information about factors that affect error detection ability. Applying these research findings to pedagogical issues illuminates avenues for future research and generates ideas for improving teaching methods and materials.

Defining Error Detection

The ability to evaluate music performance and make comparisons between sound and notation is applicable to almost every musical

[2] Gary S. Karpinski, "Lessons From the Past: Music Theory Pedagogy and the Future," *Music Theory Online* 6.3 (2000): 5.3.

[3] For a survey of perception research as it applies to some aspects of music theory pedagogy, see Elizabeth West Marvin, "Research on Tonal Perception and Memory: What Implications for Music Theory Pedagogy?" *Journal of Music Theory Pedagogy* 9 (1995): 31-70. Perceptual research is also mentioned in David Butler, "Why the Gulf Between Music Perception Research and Aural Training?" *Bulletin of the Council of Research in Music Education* 132 (1997): 38-48; Gary Karpinski, "A Model for Music Perception and its Implications in Melodic Dictation," *Journal of Music Theory Pedagogy* 4 (1990): 191-229; Karpinski, *Aural Skills Acquisition: The Development of Listening, Reading, and Performing Skills in College-Level Musicians* (New York: Oxford University Press, 2000); Edward Klonoski, "A Perceptual Learning Hierarchy: An Imperative for Aural Skills Pedagogy," *College Music Symposium* 40 (2000): 168-169; William E. Lake, "Interval and Scale-Degree Strategies in Melodic Perception," *Journal of Music Theory Pedagogy* 7 (1993): 55-67; and Steve Larson, "Scale-Degree Function: A Theory of Expressive Meaning and its Application to Aural Skills Pedagogy," *Journal of Music Theory Pedagogy* 7 (1993): 69-84.

situation, including listening, performing, studio teaching, conducting, and adjudication. As Karpinski described,

> Error detection and correction are indeed indispensable skills that all musicians should possess to a useful degree. Ideally, every time musicians sing or play from notation a constant process of self-correction takes place between their eyes and ears. The more adept musicians are at detecting and correcting discrepancies between sound and notation, the more often such errors can be corrected and even avoided in their own performances.[4]

In all of these situations, error detection requires multi-sensory perception and multi-tasking ability. Listening activities can involve both sound and notation, while performance situations add the variable of concurrently playing an instrument or conducting. In order to notice mistakes in performance, one must have correctly internalized how that music should have sounded, either from hearing it before or from interpreting music notation. Making these comparisons requires the simultaneous use of different perceptual mechanisms and skills.

Comparing different sounds (or performances) involves musical memory and expectation. One must remember what was heard first in order to recognize any changes or errors in a subsequent performance. This ability is required when comparing two consecutive performances of an unfamiliar piece or evaluating a new performance of a well-known piece. Because memory and expectation are influenced by a variety of factors, instructors cannot assume that all students have the ability to listen attentively, compare multiple sounds, and identify similarities and differences. Sound comparison tasks should therefore be an important part of the error detection component of an aural skills curriculum.

Other error detection tasks require comparisons between aural and visual information, thereby relying on the ability to associate what is heard with what is notated in the score. Examples of this task include comparing a performance to a prepared score or matching the sound of a well-known piece (either heard or imagined) to its notation (without hearing what was written). An alternate task requires the comparison of score and sound for an unfamiliar or unprepared piece. Without actually hearing the

[4] Karpinski, *Aural Skills Acquisition*, 130.

piece, listeners imagine the notated sounds in order to evaluate the performance. Gordon coined the term "audiation" to describe this ability to "assimilate and comprehend in our minds music we may or may not have heard, but are reading in notation or composing or improvising."[5] Audiation could be considered a form of "sight-hearing," which is a natural counterpart to the other typical aural skills activity of sight-singing.[6]

Almost all of the error detection examples in ear training textbooks involve this skill of aural imagery or audiation. Students are presented with an unfamiliar score and asked to identify pitch or rhythm errors in its performance. Although this is a vitally important skill, many musical experiences do not involve sight-hearing. For instance, a performer, conductor, or teacher often knows a piece or has prepared a score before needing to evaluate its performance. Likewise, an adjudicator is sometimes required to compare different performances of the same piece. Focusing solely on audiation tasks will not necessarily develop all of these important evaluative skills. Error detection activities therefore need to incorporate a variety of different comparisons, including single sensory comparisons (sound to sound), multi-sensory comparisons (sound to notation), and various combinations of familiar (or prepared) and unfamiliar examples.

A broader definition of error detection would also incorporate the evaluation of a wider variety of musical characteristics. Rather than only listening for differences in pitch and rhythm, students need to be aware of tonality, contour, interval size, meter, harmony, articulation, dynamics, tempo, tone quality, intonation, technical precision, balance, and expression. Being able to detect differences or errors in each of these features requires an assortment of valuable perceptual and evaluative skills.

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[5] Edwin E. Gordon, *Learning Sequences in Music: A Contemporary Music Learning Theory* (Chicago: GIA Publications, 2007), 4. Daniel Martin used the term "auralization" to refer to the ability to "form a mental impression of sound not yet heard." See Daniel W. Martin, "Do You Auralize?" *Journal of the Acoustical Society of America* 24 (1952): 416.

[6] James L. Byo and Deborah A. Sheldon, "The Effect of Singing While Listening on Undergraduate Music Majors' Ability to Detect Pitch and Rhythm Errors," *Journal of Band Research* 36 (2000): 27.

Incidence of Error Detection in Aural Skills Classes

In 1990, Pembrook and Riggins sent a survey about aural skills teaching to 908 schools in the College Music Society Directory.[7] Responses came from instructors at 336 schools from 45 different states. Survey questions focused on organizational approaches, teaching materials, sight-singing methods, use of computers, and division of class time. The question about materials revealed that 47% of instructors used Benward's *Sight-singing Complete* as an error detection textbook, followed by 30% designing their own materials, 17% using no text, and 5% using CAI software.[8] Interestingly, Benward's text is intended for singing practice and does not contain any specific error detection activities.

Answers to the question about the division of class time revealed additional information about error detection. According to the results of this survey, a majority of time in the freshman aural skills class was spent on sight-singing, followed by identification tasks (i.e., labeling intervals or chord qualities) and dictation. Although error detection was considered important, 84% admitted that it was given the least amount of time in the freshman aural skills class. For sophomores, an equal amount of time was spent on sight-singing and dictation, followed by identification tasks and then error detection.[9] Pembrook and Riggins summarized that "considering the frequency that students will use this skill (e.g., as conductors, classroom and studio instructors, adjudicators, etc.), it is reasonable to suggest that more time should be devoted to developing this vital skill."[10]

Although this survey was completed twenty years ago, the contents of current ear training textbooks suggest that similar results might be gathered today. Only three of the most recently published textbooks contain specific error detection activities. Not only is this number small, but the included error detection tasks are fairly limited in both quantity and scope. In *A New Approach to Ear Training*,

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[7] Randall G. Pembrook and H. Lee Riggins, "Send Help!: Aural Skills Instruction in U.S. Colleges and Universities," *Journal of Music Theory Pedagogy* 4 (1990): 231-242.

[8] Ibid., 237.

[9] Ibid.

[10] Ibid., 239-240.

Kraft includes three "Hearing Differences" sections.[11] Each of these sections contains four, four-measure melodies whose performances contain mistakes in pitch and/or rhythm. Error detection is included in almost every chapter of Benward and Kolosick's *Ear Training: A Technique for Listening*, with various chapters focusing on finding errors in rhythmic patterns, short pitch patterns, short melodies, excerpts from the literature, two-voice examples, and harmonic progressions.[12] Finally, Marcozzi includes a "Fusion and Transfer" section in each chapter of *Strategies and Patterns for Ear Training*.[13] These activities require students to identify errors in four-note pitch patterns, short melodies, two-voice examples, single chords, and harmonic progressions.[14]

All three of these textbooks have an accompanying CD, with examples played as MIDI files using the piano timbre. Instructors might also choose to perform examples using the classroom piano. In most cases, the notated score is correct and the students are asked to identify errors in the performance. However, the Benward and Kolosick textbook occasionally provides examples with a correct performance and errors in the notated score. In all exercises, students are instructed to identify errors in pitch and/or rhythm. For pitch errors, melodic contour is typically maintained and certain pitches are changed by a whole or half step. Students are usually told how many errors to find, with some examples varying the number of errors (up to 4). Marcozzi includes some "placebo" examples that do not contain any errors at all.

Based on these surveys of class time and textbooks, the attention given to error detection does not match its supposed importance. This small number of pedagogical resources could certainly be affecting class time, with limited materials making it more difficult

[11] Leo Kraft, *A New Approach to Ear Training*, 2nd Ed. (New York: W.W. Norton & Company, 1999).

[12] Bruce Benward and J. Timothy Kolosick, *Ear Training: A Technique for Listening*, 7th edition revised (New York: McGraw-Hill, 2010).

[13] Rudy Marcozzi, *Strategies and Patterns for Ear Training* (Upper Saddle River, NJ: Prentice-Hall, 2009).

[14] The following two textbooks contain comments about error detection, but no specific activities: Thomas Durham, *Beginning Tonal Dictation* (Prospect Heights, IL: Waveland Press, 2004) and Gary S. Karpinski, *Manual for Ear Training and Sight Singing* (New York: W.W. Norton & Company, 2007).

and time consuming to include error detection as a classroom activity or assigned practice task. If a wide variety of scores and recordings with errors is not readily accessible, instructors might opt to focus on other activities. Other explanations for this shortage of attention could be teacher experience, student preparation and ability, time constraints, emphasis on other ear training activities, and assumptions about the acquisition of error detection ability. Although additional resources might lessen the effect of many such issues, these resources must incorporate a broader definition of error detection and an awareness of perceptual principles in order to best facilitate the acquisition of this important skill.

Applying Research to Pedagogy

Error detection has received very little attention from the music theory research community. Although some publications discuss its importance and suggest general teaching strategies, there is very little research on the topic by those that are most likely teaching these classes.[15] The field of music perception, on the other hand, has generated a significant amount of research on error detection. Most of these perceptual studies involve listening tasks that require participants to compare two versions of a short rhythmic, melodic, or harmonic pattern. The second version is either an exact repetition of the first or an altered rendition that contains changes in key, contour, interval size, rhythm, meter, and/or tempo. Although these listening tasks do not typically involve a notated score, they provide information about the perception of a variety of musical characteristics. There are also many studies that investigate the perception of notation and the process of sight-reading in general.

Scholars in the music education community have also produced a substantial amount of perceptual research on error detection. This research focuses on the role of error detection in the training of beginning musicians, conductors, and public school teachers. Participants in these studies are typically children in the early

[15] A description of issues related to error detection is included in Karpinski, *Aural Skills Acquisition*, 130-132. Error detection is not mentioned in Michael R. Rogers, *Teaching Approaches in Music Theory: An Overview of Pedagogical Approaches* (Carbondale, IL: Southern Illinois University Press, 2004) and receives only a brief mention as the "wrong note technique" in John D. White, *College Teaching of Music Theory*, 2nd ed. (Lanham, MD: Scarecrow Press, 2002), 46.

stages of learning to play an instrument or music education majors (student conductors) learning to prepare scores and manage rehearsals. Although there are some natural differences in perceptual skills between children and college students, the findings of these studies are still relevant to the aural skills instructor. Music educators typically ask perceptual questions that are applicable to specific musical skills or stages of development, which allows for connections to be made between cognitive psychology and musical practice. It is therefore important that aural skills instructors are aware of both music perception and music education research, particularly when it addresses concepts that align with the skills we are teaching.

The remainder of this paper contains a survey of selected research from these two disciplines. After a brief summary of research on student-related factors, focus is placed on summarizing studies that investigate how various characteristics of musical structure and performance affect error detection ability. These research findings will be applied to examples from the three ear training textbooks that contain specific error detection activities. The intent is not to criticize these examples, but rather to use them as a starting point for discussing the variables that could be considered when designing effective error detection resources.

Student-related factors

A musician's background and prior experience can significantly affect the ability to make comparisons and identify differences. Some of the factors that might influence error detection accuracy are music reading ability, music memory ability, years of private lessons, number of instruments played, ensemble experience, sight-reading ability (on own instrument and sight-singing), and music theory knowledge. Research on these student-related factors has produced mixed results. Some studies show no relationship between error detection ability and years of private lessons, ensemble experience, number of different instruments played, music theory ability, sight-singing ability, dictation ability, memory skills, and score reading ability.[16] Other studies suggest that theory

[16] Manny Brand and Vernon Burnsed, "Music Abilities and Experiences as Predictors of Error-Detection Skill," *Journal of Research in Music Education* 29 (1981): 91-96; James L. Byo, "The Influence of Textural and Timbral Factors on the Ability of Music Majors to Detect

skills, performance experience, choral arranging experience, and sight-singing ability improve error detection accuracy.[17] Although these results appear inconclusive, they still suggest that error detection is a distinct skill that requires separate practice. It will not necessarily emerge as a byproduct of practicing seemingly related skills. For instance, a student who can successfully perform melodic dictation or sight-sing a melody may not automatically have strong error detection skills. Likewise, a student's performance ability and prior experience may not correlate with their level of error detection ability.

There is also substantial research on the perception of music notation and on sight-reading as it applies to performance. Studies have shown that music reading ability is a separate perceptual skill, with different processes occurring for superior and inferior readers.[18] Skilled readers have better visual memory for notation, stronger grouping (or chunking) ability, and more sensitivity to the structural configurations of notation. These skills also relate to sight-reading while performing. Good sight-readers have better chunking ability, which reflects their understanding of musical structure, expectation, and grouping. For instance, it is advantageous to recognize a triad or seventh chord as a single

Performance Errors," *Journal of Research in Music Education* 41 (1993): 156-167; Harold E. Fiske, "Relationships of Selected Factors in Trumpet Performance Adjudication Reliability," *Journal of Research in Music Education* 25 (1977): 256-263; Robert G. Sidnell, "Self-Instructional Drill Materials for Student Conductors," *Journal of Research in Music Education* 19 (1971): 85-91.

[17] Carroll Lee Gonzo, "An Analysis of Factors Related to Choral Teachers' Ability to Detect Pitch Errors While Reading the Score," *Journal of Research in Music Education* 19 (1971): 259-271; Janice N. Killian, "The Relationship Between Sightsinging Accuracy and Error Detection in Junior High Singers," *Journal of Research in Music Education* 39 (1991): 216-224; Richard C. Larson, "Relationships Between Melodic Error Detection, Melodic Dictation, and Melodic Sightsinging," *Journal of Research in Music Education* 25 (1977): 264-271; Deborah A. Sheldon, "Effects of Contextual Sight-Singing and Aural Skills Training on Error-Detection Abilities," *Journal of Research in Music Education* 46 (1998): 384-395.

[18] Andrea R. Halpern and Gordon H. Bower, "Musical Expertise and Melodic Structure in Memory for Musical Notation," *The American Journal of Psychology* 95 (1982): 31-50; John A. Sloboda, "The Psychology of Music Reading," *Psychology of Music* 6 (1978): 3-20; John A. Sloboda, "Experimental Studies of Music Reading," *Music Perception* 2 (1984): 222-236.

entity rather than as multiple, individual pitches. Noticing such patterns reduces the amount to be remembered and facilitates the performance of unfamiliar music.[19] Studies of eye movements during performance have also shown that good sight-readers consistently look beyond the music they are currently playing.[20] Although many error detection tasks do not require simultaneous performance, there are similarities between sight-reading and sight-hearing. Listeners must understand notation, recognize musical patterns or groups, and look ahead in the score in order to notice errors in the performance of an unfamiliar or unprepared piece.

Music-related factors

Many structural features affect the complexity and perception of music, thereby also affecting error detection accuracy. Some important features to consider are tonal context, contour, interval size, consonance and dissonance, harmonic progression, phrase structure, pattern repetition, rhythm, meter, accents, texture, timbre, and tempo. The location of the error relative to other structural features, along with a person's familiarity with the music, also affects responses to an error detection task. All of these features must be taken into consideration when choosing music for an error detection task, planting errors in a performance, and understanding student strengths and weaknesses.

Memory is a particularly important factor when examining the relationship between musical structure and error detection ability. In tasks that require participants to sing back a short melody from memory, global characteristics like meter, key, overall shape, and

[19] For a survey of research on sight-reading, see Andreas C. Lehmann and Victoria McArthur, "Sight-Reading" in *The Science and Psychology of Music Performance*, ed. Richard Parncutt and Gary E. McPherson (New York: Oxford University Press, 2002), 135-150; Andreas C. Lehmann and Reinhard Kopiez, "Sight-reading" in *The Oxford Handbook of Music Psychology*, ed. Susan Hallam, Ian Cross, and Michael Thaut (Oxford: Oxford University Press, 2009), 344-351.

[20] Thomas W. Goolsby, "Profiles of Processing: Eye Movements During Sightreading," *Music Perception* 12 (1994): 97-123; Jaime Madell and Sylvie Hébert, "Eye Movements and Music Reading: Where Do We Look Next?" *Music Perception* 26 (2008): 157-170; Andrew J. Waters and Geoffrey Underwood, "Eye Movements in a Simple Music Reading Task: A Study of Expert and Novice Musicians," *Psychology of Music* 26 (1998): 46-60.

phrase structure are best remembered.[21] Melodies that follow tonal patterns and expectations are also better remembered than those that do not, particularly when those melodic patterns coincide with metric and rhythmic accents.[22] Exact pitches, intervals, implied harmonies, and rhythms are more difficult to remember, with metric context, rhythmic complexity, number of contour changes, and metric placement of contour changes affecting error detection accuracy.

Sheldon studied the role of memory by investigating how the number of repetitions affects error detection accuracy.[23] In this study, participants were given notated scores of twelve examples from the band literature. A correct performance of each piece was followed by an error-filled performance that was repeated three times. The task was to identify mistakes in articulation, intonation, pitch, rhythm, tempo, dynamics, and balance. Results indicated that error detection was most accurate following the first hearing, with accuracy decreasing after the second hearing and then again for the third. During the last two repetitions, participants also identified errors that did not actually occur. Sheldon suggested that the results after the first performance were better because it immediately followed hearing the correct rendition and was less dependent on the listener's memory. Later hearings, on the other hand, required participants to rely on audiation to compare the performance and the score. This suggests that increasing the number of hearings does not necessarily facilitate error detection accuracy. Perhaps it instead causes listeners to mistakenly identify correct notes as errors as they "learn" the error-filled performance and lose either the memory of the correct version or the ability to audiate the notated version. A single listening also more accurately reflects every-day musical experiences. We hear a performance and must immediately respond to adjust our own performance,

[21] John A. Sloboda and David H.H. Parker, "Immediate Recall of Melodies" in *Musical Structure and Cognition*, ed. Peter Howell, Ian Cross, and Robert West (London: Academic Press, 1985); Jack A. Taylor and Randall G. Pembrook, "Strategies in Memory for Short Melodies: An Extension of Otto Ortmann's 1933 Study," *Psychomusicology* 3 (1983): 16-35;

[22] Marilyn Boltz, "Some Structural Determinants of Melody Recall," *Memory and Cognition* 19 (1991): 239-251.

[23] Deborah A. Sheldon, "Effects of Multiple Listenings on Error-Detection Acuity in Multivoice, Multitimbral Musical Examples," *Journal of Research in Music Education* 52 (2004): 102-115.

give corrective feedback to individual students or ensembles, or generate an evaluative opinion.

Dowling has conducted many experiments that investigate how listeners remember the pitch-related elements in a melody, with possible conceptualizations being a set of absolute pitches, a contour, a set of consecutive intervals, or a series of relative pitches in a tonal context.[24] Participants in these listening experiments were asked to compare two different performances of various short melodies. The second performance was an exact transposition of the first to a different key, a transposition that started on a different pitch but maintained the original key (a "tonal answer"), an atonal version that retained the same contour, or a randomly generated melody that had a different contour and different intervals. The task was to indicate whether the second melody was the same as the first. Playing the melodies at different pitch levels allowed Dowling to study the perception of contour, interval size, and scale degree (rather than just exact pitch repetition).

Results of one study showed that listeners were very accurate when distinguishing the original melody from the atonal and random versions. But participants performed at chance when attempting to differentiate between the exact transposition and the tonal answer.[25] A tonal answer has the same contour as an exact intervallic transposition, but some intervals are changed by a semitone in order to stay in the same key as the original melody. Having difficulty telling these two versions apart suggests that listeners remember contour and tonal strength rather than exact intervals when comparing performances of unfamiliar melodies. This is consistent with other studies whose results suggest that listeners identify contour differences better than pitch differences in error detection tasks involving short-term memory.[26] However,

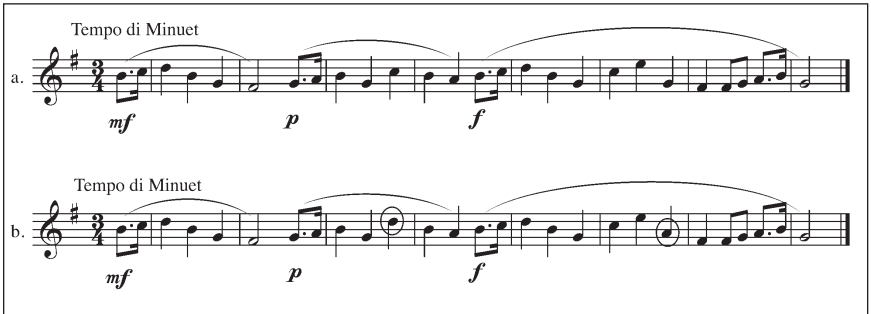
[24] W. Jay Dowling, "Context Effects on Melody Recognition," *Music Perception* 3 (1986): 282-283.

[25] W. Jay Dowling, "Scale and Contour: Two Components of a Theory of Memory for Melodies," *Psychological Review* 85 (1978): 341-354.

[26] W.L.M. Croonen, "Effects of Length, Tonal Structure, and Contour in the Recognition of Tone Series, *Perception and Psychophysics* 55 (1994): 623-632; Lola L. Cuddy, "On Hearing Patterns in Melody, *Psychology of Music* 10 (1982): 3-10; Lola L. Cuddy, Annabel J. Cohen, and D.J.K. Mewhort, "Perception of Structure in Short Melodic Sequences, *Journal of Experimental Psychology: Human Perception and Performance* 7 (1981): 869-883; Lucinda A. Dewitt and Robert G. Crowder, "Recognition of

the opposite is true for the perception of performances of well-known melodies that are stored in long-term memory. People have extremely accurate memories for the exact intervals of familiar tunes, which aids in the identification of songs transposed to different keys.[27]

This research on the perception of contour, pitch, and tonal context is directly applicable to error detection tasks in the aural skills class. In most ear training textbooks, error detection examples retain contour and change certain pitches by a whole or half step. For instance, both of the errors in the performance of the melody in Example 1 are a whole step higher than the correct note. Although this performance has not been transposed to a new key, these errors create a tonal lure similar to the ones used in the perception studies. Without a fully developed sense of scale degree function and strong audiation skills, students might fail to notice these pitch errors in an unfamiliar melody that exists only in short-term memory. The wrongly played pitches retain overall contour, maintain



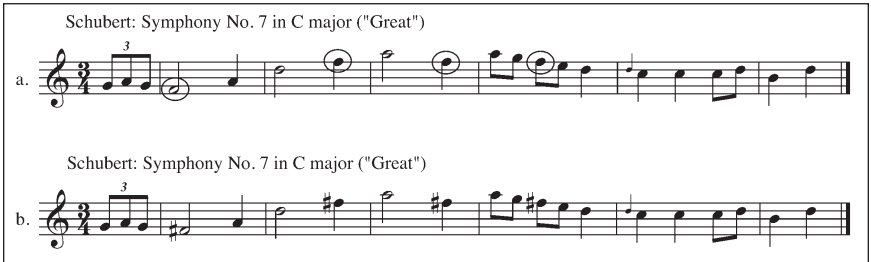
Example 1. Adapted from Exercise 3F-1, #3 in Marcozzi, *Strategies and Patterns of Ear Training*, 82 (a. student notated version; b. instructor performed version). Notation is correct, performance errors are circled.

Novel Melodies after Brief Delays," *Music Perception* 3 (1986): 259-274; W. Jay Dowling, "Tonal Strength and Melody Recognition After Long and Short Delays," *Perception and Psychophysics* 50 (1991): 305-313; W. Jay Dowling, "Melodic Contour in Hearing and Remembering Melodies," in *Musical Perceptions*, ed. Rita Aiello and John A. Sloboda (Oxford: Oxford University Press, 1994): 173-190; W. Jay Dowling and Diane S. Fujitani, "Contour, Interval, and Pitch Recognition in Memory for Melodies," *Journal of the Acoustical Society of America* 49 (1971): 524-531.

[27] W. Jay Dowling and James C. Bartlett, "The Importance of Interval Information in Long-Term Memory for Melodies," *Psychomusicology* 1 (1981): 30-49.

tonal context, avoid disrupting cadences, and create a reasonable alternate melody. Since this type of pitch error can be difficult to hear when comparing the sound of two melodies, it might also be difficult to imagine in an aural-visual comparison task.

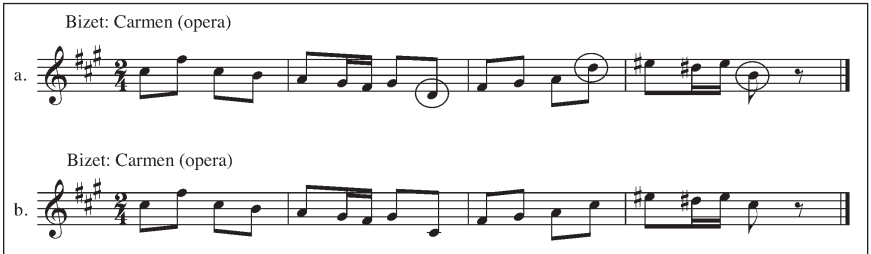
The melody in Example 2 also contains errors in exact interval size. This melody is taken from the middle of a piece, where the composer has modulated and the key signature no longer matches the key of the melody. Although the performance correctly reflects this change of key, the accidentals have been omitted from the score. If the instructor establishes this new tonal context, students might correctly perceive that the notated score lacks leading tones. But error detection is more difficult without this tonal context, particularly when the contour is maintained and the incorrectly notated melody looks acceptable in some other key. The ability to notice missing accidentals in the notated C major melody is dependent on the ability to hear the performed melody in the key of G major. It might therefore be more effective to use this example as a key perception task, rather than an error detection task. After hearing a performance of each version of the melody, students could be asked to sing back the tonic pitch. If students correctly perceive the way the F-sharps affect the relationship between whole and half steps and define tonal context, they would sing C for one version and G for the other.



Example 2. Adapted from Melody 10B, #10 in Benward & Kolosick's *Ear Training: A Technique for Listening*, 203 (a. student notated version; b. instructor performed version). Performance is correct, notated errors are circled.

The relationship between pitch and contour is different when listening to a familiar melody, where people have long-term memory for precise interval sizes. Example 3 contains an excerpt of a well-known melody from Bizet's opera *Carmen*. Similar to the melodies in Examples 1 and 2, correct contour is retained and

certain pitches are altered by step. But in this case, the performance is correct and the errors are in the notation. The listener therefore does not have the jarring perceptual experience of hearing a familiar tune played incorrectly. Although the error at the end would be easiest to perceive since it occurs at a cadence and does not match tonal context, students who cannot correctly audiate the notated score might find it difficult to identify the two pitch errors in the middle of the melody. Error detection accuracy would be much higher if the task was reversed and the errors instead occurred in the performance. The sound of this familiar melody would not match long-term memory and listeners would be better able to identify misplayed notes and determine corrections.



Example 3. Adapted from Melody 5B, #1 in Benward & Kolosick's *Ear Training: A Technique for Listening*, 95 (a. student notated version; b. instructor performed version). Performance is correct, notated errors are circled.

If error detection is only defined as the ability to match score and sound, location of the error could be deemed irrelevant. But visual perception of music notation is different than aural perception of music performance. Although all errors might create unexpected dissonance, violate tonal context and expectation, or contradict long-term memory, seeing that error and hearing that error are two different perceptual experiences. It is also rare that notated scores have errors. In typical performance and conducting situations, the score is notated correctly and the errors occur in performance. It is important that our pedagogical resources mimic musical practice as much as possible.

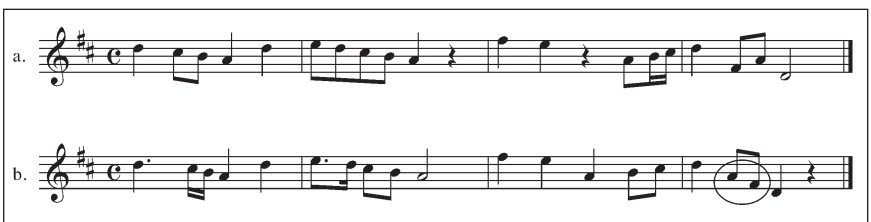
The difference between visually perceived and aurally perceived errors also relates to the role of tonal context in the task of error detection. As Sheldon described,

> An interesting hypothesis concerning the abilities of listeners to detect errors centers on musical context or

> reasonableness of the transgression. Some errors may seem more incorrect than others due to musical context. Errors that are less egregious than others may be more readily 'forgiven' and therefore not detected as errors at all, whereas errors that violate context to a greater degree are more likely to be identified by listeners.[28]

Incorrectly played pitches that violate tonal context are perceptually different than those that remain suitable in the prevailing key. A similar case could be made for rhythmic errors that violate metric context. This could be compared to research on proofreaders' error when reading text, where familiarity, expectation, and context can cause readers to overlook certain typographical or spelling errors. Sloboda tested proofreaders' error in music performance by asking pianists to sight-read simple pieces from scores with planted pitch errors.[29] Rather than playing them as written, the pianists instinctively corrected the pitches to match tonal context and expectation.

Proofreaders' error could explain why some listeners would fail to notice all of the performance mistakes in Example 4. The rhythmic errors that add dotted rhythms or omit rests might be easily identified, but the pitch errors in the last measure could be more challenging. Although these errors occur at a cadence and change contour, they create an alternate arpeggiation of the final tonic chord and provide a reasonable close to this melody. A listener that is focused more on sound than on notation might overlook an acceptable cadential pattern that does not happen to match the one on the score.



Example 4. Adapted from "Hearing Differences 2" in Kraft, *A New Approach to Ear Training*, 137-138 (a. student notated version; b. instructor performed version). Notation is correct, pitch-related performance errors are circled.

[28] Sheldon, "Effects of Multiple Listenings," 103.

[29] John A. Sloboda, "The Effect of Item Position on the Likelihood of Identification by Inference in Prose Reading and Music Reading," *Canadian Journal of Psychology* 30 (1976): 228-237.

Repp addressed issues of context and expectation by studying the perception of different types of pitch errors in piano performance.[30] His categories of pitch errors were substitutions (playing a wrong note at the right time), omissions (skipping a note in the score), and intrusions (playing a note that is not in the score). After one hour of rehearsal, ten graduate student pianists were recorded performing four different pieces three times each. Analysis of these performances showed that omission errors were most common, followed by intrusions and substitutions. This suggests that we should include omission errors in our error detection activities. It might be more likely for a performer to omit a correct note than to replace that note with something that violates the tonal context and thereby attracts the listener's attention.

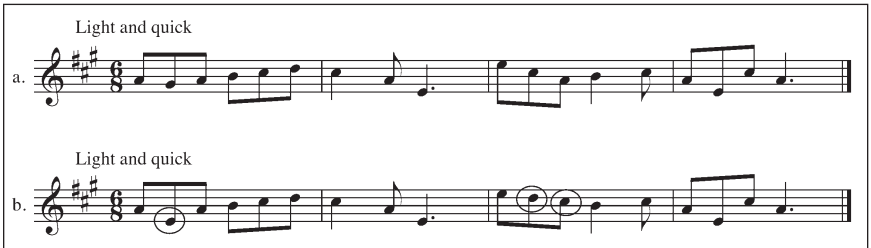
Repp then examined how listeners responded to these analyzed performance errors. A different group of pianists listened to the recorded performances from the first part of the experiment and was instructed to circle all pitch errors on the notated score. Results indicated that listeners only noticed 38% of the performance errors, with only 1.5% of errors being correctly identified by all listeners. As hypothesized, the most commonly perceived errors were those that violated tonal, harmonic, or melodic context in some way. Errors that fit the underlying context were rarely noticed or identified, making them "perceptually inconscipuous." As Repp summarized,

> The present results demonstrate that performance errors vary along a continuum of perceptual salience . . . The listener's musical experience, knowledge of the music, availability of the score, level of attention, and other factors determine a perceptual criterion or threshold that admits only a certain proportion of errors to consciousness. Even errors that have been detected still vary in degree of severity, and a listener probably could rate them accordingly. Errors then are a matter of degree.[31]

[30] Bruno H. Repp, "The Art of Inaccuracy: Why Pianists' Errors are Difficult to Hear," *Music Perception* 14 (1996): 161-184.

[31] Ibid., 179.

One of these "reasonable" errors occurs in the performance of the melody in Example 5. In m. 1, the distance between the correct note and the performed note is a major third. This interval size, along with the familiarity of the expected do-ti-do pattern, might facilitate the identification of this error. However, the error is drawn from the same implied dominant chord and does not disrupt perception of harmony and key. Listeners that are attending to larger-scale aspects of the piece might therefore overlook this error. The errors in the third measure involve pitch and contour, respectively. Although both of these errors fit with tonal context and occur in metrically weak positions, research suggests that the change of contour prior to the second beat of the measure would be more readily perceived than the pitch change on the preceding note.



Example 5. Adapted from Exercise 2F-1, #10 in Marcozzi, *Strategies and Patterns of Ear Training*, 59 (a. student notated version; b. instructor performed version). Notation is correct, performance errors are circled.

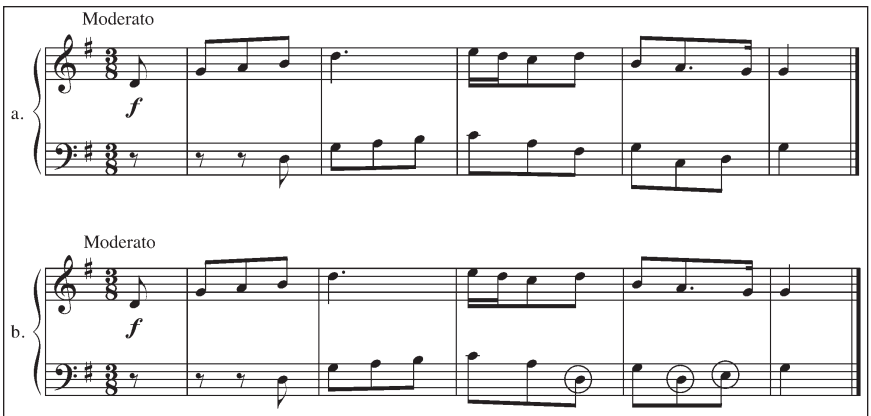
Bigand, McAdams, and Forêt discussed the role of tonal context when investigating the detection of errors in multi-part music.[32] Earlier research suggests that listeners follow either a divided attention model that allows them to simultaneously perceive multiple melodies (as in polyphonic music) or a selective attention model that focuses on an individual melody (or voice) while staying aware of the other background voices.[33] This study proposed a third alternative, which the authors called an integrated perception model. When using this approach, listeners fuse all parts into a single stream that has a certain tonal and harmonic coherence. Error detection ability is therefore dependent on how the mistake

[32] Emmanuel Bigand, Stephen McAdams, and S. Forêt, "Divided Attention in Music," *International Journal of Psychology* 35 (2000): 270-278.

[33] John A. Sloboda and Judy Edworthy, "Attending to Two Melodies at Once: The Effect of Key Relatedness," *Psychology of Music* 9 (1981): 39-43.

affects this integrated perception, with errors being more noticeable if they create unexpected dissonance and change the perception of the whole. Purposely planted errors that maintain the underlying harmony or do not create dissonance are harder to hear. This helps to explain why it is difficult to perceive errors in polytonal music. The lack of harmonic and tonal coherence prohibits the establishment of an integrated context and thereby challenges the ability to simultaneously process multiple melodies.

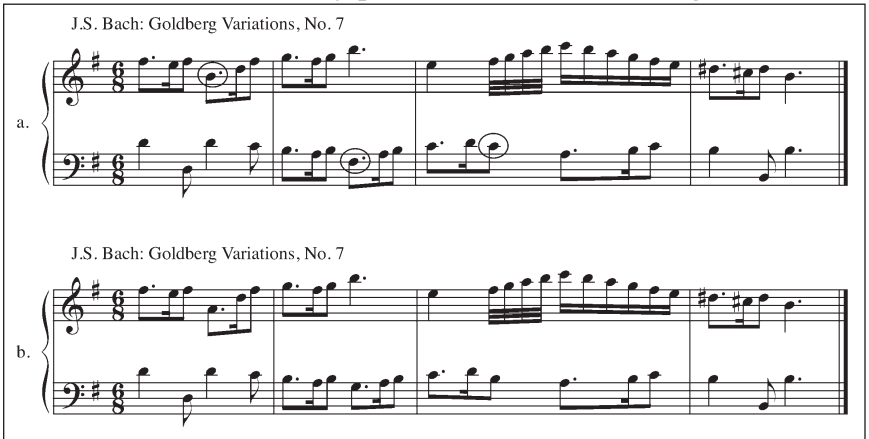
Examples 6 and 7 highlight the role of tonal context during two-part melodic error detection tasks. The first error in Example 6 changes the inversion of the implied dominant chord. A listener who has analyzed the specific intervals between voices might notice that the expected minor sixth was instead performed as an octave. But a listener who has integrated the voices and is perceiving overall harmonic function might fail to notice this error. The subsequent two errors affect the closing cadence. Cadences are structurally significant and have stereotypical patterns. An awareness of conventional cadence patterns would therefore make it easier to recognize errors in the two penultimate chords. Errors at cadences also benefit from the recency effect, which is the tendency to better remember items that are presented last in a sequence.



Example 6. Adapted from Exercise 7F-1, #5 in Marcozzi, *Strategies and Patterns of Ear Training*, 193 (a. student notated version; b. instructor performed version). Notation is correct, performance errors are circled.

Similar to previous examples, the errors in Example 7 maintain contour and change exact interval size. Although the error in the first measure alters the implied harmony, it still creates consonance

between the two voices. The error would therefore be more difficult to identify if the listener has integrated the two parts and is listening for unexpected dissonance. The second and third errors, on the other hand, create dissonance and would theoretically be more readily perceived. But this example provides a correct performance and an error-filled score, which means that these dissonances will not actually be heard. A listener must therefore analyze the score and audiate all expected interval relationships in order to identify the errors. Error detection accuracy would be significantly higher if the mistakes were instead in the performance, thereby creating aural dissonance rather than visual dissonance. In addition, the third error is in the accompaniment part, underneath the fastest notes in the melody, and on a weak part of the beat. This is always less noticeable than an error in the melody part that occurs on a strong beat.



Example 7. Adapted from Melody 12B, #4 in Benward & Kolosick's, *Ear Training: A Technique for Listening*, 255 (a. student notated version; b. instructor performed version). Performance is correct, notated errors are circled.

Musical context is also created by timbre and texture. Using excerpts from the band literature, Byo found that error detection is affected by the location of the error within the texture and by the number of different timbres in the performance.[34] In his studies, error detection accuracy was higher if the error occurred in a single timbre example or in the melody part of the piece. As he summarized,

[34] James L. Byo, "The Influence of Textural and Timbral Factors on the Ability of Music Majors to Detect Performance Errors," *Journal of Research in Music Education* 41 (1993): 156-167 and James L. Byo, "The Effects of Texture and Number of Parts on the Ability of Music Majors to Detect Performance Errors," *Journal of Research in Music Education* 45 (1997): 51-66.

> Results from the present study indicate that the musical context within which an error exists can have a consequential effect on error detectability. A pitch error in one context (e.g., polyphonic texture, single timbre, alto voice, melodic function) may have a different degree of detectability than the same error inserted within another context (e.g., homophonic texture, multitimbre, soprano voice, harmonic function). . . . This raises the possibility that the error-detection process may be context-specific, that is, idiosyncratic to a particular musical work, piece, section of a piece, or experimental excerpt, thus complicating this already complex phenomenon.[35]

In Example 8, isolated chords and short harmonic progressions are used to demonstrate the role of texture and context in multi-part error detection tasks. Although the errors change the quality of the two chords in A.1 and A.3, the sounding chords are still a recognized type of triad. A student must therefore correctly audiate the notated chord quality without any tonal context in order to notice that the performed chord is different. This is made even more difficult by the placement of the error in an inner voice.

In the performance of exercise B.1, a seventh is added to a notated triad. The opposite occurs in exercise B.2, where a notated seventh chord is played as a triad. Although some students might recognize the addition of the chord seventh and identify the errors, others would struggle to notice errors that occur in the inner voices, do not change the underlying harmonic progression, and fit with tonal context.[36] Error detection accuracy would likely increase if the misplayed note introduced an unexpected dissonance or changed harmonic function. Type and location of error within a musical texture also depends on the instrumentation of the piece. Pianists playing multiple simultaneous parts (or chords) might make different errors than ensembles made up of multiple melody instruments.

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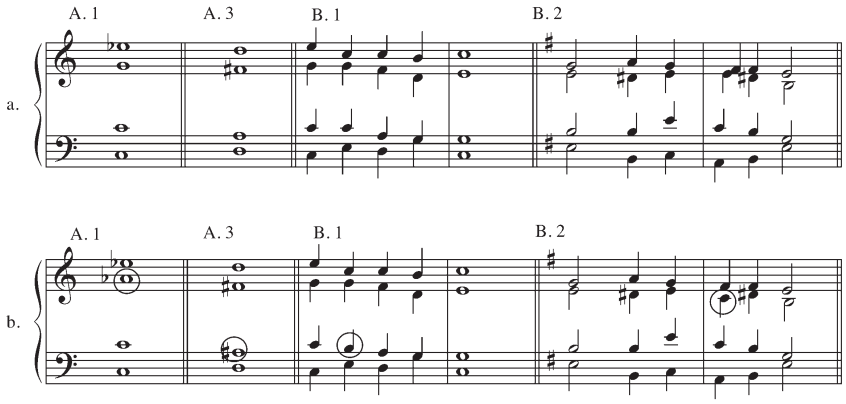
[35] Byo, "The Influence of Textural and Timbral Factors," 165.

[36] Caroline Palmer and Susan Holleran, "Harmonic, Melodic, and Frequency Height Influences in the Perception of Multivoiced Music," *Perception and Psychophysics* 56 (1994): 301-312.



Example 8. Adapted from Exercise 9F-1 in Marcozzi, *Strategies and Patterns of Ear Training*, 250 (a. student notated version; b. instructor performed version). Notation is correct, performance errors are circled.

Finally, research has shown that stimulus length affects the establishment of context and expectation. Although it is typical for an aural skills instructor to provide tonal and metric context prior to playing an example in class, this information is not provided in a "real" listening situation. Edworthy investigated the response to melodies under these "natural listening conditions."[37] Participants heard two versions of melodies of different lengths, an original and a transposition that contained either a pitch error or a contour error. Results confirmed her hypothesis that tonal context emerges as the notes of the melody are heard, thereby causing listeners to more accurately identify contour errors in the shorter melodies and pitch errors in the longer melodies. In addition, participants more accurately identified pitch errors that occurred later in those longer melodies, rather than at the beginning. This could be compared to the recognition of contour errors in unfamiliar melodies (short-term memory) and pitch errors in learned melodies (long-term memory).

All of these studies suggest that we should carefully consider error type, context, and stimulus length when designing and evaluating error detection tasks. Errors that do not violate context or expectation might simply be more difficult to notice and correct. In addition, the perception of errors depends on the extent to which context has been established, with contour errors being perceived

[37] Judy Edworthy, "Pitch and Contour in Music Processing," *Psychomusicology* 2 (1982): 44-46; Judy Edworthy, "Interval and Contour in Melody Processing," *Music Perception* 2 (1985): 375-388.

differently than pitch errors and short pitch patterns being different than longer melodies. Finally, students might benefit from discussing the relationship between context and perception as it relates to errors in performance. As Sloboda described,

> . . . experienced performers soon come to realize just how much they can "get away with" in live performance. I have often been amazed, when listening to a recording of my own performance, just how unnoticeable were errors which, at the time of performance, struck me as catastrophic. Indeed, part of the art of sight reading is knowing which parts of the music will not be salient for a listener. One learns how to create an impression of accuracy in a performance that is actually far from faithful to the score.[38]

A deeper understanding of musical structure and context could help students acquire this ability to create the "impression of accuracy" during sight-reading and performance while singing or playing their own instruments.

Improving Error Detection Pedagogy

Pedagogical improvement in any discipline requires the continual assessment of methods, approaches, and materials. In speaking about aural skills pedagogy, Kate Covington admitted being troubled by "the dilemma that good musicians sometimes demonstrate a rather low level of aural ability as taught and tested with traditional materials. That seems to imply that either we are teaching the wrong things or we are not teaching well, certainly not in a way that is compatible with how students already perceive and relate to music."[39] A knowledge of existing perceptual research could help instructors become more aware of the factors that affect error detection ability, thereby allowing for the creation of effective pedagogical resources and teaching techniques that help reduce this gap between performance skills and aural skills.

The first step is to recognize that error detection is a complex skill that is affected by many factors and unlikely to be developed solely

[38] John A. Sloboda, *The Musical Mind: The Cognitive Psychology of Music* (Oxford University Press, 1985), 85.

[39] Kate Covington, "An Alternate Approach to Aural Training," *Journal of Music Theory Pedagogy* 6 (1992): 6.

by practicing related skills. Karpinski identified four different steps for dictation – hearing, memory, understanding, and notation.[40] Error detection likely has the same components. Students therefore need opportunities to practice tasks that develop each of these skills, both individually and in combination. We must also reconsider the relationship between error detection and dictation. As White described,

> Unlike sight-reading, melodic dictation is not a skill that musicians are frequently called upon to use, per se, in the practice of their art. There may be occasions when musicians hear a melody that they later jot down, but for the most part melodic dictation is practiced for what it contributes to the other skills – the ability to identify incorrectly performed notes in rehearsal, the ability to hear a passage inwardly in order to read it in rehearsal or performance, sensitivity to other parts in ensemble, and so on."[41]

This suggests that error detection is not just a preliminary skill that acts as a means to the end goal of performing dictation. Instead, error detection is an end goal in and of itself. If this is the case, instructors must increase the amount of classroom time spent on error detection and avoid the assumption that students will automatically develop those skills by only practicing dictation.

It is also important to consider a much broader definition of error detection. In addition to working on audiation, students must be given opportunities to develop focused listening skills, good habits of score study, and knowledge of tonal and metric context in order to generate musical expectations. Error detection tasks should include sound to sound comparisons, sound to notation comparisons, and examples with both familiar and unfamiliar pieces. In addition, students should practice listening to a wider variety of musical characteristics. Rather than focusing on only pitch and rhythm, emphasis should be placed on evaluating meter, harmony, articulation, dynamics, tempo, tone quality, intonation, balance, and expressive nuance. This requires an increase in perceptual research on these characteristics and the development of error detection materials that exhibit a greater variety of texture, timbre, and instrumentation.

Research has shown that timbre and texture affect error

[40] Karpinski, *Aural Skills Acquisition,* 64-91.

[41] White, *College Teaching of Music Theory*, 43.

detection difficulty, depending on the number of parts, the number of different timbres, the relationship between the parts, the location of the error within a certain part, and how the error affects the perception of the whole. As Byo summarized,

> In the preparation of prospective instrumental conductors, there is an obvious need for students to transfer knowledge and skills gained through conventional, piano-centered ear-training experiences to the heterogeneous timbres of the band and orchestra. . . . It is evident from these data that instructors of university ear-training courses must take steps to facilitate the transfer of knowledge from a piano focus to issues involving heterogeneous tone qualities."[42]

One method of facilitating this transfer would be to incorporate a greater variety of performances into the classroom. Although it might be simpler to perform on classroom pianos or use MIDI files of monophonic melodies, using recordings of both solo and ensemble music provides students with richer sound sources and better captures future musical experiences. Instructors might also include more live performances in the classroom, with students either singing or playing their own instruments. This can be done with prepared and sight-read music, thereby allowing for the discussion of a variety of natural performance errors and expressive nuances.

Error detection ability is also affected by a complex interaction between an assortment of structural features, including tonality, meter, rhythm, intervals, contour, harmony, phrase structure, timbre, texture, and tempo. The type of error, along with its location relative to other features, significantly affects the likelihood of identification. For instance, research has consistently shown that contour errors are more easily identified than pitch errors for short melodies in short-term memory. In addition, errors that do not disrupt tonal, metric, or harmonic context are considered "reasonable" and are easily overlooked. Knowing that these errors are less noticeable might help to explain many student strengths and weaknesses.

[42] Byo, "The Influence of Textural and Timbral Factors," 166.

An awareness of the relationship between musical structure and perception could also affect the creation of error detection examples with planted performance errors. In general, error detection exercises should not always contain the same type of error, such as a pitch change of a whole step in one direction or another. This "same" error can be perceptually different, depending on the surrounding musical context. In addition, this limits the comparisons students are asked to make and does not mimic the variety of errors that might be encountered in typical teaching, performing, and conducting situations. It might also be helpful to occasionally include errors of omissions. When working with notation, we should consistently provide a correct score and a performance with errors. Not only does this reflect actual musical experience, but it accounts for the fact that visual errors are often perceived differently than aural errors.

Methods of presentation and instructions to students could also better mimic typical musical situations. Instructors must consider the number of times that students hear an example during an error detection task. Research has shown that repetition does not necessarily facilitate error detection accuracy. Likewise, we are generally not granted a predetermined number of repetitions in a typical musical situation. In terms of instructions, it might be necessary to focus on certain types of errors in the beginning stages in order to help students concentrate on individual musical parameters. But students must eventually have opportunities to evaluate performances without being told what type or how many errors to listen for. It would also be helpful to include more "placebo" examples, where the performances do not have any errors at all. Knowing that something is performed correctly is just as important as being able to identify errors. Finally, students should be required to both detect and correct the error. Rather than simply circling the error on the score, students must learn to describe what should have been played, correct the error themselves, or instruct others how to make that correction. Karpinski suggested that having students use words to describe errors could also develop important writing skills.[43]

All of these suggestions require the creation of additional pedagogical methods and resources. In order for these resources to reflect music perception and practice, instructors must be familiar

[43] Karpinski, *Aural Skills Acquisition*, 132.

with existing research and willing to create additional research. Perspectives as musicians and pedagogues must be combined with principles of perception, cognition, and skill development. As Karpinski summarized, "all of us who teach and write about aural skills should pay heed and be certain that these advances inform our work."[44] This collaboration could inspire the creation of teaching materials that better capture White's definition of the broad purpose of aural skills.

> To be thoroughly mastered, every musical and theoretical concept must be comprehended from the perspective of sound itself. Ear-training, then, should be more than developing the ability to identify intervals, chords, or rhythmic patterns or learning the skills of melodic and harmonic dictation. It is the development of the ear for the study of music, for the performance of music, for the creation of music, and for enhancing the pleasure of simply listening to music.[45]

[44] Karpinski, "Lessons From the Past," 5.3.

[45] White, *College Teaching of Music Theory*, 27.

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"Model Composition" Revisited: The Ragtime Project

By Bruce Campbell

> "Theory without practice, as I have said before, is of small value, since music does not consist only of theory and is imperfect without practice. This is obvious enough. Yet some theorists, treating of certain musical matters without having a good command of the practice, have spoken much nonsense and committed a thousand errors. On the other hand, some who have relied only on practice without knowing the reasons behind it have unwittingly perpetrated thousands upon thousands of idiocies in their compositions."[1]
>
> Gioseffo Zarlino

Background

Model composition is the writing of music based consciously upon a pre-existent example of style, form, or both. It has a long and honorable history as a technique to develop students' sensitivity to masterworks and to help them arrive at some objectivity about their own attainments. The practice is not limited to music. In the study of English literature, it is common for students to try their hands at writing a Shakespearean sonnet. The formal conventions are simple enough to recall, but the degree to which students may reflect varying degrees of responsiveness to language, literary conceit, and the Elizabethan world-view varies considerably. In the visual arts, one finds students in museums seated by masterworks, faithfully copying them to the minutest detail. That the casual museum-goer may easily observe how large is the gap between the student's limited fruit of applied observation and the original does not demean the value of the exercise to the student's acquisition of technical skill.

[1] Gioseffo Zarlino, The Art of Counterpoint. Part Three of *De Institutioni Harmoniche*, 1558. Translated by Guy A. Marco and Claude Palisca (New Haven and London: Yale University Press, 1968) pp. 226-7.

Model composition persists in courses of stylistic counterpoint, in which students attempt a genteel forgery of Palestrina or J. S. Bach as expressed in the saying, imitation is the sincerest form of flattery. If a phrase does not sound quite like Palestrina or Bach, then try to articulate as precisely as possible, where does the divergence occur? How might the passage be improved? It might be quite a large distance between identifying a weakness and applying a cure, but it is a crucial step. Counterpoint courses are no longer routine for all music students. Students in freshman or sophomore classes may never get the opportunity to compose in some manner that is conditioned by the norms of tonality upon which so much of their curriculum is focussed. Indeed, many are denied any sort of creative-synthetic opportunity at all in theory classes.

In the words of Marcel Dupré, the distinguished composer and organist:

> "If you speak of music, the phrase 'heritage of the past' is thoroughly misleading. At the least you must perceive that heritage as a living force in our midst, like a lovely garden we have inherited from our forebears and which we now cultivate ourselves, and not like a wilted flower pressed to dry between the pages of a book. It is always the same garden — yet with variations in the strength of its foliage and in the cycle of its seasons."[2]

If we examine the so-called Attwood studies,[3] the notebooks of Englishman Thomas Attwood who studied with Mozart, we see a progression from species counterpoint to small-scale pieces of free composition such as minuets and variations. The minuet is very remote to most students today, yet its lessons about phrase-building and motive-handling are regarded as still important: witness the

[2] cited in: Michael Murray, *Marcel Dupré* (Boston: Northeastern University Press, 1985), p. 126.

[3] The Attwood Studies, K485a (506a) are available in the *Neue Mozart Ausgabe*, Serie X, Werkgruppe 30, Band I (Kassel: Bärenreiter, 1965)

incorporation of the phrase model schema in recent textbooks.[4] You may have some eager students with a sense of the characteristics of the minuet gained from exposure in studio lessons or ensembles. But without a fairly specific floor plan, the majority will founder while others will adhere unimaginatively closely to one piece they fix upon from the small handful of idealized introductory examples that the instructor provides. When students feel unsure of how to proceed, they often describe themselves as *confused* when they are in fact *unfamiliar*. Their experience in problem-solving has been slight and their motivation to widen their knowledge base of the Western canon may be small. The professoriate has the seemingly quixotic, or at times, Sisyphean task of encouraging conscientious critical thinking and industrious independent effort that has historically been central to the experience of higher education. This is more necessary than ever as the the prospects for musical employment continue to diminish alarmingly: we need to impart the thinking tools that will be expected of a college graduate that are only rarely presented systematically in the studio or rehearsal hall. The liberal education of the music major takes place largely in theory and music history classes.

In the words of Joseph W. Polisi, current president of the Juilliard School:

> "Vocational education, to my mind, prepares someone to work on a specific task—let's say, fixing brake linings. We all want our brake linings to work; somebody needs to do it, and I hope they're paid well. But their job is to repair brake linings, not to design the brakes, and not to come up with new ideas about how to stop cars in general. That's what distinguishes an artistic education… We're talking about creativity, imagination, the human experience."[5]

[4] See, for example, Part III of Clendinning, Jane and Betsy Marvin, *The Musician's Guide to Theory and Analysis* (New York: W. W. Norton & Company, 2005), and Chapters 12, 17 and 18 in Steven G. Laitz, *The Complete Musician*, Second Edition (New York: Oxford University Press, 2008).

[5] Joseph W. Polisi, President of the Juilliard School, as interviewed by Paul Kawak, reported in the Juilliard Journal, Vol. XXI No. 8 (May 2006), p.4 .

Students enter college regarding music as an *activity*, not a *subject*.[6] Composing is an activity that intrigues a great many students, whereas any form of analysis is an abstraction. Tell students that it's extremely common for the contrasting tonal area in a sonata-form movement in the major mode to be in the dominant and they may wonder aloud what difference that makes to a convincing performance. Ask them to write a short sonatina movement however, and they will discover that phrase structure and modulation are vital to a result that is worth listening to. Using compositional activity to reinforce broad tonal concepts is a powerful way to make music theory more engaging to average students, and to excite the energetic and talented ones. Of course the amount of true originality in student works may be scant, but like fingerprints or snowflakes (so I'm told), each one is different, therefore singular, and much more appealing than devising an acceptable solution to a voice-leading exercise. And practically speaking, workbook exercises are fast becoming obsolete as solutions may be retrieved from the internet.

A class in music history is a knowledge-based course, a class in music theory, a skills-based course.[7] Students often erroneously assume that the classroom format dictates a similar approach to materials. They find that cramming for the exam doesn't seem to work as well for the theory class, not because, as noted above, they are confused, but unfamiliar, as if they took their places onstage for a dress rehearsal and attempted to sight-read their parts. The apt metaphor for a theory class is the private studio lesson. Centuries-

[6] Having just emerged from secondary school, the music-education major may have a quite fixed idea of what that profession requires. Maintaining band uniforms, devising half-time shows and above all, ensuring that students are entertained sufficiently in rehearsals so as not to drop out of the ensemble seem far more central than fluency in the application of music theory. The term music education is a misnomer for music participation. However, it is understandable why advocates for the fine arts have urged its use: participation is what one does in extra-curricular activities, like sports; education is supposed to entail learning, although one finds many entering freshman to be ignorant of terms such as tonic and dominant!

[7] The term "skills" seems permanently fixed in edspeak, although it deserves to be rehabilitated. The reader is directed to the remarkably insightful and still relevant Preface to *Counterpoint in Composition* by Felix Salzer and Carl Schachter (New York: McGraw Hill, 1969), which points out "the general neglect of musical techniques, for all too long condescendingly called 'skills.'" (p. viii)

old economic exigencies place the study of music theory into a classroom, an unfortunate compromise. How far would students progress if their instrumental or vocal study consisted entirely of group lessons?[8] No performer advances without practicing, no matter how insightful the instructor.

A consequence of the fairly-recent separation of music theory from composition has been that traditional tonal craft, like species counterpoint and figured bass, is not well mastered even by those who believe it to be an indispensable prerequisite to Schenkerian analysis.[9]

The challenge to adherents of model composition is to find some practical entry-point to the creative usage of musical materials. The minuet may be too remote, yet urging students to express themselves in any style with which they feel comfortable results too often in a simulacrum of some top 40s ballad, remarkably unrelated to the consistent tonal usage they encounter daily in the repertoire of their lessons and ensembles (and theory classes).

I have found that compositional activity, which in the domain of model composition has at its core applied voice leading (although

[8] Determined to apply the knowledge-based template, students evaluate instructors, equilibrating clear with easy to proceed, just as the word tricky is used to mean difficult. Therefore many students prefer the factoid approach of multiple choice tests. As in the studio lesson, theory students must rehearse repeatedly and regularly to retain and apply concepts, and to develop accuracy and speed. In comparing the skills- and knowledge-based courses, the homework load upon the instructor is disproportionate. Grading, let alone correcting student papers of any quantity and frequency interferes with scholarly output in comparison to a course whose so-called assessments may consist of midterm and final examinations, and maybe a brief paper. The shift to musical analysis as the goal for a complete professional education is an understandable response to institutional policies.

[9] A theorist is rated in academia as engaged in substantive research by writing an article about a fugue, whereas demonstrating competence by actually writing a fugue is not significant. That the writing of prose has supplanted the writing of music by persons whose principal responsibility is imparting musicianship is historically incredible. For, as Carl Schachter has observed, "From Pythagoras on, most of the people who have made an enduring contribution to theory have been more than theorists… If, with some of them, music theory reaches the level of 'art'… , it is partly because they were deeply involved with music in all of its important manifestations and were able to make theory another vehicle for artistic expression." (Schachter, Carl E. "Diversity and the Decline of Literacy in Music Theory," *College Music Society Symposium*, Vol. 17, No. 1, Spring 1977, p. 150.)

it will involve many additional decisions), can be introduced to all music theory students through a distinctly American genre that has never lost its popularity: ragtime. Ragtime, unlike so many tonal styles unfortunately, is instantly recognized by undergraduates, and its greatest exponent, Scott Joplin, is a musical household name. Joplin supplies an alternative to European composers, which is ideologically important to some, yet, thanks to his fastidiousness, his works hew to the harmonic and voice-leading norms of what has been called common-practice music.[10] What might appear to be its formal limitation, the rigid use of sixteen-measure sections, is a valuable constraint for beginners as it allows them to concentrate upon the content rather than upon the form of their music. The phrase model enumerates the most basic elements of phrase design, found in utterances both hideous and sublime. Locating its components is rather like identifying the subject and predicate verb in a declarative sentence: they are necessary elements of structure but are devoid of art. Both the music of Beethoven and a forgettable pop song contain cadences, and their aural recognition needs to be drilled, but that is not theory, only the beginning. It is the content that has been slighted by the recent emphasis upon analysis. Model composition is an extension of the technique of the cantus firmus, now applied to phrase-lengths and to the harmonic progressions within phrases.

The history of ragtime is fascinating, as are the biographies of its leading composers, and as are various experimental offshoots and derivatives.[11] Yet we must use our limited time in the classroom to focus solely upon the construction of music in reasonable facsimile. This means that we shall generalize and establish normative procedures based upon representative works by Joplin, much as there are reasonable prerequsites of understanding prior to writing a Palestrina-style motet or a Bach invention.

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[10] In the late twentieth century, it became fashionable again to take ragtime seriously, albeit in the academy: most notable are the rags by William Albright and William Bolcom. A study of their contributions would sidetrack progress toward the goal of emulating a style as embodied in the works of a single composer. However, talented and adventurous students might be stimulated by them as examples of successful ongoing vivification.

[11] Igor Stravinsky's *Ragtime* of 1918 comes to mind immediately, and there are many other works in thrall to European conceptions of American rhythmic innovation.

The Project

This project will review and reinforce these ideas:

- cadences
- period structure
- sentence structure
- the harmonic paradigm of tonic, dominant preparation, and cadence (the phrase model)
- the oscillating or arpeggiated $\frac{6}{4}$ chord
- common uses of applied (secondary) dominant-function chords, principally V^7/V and vii^{o7}/V preceding a cadential $\frac{6}{4}$
- notation and score preparation

Additionally, it will encourage experimentation with motives and repetitions of patterns, but this is a vehicle to animate the progress of the phrase and suggest passing harmonies and so is informally treated. That is, I do not put forward a type of motivic procedure specific to ragtime (beyond the obvious submetrical syncopations, which are mentioned below). It will be invaluable if students have been given a thorough exposure to motive as does Chapter 16 of Laitz's *The Complete Musician*.[12] The pedagogical works on Arnold Schoenberg written in Los Angeles are indispensable in this regard, and will be taken up later.

[12] cited already in footnote 4, p. 364ff.

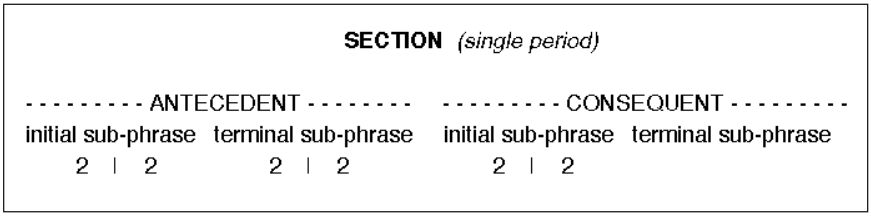
Repertoire

Reference is made to these works, and students should be provided (or be instructed to provide themselves) with scores.[13] At least the first three works should be studied carefully. To use only one example runs a great risk that students will mimic it too closely.

- The Entertainer (first section)
- The Easy Winners (first section, entire piece recommended)
- Wall Street Rag (entire piece)
- Magnetic Rag (optional, but entire piece valuable as "pushing the envelope")
- Elite Syncopations (optional)

Terminology

Examples used for discussion below refer to a 16-measure structure as a section. The section is *divided* into two phrases of equal length, an antecedent and a consequent. Within this general scheme, some common variants occur. Often the phrases are *subdivided* into two four-measure sub-phrases: an initial sub-phrase and a terminal one. The sub-phrase can be divided furthermore into two-measure units (a half-sub-phrase?) as famously in the first section of *The Entertainer.* Here is a visual summary.



Example 1 - One possible design of a section (with nestings)

Is there any word in the classroom deadlier than hierarchy? Instructors can't seem to stop themselves from using it, but frequently don't stop to define it. Such a concept may make sense to students if they perceive it in a straightforward example of phrase

[13] Lawrence, Vera Brodsky ed. *Scott Joplin Collected Piano Works*, New York: The New York Public Library, 1971. The works are in the public domain and widely available, for example online at the International Music Score Library Project: http://imslp.org

organization. (Arcs could be added to the above diagram to show nesting.) Later, it can be extended by analogy to longer phrases and formal divisions.

It is common for students to be given a working definition of a musical period as a unit consisting of at least two phrases, the last of which has a a relatively *more* conclusive cadence than the previous one(s). The strict application of such a definition would yield analyses of some ragtime sections as double periods, and others as lacking periodic form at all. (For example, the first and third sub-phrases, that is, the two initial sub-phrases in the first section of *The Entertainer* may be analyzed as ending with perfect authentic cadences.) A preference for describing phrase organization according to harmonic criteria, along with a passion for rigor, may obscure the obvious commonsensical design by thematic association. Similar issues arise with the 32-measure song form. When a fixed length is expected by the listener, fussiness about internal cadential hierarchy can be misleading or irrelevant.

Form

The basic plan of a ragtime piece comprises four 16-measure sections. Each section is sensibly understood as a single period. Four of these periods, with obligatory repeats, are strung together for a 144-measure composition, yielding an A–A–B–B–C–C–D–D design. Most commonly, sections A and B are in the tonic; C and D are a (perfect) fifth below, so a natural division into two equal halves occurs, as shown in Example 2. This practice recalls the American march form as perfected by John Philip Sousa in which the so-called *trio* section is a fifth below the initial key. One hesitates to describe the later key as the subdominant, for the harmonic relationship could just as easily be V to I as I to IV. The term trio is a misleading at best, for the final section of a rag (or a march) generally has a triumphant quality, and is the loudest segment. This practice is quite apart from the trio as in the compound-ternary minuet and trio (or scherzo and trio) of the European concert tradition in which trio denotes a thinner texture, simpler harmonies, and the character of a contrasting, subordinate interlude.

It is nearly obligatory to begin the piece with a four-measure introduction elaborating a simple tonic-to-dominant progression, and which often repeats a one-measure motive. Originally, ragtime was a dance form and the introduction alerted the dancers to get

into position. Although many A sections begin with an eighth-note upbeat, the introduction never does. (A common student error begins the introduction with an upbeat.) A fine example is *Wall Street Rag* (1909).

Part One		Part Two	
section 1 (A)	section 2 (B)	section 3 (C)	section 4 (D)
8 + 8	8 + 8	8 + 8	8 + 8
" tonic"		"subdominant"	

Example 2 - Typical design of a ragtime piece

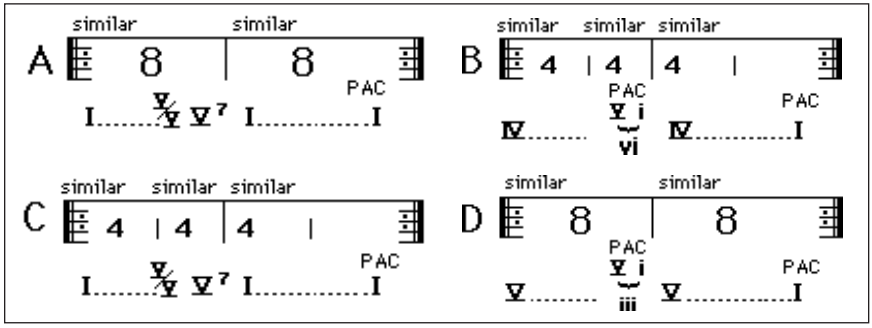
A slightly more complicated scheme brings back section A without repeat after section B. The common procedure may be diagrammed as intro-A-A-B-B-A-trans-C-C-D-D. Less common than an introduction is the four-measure transition between the halves. Sometimes these four measures of transition are modulatory, especially if the upcoming key-area is not a fifth below the initial tonic, and occasionally they are properly an introduction to the second half and written entirely in its key-area. A clear example is *The Easy Winners*.

It will assist students to think in terms of modules or units of structure if measure numbers are applied to support them. The introduction will have four measures, which can be referenced as intro-1, intro-2, and so on. Each section will have 16, so begin each with the number one (A-1 is the first measure of the first section, B-1 is the first measures of the second section, and so on). Then "measure 8" will refer to the last measure of the antecedent in nearly all cases. In referring to scores in this paper, I shall use conventional numbering, but later, in describing a student project, I shall use this structural numbering. This may appear to be a very small point, but when a student is working at something new, literally nothing comes easily, or rather, it is efficient to attempt to reduce the possibility for a mix-up.

There are general characteristics that we can observe about each of these sections. The A section generally has the most memorable tune, and often is less regular in terms of thematic organization than subsequent periods. A contrasting period is not unusual. The B section invariably begins with a chord other than the tonic, and it is generally less assertive than the A section, although its final cadence is very strong. The C section usually begins in a lower

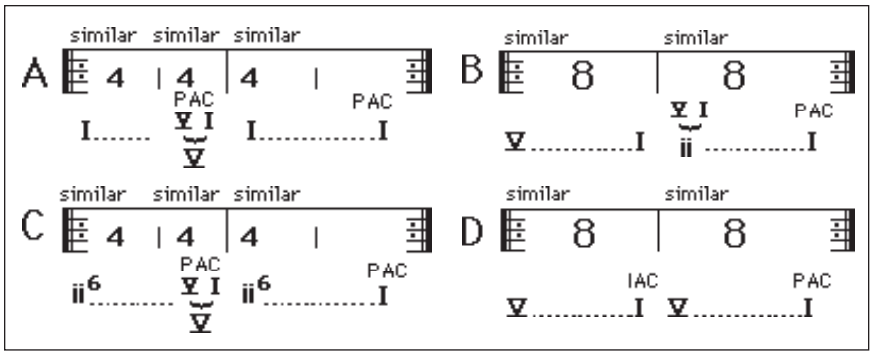
tessitura than the preceding two sections. This move heightens the contrast obtained by the shift to the new key-area, which locally at least, sounds like a relaxation into the subdominant. Finally, the D section returns to the register of the A section (or higher), and is bright, even raucous, for a sprightly and rousing conclusion.

Here are basic diagrams with greater detail for two pedagogically-useful rags. That for *Wall Street Rag* is more detailed than Example 2, which omitted the thematic subdivison of section C is order to reinforce the antecedent-consequent pairing. When students digest and hear that, then the notion of thematic hierarchy (the use of sentence structure) can be more readily perceived. Initially, many students assume a period and a sentence are mutually exclusive. Sometimes this is a desire for simplification (rather than understanding), but we might say it is also a democratic bias, as when students infer that chord-inversions are, or even maybe ought to be treated (and used in exercises) equally. (What have you got against the $\frac{6}{4}$ chord anyway?)[14]



Example 3 - Overall design of *Wall Street Rag* (1909)

[14] Graduate classes composed largely of international students easily recognize how the democratic bias inhibits an understanding of hierarchy, and they have less trouble with it. Even more indicative of American culture to them is the frequency of clichés based upon violent metaphors. In Microsoft's PowerPoint, we use bullet points to show how we'll hit the target, for they trigger lining up our ducks in a row so we don't have to take a shot in the dark but rather shoot fish in a barrel. We fire off a letter or shoot someone an e-mail about how to fight crime by declaring a war on drugs. Of this light-hearted footnote you probably expect a punch line.



Example 4 - Overall design of *The Easy Winners* (1901)

Students should be asked to transfer the information from the schematic diagrams to their scores, and listen to multiple recordings, before discussion in class begins. It is wise to include arrangements for melodic instruments with piano, as their project will use this configuration (and about which more below). Versions for ensembles also encourage careful listening.

I caution against emphasizing the differences among sections, as the generalization will not assist students in writing their own section (the first). However, one could devise an extensive, multi-week group project in which students would assemble a committee piece, each person composing a section. Then a close examination of several entire works by Joplin would be important in order to discover how different types of thematic organization contribute to a cumulative effect of motion over the discrete sections. After students have written their individual contributions, such overall study of an entire rag will be beneficial as they decide the final ordering for the individual sections. This may involve transposition and suggest changes of tessitura.

Joplin provided short descriptive prose for each section in *Wall Street Rag*. While perhaps naîve and dated, its sincerity is unquestionable.

A: *Panic in Wall Street, Brokers feeling melancholy.*
B: *Good times coming.*
C: *Good times have come.*
D: *Listening to the strains of genuine negro ragtime, brokers forget their cares.*

These comments may prod students to think imaginatively, perhaps infer some musical hermeneutics or a dramatic, progressive

scheme. The following is a bit out of order, but to follow up upon the idea of group participation: initiate a Committee Rag by organizing students into teams of four. Each team will produce a complete rag, with one section written by each student. Members could meet together and get much benefit from each other's critique. Because the style of ragtime is so familiar and the sense of overall trajectory so apparent in the familiar examples, students can rely upon what is popularly called the intuitive response to a degree impossible, for instance, in modal counterpoint. By the way, teams can promote some healthy rivalry, for all student projects should be performed in class. Enterprising students will arrange their work for quartet or ensemble.

It is worth noting that one of Joplin's earliest pieces (1899) and arguably his most famous, *Maple Leaf Rag*, has no introduction, and only the third section is in the subdominant. Although beginners are unnerved by exceptions, it is useful for them to ascertain and articulate to what extent a celebrated piece may not adhere to the norms that the composer established for most of his creative activity in the genre.[15] It does not make it irregular or strange. The normative procedure needs to presented and reinforced by the instructor as a *modus operandi.* Redundancy, often considerable, is necessary in making important points stick with beginners.

The experience with exceptions may prove valuable later on when students encounter seeming anomalies in more complex formal designs. Then they may be less likely, for example, to describe a monothematic sonata-form movement as breaking the rules. In the case of Haydn's *Paris* symphonies (numbers 82 through 87), most of the sonata-form first movements exhibit this characteristic, so within the context of the group, monothematism is actually the rule rather than the exception.

"Practice before concept: music before music theory" is a sensible route. Students will hear how the latter follows from the former, rather than the latter being imposed upon the former.

[15] The first section has a consequent that is thematically unrelated (in any obvious way) to the theme of the antecedent. The consequent is made up of one eight-measure conclusive phrase and its repeat an octave lower, in the register of the opening. It is a fine example of how register can play a crucial role in establishing conclusiveness.

Preliminary Exercise:

Order It!

Before going into the details of organization that will be necessary for most students to achieve a respectable result, let them experiment with the components. A hands-on way to acquaint students with the process of ragtime composition is to give them a section broken up into four-measure segments (sub-phrases), and ask them to put the segments in the correct order. This can be done by reproducing each four-measure segment on a single page in random order. One could photocopy and cut up a score, but it is clearer if one takes the trouble to notate the score using a note-processor and printing out each sub-phrase on a separate system. Then one can eliminate anticipative syncopations which belong, expressively at least, to the next measure (see, for example, measure 12 of *Magnetic Rag*). In addition, the segments will then appear uniform visually. A pianist plays the segments in the order given on the sheet, and students are asked to provide ordinal numbering. The exercise is more rewarding if the segments are printed on separate slips of paper (about 2½ x 8″) and students are put into small groups,[16] preferably gathered around a keyboard for re-hearings. The excerpts can be paper-clipped to cardboard on the music rack. Somehow the tactile experience of re-ordering the pieces of paper makes a stronger impression than staring at a single page of four segments. Group members discuss with one another their reasons for a particular succession. Given the constraints of the genre, the discussion should focus, eventually, on cadences and initial thematic material.

The difficulty for many students in arranging four thematically-related sub-phrases varies greatly, depending upon the examples chosen. It isn't always as obvious as it may seem to the instructor. Paying attention to the bass motion in cadences (or anywhere else) is entirely new to many singers and single-line instrumentalists. The exercise will encourage students to listen carefully, and wholly. A useful variant of this exercise is to play the segments and not provide *any* written notation, so that students will have to rely only on their ears and memory. The cadence ending the period is always authentic, and usually perfect. It is sensible to start with straightforward examples that students can use later as direct

[16] If you can enlarge the project to include the Committee Rag, keep the same groups.

models for writing. Choose a section which begins in the tonic and closes with a perfect authentic cadence, and which employs sentence structure. The first section of a ragtime piece usually fulfills these requirements and very often contains the most memorable or signature melodic material. The authentic cadence is the marker for the fourth sub-phrase. Sentence structure will dictate that the first three sub-phrases will be thematically identical, or very similar. As a recommended procedure, begin by playing four separate four-measure excerpts, and ask students to identify just the one which would end the consequent. While easy for some students, others must be given the opportunity to develop confidence.

Less obvious examples are useful not so much as models for direct imitation than to provide students with some sense of the possibilities within the apparent constraints of the genre. Presenting form in a way that will appear "crystal-clear" to an average student is crucial for their completion of a satisfactory assignment. Discussion of works that are beyond the reach of a first attempt to emulate is entirely optional. Nevertheless, to discourage impatient students from concluding that ragtime has a form that is routine and boring, consider a later work, such as *Magnetic Rag* of 1914, which has an initial section built as a contrasting period. The two sub-phrases of the antecedent are thematically very similar. Students hearing the four segments for the first time may conclude that the two melodic statements that begin the same are the first sub-phrases, respectively, of the antecedent and consequent of a parallel period. The two sub-phrases of the consequent are identical, and there's no simple clue of melodic closure on î to signify the very end. One hopes that (aided by a process of elimination), students will identify the root-position tonic cadence, strengthened by a preceding subdominant, as the end of the period. They will then locate the other cadence, an imperfect cadence in iv as the conclusion of the antecedent, and then everything has fallen into place. The second section of *Magnetic Rag* is in G minor. Its tonal and thematic organization is much more evident than the first. The minor mode is rare in ragtime, but students might be led to hearing its foreshadowing in the cadence of the first section's antecedent. In the third section, the usual period of 16 measures has been expanded to 24. It's not pedagogically worthy to include it as an exercise in segment-arrangement preparatory to composition, but with a thoughtful and receptive class, and several weeks of focused ragtime study, it is worthwhile to encourage students to speculate about the enlargement.

The Entertainer (1902) is a reasonable first choice, for it is likely that many students have heard it and it is formally very clear-cut. The consequent ends with a perfect authentic cadence and the antecedent pauses on the dominant, supported by an applied (secondary) dominant. The initial sub-phrase of the antecedent and that of consequent are identical. That may be enough to classify it as a phrase model, but refrain from dismissing the chromatic tones as paltry surface elaboration.

Another instructive example is *The Easy Winners* (1901). Like *The Entertainer,* it is well-known and employs the sentence (the first three sub-phrases begin the same) within a musical period. (The consequent ends with a PAC and the antecedent pauses on the dominant, supported by an applied dominant.) However, the initial sub-phrases of antecedent and consequent are *not* identical. In the latter, the bass D♭2 continues to C2 (measure 16), using a 5–6 voice leading, with the sound, but not function, of a phrygian progression.[17] In the same manner that it is useful to distinguish a deceptive progression, which occurs *within* a phrase, from a deceptive cadence which *ends* one, so it is instructive to identify the phrygian semitone bass as a *motion,* rather than always as a *conclusion.* It is worthwhile to draw students's attention to the association of the C major chord with the focal point (highest note of the melodic line). The linking of a climactic note with a uniquely-used, often altered chord is a frequent, but surely not a necessary condition of persuasive writing. In the initial sub-phrase of the antecedent, the D♭ chord (IV, in measure 7) serves to prolong the initial tonic harmony. In the consequent, the D♭ chord in the comparable location (measure 15) is itself prolonged by the major mediant (III♮). The terminal sub-phrase begins in measure 17 and is essentially the same music as measure 7. This sub-phrase intensifies the characteristic syncopated rhythm of the section, as found in measures 6, 7, and elsewhere. I do not think it is far-fetched to ask students to perceive measure 18, second beat, as a diminution of measure 5. Aside from showing them an unequivocal instance, it may suggest a technique to use if a similar opportunity arises in their own work.

If the instructor discusses details such as those in the preceding paragraph, it is important to emphasize that they refer to *content*

[17] An example of secondary mixture. See Chapter 22 of Edward Aldwell and Carl Schachter. *Harmony and Voice Leading,* Second Edition (New York: Harcourt, Brace Jovanovich, 1989).

and not to requirements of the form. Otherwise, part of the class may attempt some sort of phrygian progression at the end of the consequent's initial sub-phrase! In this regard, model composition resembles the Elizabethan sonnet exercise much more than the faithful copying of a painting. As noted above, without this caution, students may adhere inartistically closely to a specific scenario. Voice leading details, motives and specific chord-choices are usually related, gathered under the heading of organicism. It is useful to point out such examples but not to expect them.

It is noteworthy that *The Entertainer* has a thematic intensification similar to that in the first section of *The Easy Winners:* the terminal sub-phrase begins in measure 17 and is essentially the same music as measure 7. The ensuing two measures repeat the motive. (It is worthwhile to label the process as *intensification by motivic repetition,* for it is a common technique and can be successfully applied by students to their own work.) However, measure 17 is texturally simplified: the octaves are present, but no thirds. The cadence (measure 19) culminates with restoring the thirds, as the previous cadential measures, 7 and 15.

Generally speaking, any chromatic note should serve some motivic purpose, as it is not a requirement (in the major mode) of tonal organization. I have found it useful to mention the literary technique informally called "Chekhov's gun": that an object (in musical context, a chromatic note) introduced near the beginning must figure later in the drama (for ragtime: within the section), otherwise it is artistically superfluous ("random" is the current buzzword for this) and should not have appeared in the first place. In measures 5 and 6 of *The Entertainer,* the tonic chord is prolonged from $\frac{5}{3}$ to $\frac{6}{3}$ position (root position to first inversion). The F Major chord functions as an upper neighbor note of E3, and the $\frac{4}{3}$♭ chord in measure five, second beat (locally, an applied dominant), might be called a secondary embellishment: an embellishment of an embellishment. In the terminal sub-phrase of the antecedent (measures 9-12), the chromatic E♭3 introduces the dominant of the dominant. In the terminal sub-phrase of the consequent (measures 17-20), the chromatic descent re-uses the B♭3 of measure 5, now more prominent as a member of the bassline, and a transposition of measure 10 occurs in measure 18 to introduce the cadential $\frac{6}{4}$.

In *The Easy Winners,* similar relationships of motive and harmony may be found. There is a chromatic note just prior to the cadential $\frac{6}{4}$ at end of the antecedent. (This time, it's the the leading-tone to the

dominant, a so-called misspelled vii^{o7} of the dominant. F♯3 "should" be G♭3. (At one time, this passing chord would be called a raised submediant!) The A♮2 is a harmonic expression of the chromatic idea present in the first sub-phrase (B♮4 and E♮5). The E♮5 as a lower neighbor is enlarged when it becomes a chord tone in the dramatic culmination of the section with the C major chord in measure 16. The beginning of the terminal sub-phrase (measure 17) can be heard as a prolongation of IV (measure 18 as its upper fifth), a hearing which is supported to some extent by the alternation of strong and weak measures, or more literally, as a quotation of measures 7 and 8, as indicated above. It is a valuable lesson about context to consider if the IV in measure 17 leads directly to V in measure 19, or resolves immediately to the tonic in measure 18. Skillful pianists in class might be asked to demonstrate how the theoretical interpretation could affect the interpretation: are measures 8 and 18 identical or somehow a bit different as regards a projected sense of mini-arrival? If students don't hear the difference or feel that it matters, well, that's really of little significance, as it isn't going to improve their writing.

Students can learn much about harmony in context from these pieces. For example, in the first section of *Wall Street Rag*, measures six and eight, a chord is formed entirely by neighbor notes: D5, F4 and A♭3 embellish C5, E4 and G3. There's nothing gained by calling it a ii$^{\varnothing 4}_{2}$ chord, and clearly C3 is pedal tone, not an unresolved seventh. By using roman numerals to interpret *function* rather than to denote pitches—which is more easily done with figured bass—the bewildering number of chordal functions can be reduced when linear origins are kept in mind. However, we must take care not to give the impression that the structure is more important than the actualization of that structure. The ragtime assignment exists to reinforce that awareness, of course. Analysis is never a creative activity as it doesn't produce something independent or stand-alone. It may be insightful, and it may stimulate the imagination to new possibilities of interpretation, but an interest in making observations *about* music as an end in itself is the exception among average undergraduates.

The comments about the motivically-sourced embellishing role of harmony above need only be given to classes that seem capable of applying it with some imagination. In like manner, pointing out the role of E5, D5 and C5 to guide the melodic line in the first section of *The Entertainer,* while more easily comprehended than the discussion above, will not engage everyone.

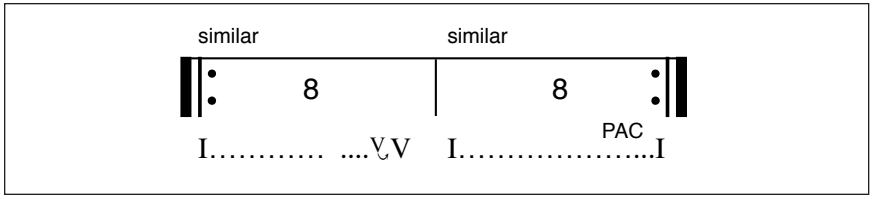
What roman numeral to write for the cadential $\frac{6}{4}$ seems to have become a shibboleth of harmonic ideology. In a completely literal sense, it's I and in a functional sense, V. When students are unfamiliar, they often take a literal approach.[18] The use of roman numerals for both purposes often misleads students, as they have difficulty making the distinction. If students are told that there is no such thing as a tonic six-four chord, they will want to have an alternative label. Some students will arrive at the not-entirely-illogical conclusion that in a "second-inversion chord" the roman numeral corresponding to the scale-step of the lowest note is appropriate under all circumstances. Other students are flummoxed that $\hat{2}$, $\hat{4}$, and $\hat{7}$ (listed from bottom to top and arranged vertically) will take the same roman numeral as $\hat{5}$, $\hat{1}$, and $\hat{3}$, for they recognize that "II$^{6}_{4}$" would be nonsense. Much classroom theory is an uneasy alliance between applying symbols (roman numerals) and determining function, yet textbooks seem to grow more detailed and longer. If students were given a very short *précis* of harmony for reference and a comprehensive anthology, music study could be more a process of discovery than of application of concepts.[19]

Structure

As noted earlier, the basic formal unit in a rag (a section) is 16-measures, evenly divided into antecedent and consequent phrases, as given in Example 1. This design is commonly called a musical period, and is one of the most basic types of phrase organization from the late 18th century onwards. The importance of a fixed-length form for beginners cannot be overestimated. It is comparable to the use of a chorale tune in a Baroque-style counterpoint class in which students concentrate upon motivic consistency in the lower voices guided by the harmonic direction of the phrase. Within the fixed-length phrases in ragtime, students can map out a suitable progression directed toward the cadence, and coordinate a top-voice linear progression that can be elaborated by motivic cells.

[18] For example, graduate students for whom English is a distant-second language may naturally hear you mean "the treble clef is a cymbel" when you said "symbol" — their assumption being that a word most likely has a musical reference.

[19] This is the activity of education in the studio. Singers learn several songs by Schubert, on the assumption by the teacher that the experience with a representative selection will equip them to master others later on their own. General characteristics of the German Lied are not given much time.

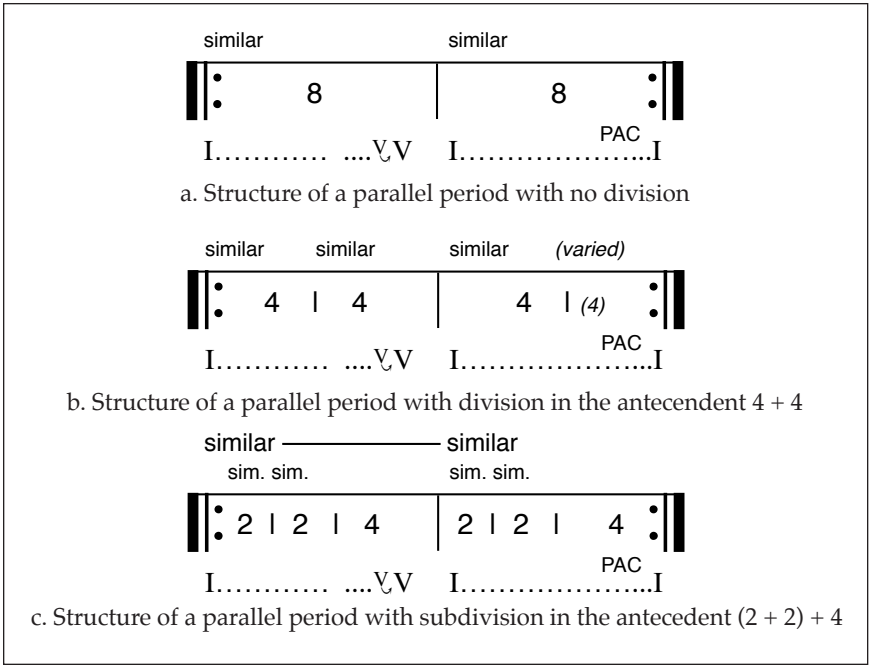


Example 5 - Very basic design of a section

Formal analysis involves the description of two domains: the harmonic and the thematic. The harmonic characteristics will be addressed first. Form in Western music is defined most fundamentally by its *harmonic* design, not its thematic design, contrary to the common view that students hold initially. Much apparent confusion among students can be avoided if they are encouraged to make separate observations about each domain. Important thematic or melodic material typically *begins* a phrase; functional harmony (a cadence) is what *ends* it.

In ragtime, the antecedent is characterized by a pause on the dominant, or a substitute, and the consequent concludes with an obvious tonic cadence, usually of the perfect authentic type. The end of the antecedent phrase is inconclusive in relation to that final cadence. Some writers have tried to define exactly what an inconclusive cadence is, but such enumeration is unnecessary or actually misleading to students, who may try to commit a list to memory. In this case, a fuzzy relativism is better. Simply stated, anything less forceful than a perfect authentic cadence in the tonic can be inconclusive.

Turning now to the composition of a single section, there are several thematic plans available, but to a novice the parallel period is the more manageable than a contrasting one, as shown in Example 6a. This paradigm will most likely be very much like what the student has encountered in phrase structure of the Classical Era. Compare the first section of *Elite Syncopations*.



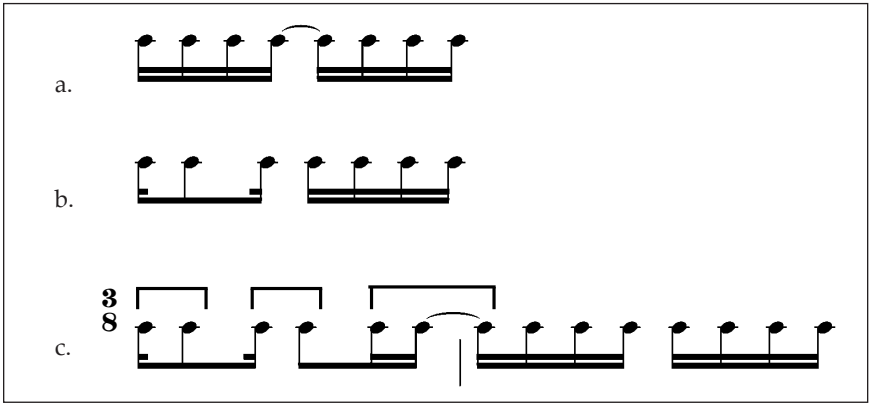
Example 6 - Common phrase designs

Another frequent procedure is to divide the antecedent into two parallel sub-phrases, 4 + 4, as shown in Example 6b, often called sentence structure. See the first section of *The Easy Winners*. As the larger structure is still the parallel period, the beginning of each 4-measure group will begin with the same material. The *final group* of four measures is always different, but it will usually make use of a previous motive to intensify the drive toward the cadence.

Yet another variant of the parallel period subdivides the antecedent into *two* sub-phrases which *contrast* thematically, as given in Example 6c. However, repetition is preserved in that the *first* of these four measure sub-phrases is subdivided still further into two-measure units, which *are* parallel. These four measures recur at the beginning of the consequent. Compare the first section of *The Wall Street Rag*.

Rhythm

Undoubtedly the most characteristic and infectious aspect of ragtime is its rhythm. It causes students the fewest difficulties, so not much class time need be spent on it. Over the steady *oom-pah* bass and chord pattern in the left hand, the right hand employs syncopation and frequently, micro-rhythms.



Example 7 - Some characteristic rhythmic patterns

Tying the fourth and fifth sixteenth-notes together yields perhaps the most common rhythmic cell (Example 7a). Syncopation within a beat — tying the second and third sixteenth notes together, is also very common (Example 7b). Repetitions of a very short pattern can establish a micro-rhythm. The meter 3/8, for example, can be imposed over two measures (Example 7c). Regarding the *oom-pah* rhythm, students should be alerted that a repetition of the same bass note on beats one and two in this pattern is generally avoided, unless the notes are members of a cadential dominant (or cadential $\frac{6}{4}$ chord).

There are numerous other patterns, of course. An exhaustive list will not assist the student materially, and through overkill may subvert the pedagogical goal. Tracing how a *few* motives are used consistently within one composition will show how rhythmic motives work *with* pitch to create accent and motion. Speaking of the motive, it may be divided into two components: *pitch* and *rhythm*.[20] By identifying pitch and rhythm separately, students can

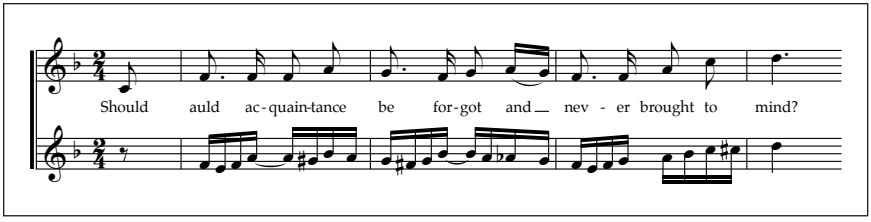
[20] If students become accustomed to expecting pairs of attributes in making descriptions (accented/unaccented, harmonic/thematic, structural/embellishing), it will deepen their observations. One label isn't enough! Assuming that there is likely a counterpart will rouse the imagination.

devise a melodic line and then impose rhythmic cells upon it — this is called *ragging* the tune. Conversely, they may favor a particular set of rhythms, and subsequently coordinate in a consistent fashion melody notes or arpeggiations within a chord.

The notion of *hypermeter* and to a lesser degree, *metrical displacement* can be reviewed because of the regularity of the phrasing. Within a group of four measures, some measures take a strong accent, others, a weak one. In the first section of *Wall Street Rag*, in the initial sub-phrase of the antecedent, the even-numbered measures (those with the neighbor-note chords) need to be accented. However, the terminal sub-phrase of the antecedent begins with a strong measure. Within the regular grouping of four-measure rhythmic units, the individual measures develop different patterns of accentuation. The relative straightforwardness of hypermeter in ragtime can give students confidence and insight to apply this technique of performance-relevant analysis to compositions in the studio.

Rag It!

A useful way to begin is to use the aforementioned technique of ragging a tune. Like *Order It!* where it was phrase-structural, this is an isolation of a particular aspect, motivic-imposition. Virtually everyone has heard Robert Burns's *Auld Lang Syne.* Example 8 gives the first phrase, along with a ragged version.



Example 8 - First phrase of "Auld Lang Syne"

Notice how the lower neighbor note is combined with the most common rhythm cell, the tied fourth ands fifth sixteenth notes, to establish a simple motive that can be put easily to recurrent use. The harmony for the folksong can be plainly diatonic, or enriched with applied dominants.

Texture

Although Joplin wrote ragtime pieces principally for the piano, this is not recommended for students unless they are accomplished pianists. Ragtime is difficult to play well. Joplin lived to see his works abused for pyrotechnical display rather than appreciated as expressive, lyrical, and often reflective character pieces. His later publications often offer this advice, "NOTE: Do not play this piece fast. It is never right to play Ragtime fast. *Composer.*"

If we use the piano along with a melodic instrument, we shall reap several benefits.

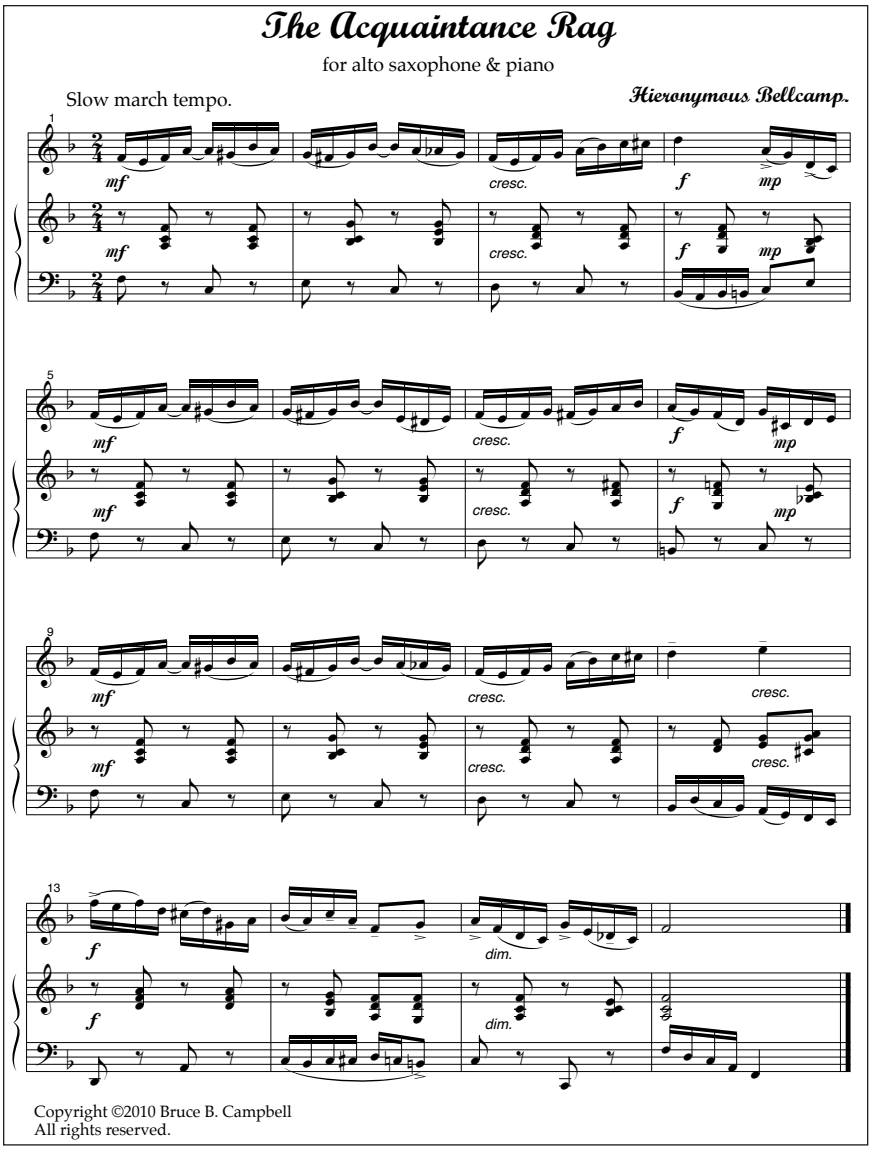
- The three musical strands of melody, bassline, and harmony are assigned to their respective staves.
- Students usually choose to write the melody for their major instrument, or in the case of voice majors, for an instrument with which they have some affinity. This generally results in idiomatic and often gracious statements. Students get vast helpings of piano music in theory classes from the widely-used anthologies. This exercise cultivates the appreciation of other instruments.
- It's much easier to play, of course. What is assigned to the left hand in the Joplin piano rag is now the entire task of the pianist.
- The voice leading in the piano need not be compromised in order to accommodate melodic figuration, or technical limitations. The writing will follow the rules of voice leading for the so-called keyboard style, with three notes in the right hand and the bassline in the left.
- The isolation of the bassline on a single staff encourages the student to think of it as a secondary melody. If basic theory study has included counterpoint in five species, then the student has the chance to apply it here in a practical way between the initial tonic chord and the cadential progression.

A graphic representation of the thematic procedure can be helpful. A grid of the type given in Example 9 can assist the student in a preliminary analytical homework assignment.

	1	2	3	4
ANTECEDENT				
	5	6	7	8
	the music of measure 1 goes here			
	9	10	11	12
CONSEQUENT	the music of measure 1 goes here	the music of measure 2 goes here	the music of measure 3 goes here	
	13	14	15	16

Example 9 - Grid of thematic organization (4 | 4 | | 4 | X)

Example 10 is a section of ragtime, written in accordance with the steps outlined so far. It follows what the author has found to be the most workable plan: the one shown earlier in Example 6b. Note that the music is laid out with four measures per line, so that the formal design is as obvious as possible. The score is in concert pitch. Students should be asked to provide a separate part for the solo instrumentalist, transposed if necessary (true in this case, for the alto saxophone). At this point, details of score-preparation should be reviewed. (See item six of Example 11). Observe that measure 13, the climactic point, differs from the initial measures of the three preceding four-measure groups, but still manages to preserve the basic F-E-F neighbor motion that is derived from the folktune.



Example 10 - "Acquaintance Rag"

A list of suggestions can be provided to assist the student in determining the steps needed to complete a successful project, as shown in Example 11.

1) Rule the music paper in four four-measure systems, and number them. The meter is 2/4.

2) Sketch in cadences for the antecedent: PAC on V, and the consequent: PAC on I

3) Sketch the melodic line (and chords) for the first measure or so — copy that into measures 5 and 9 (but not measure 13!)

4) Complete the melody of the antecedent: sketch bassline & harmony (RNs) consequent: sketch bassline & harmony (RNs)

5) Write the accompaniment, with oom-pah pattern, check the voice leading.

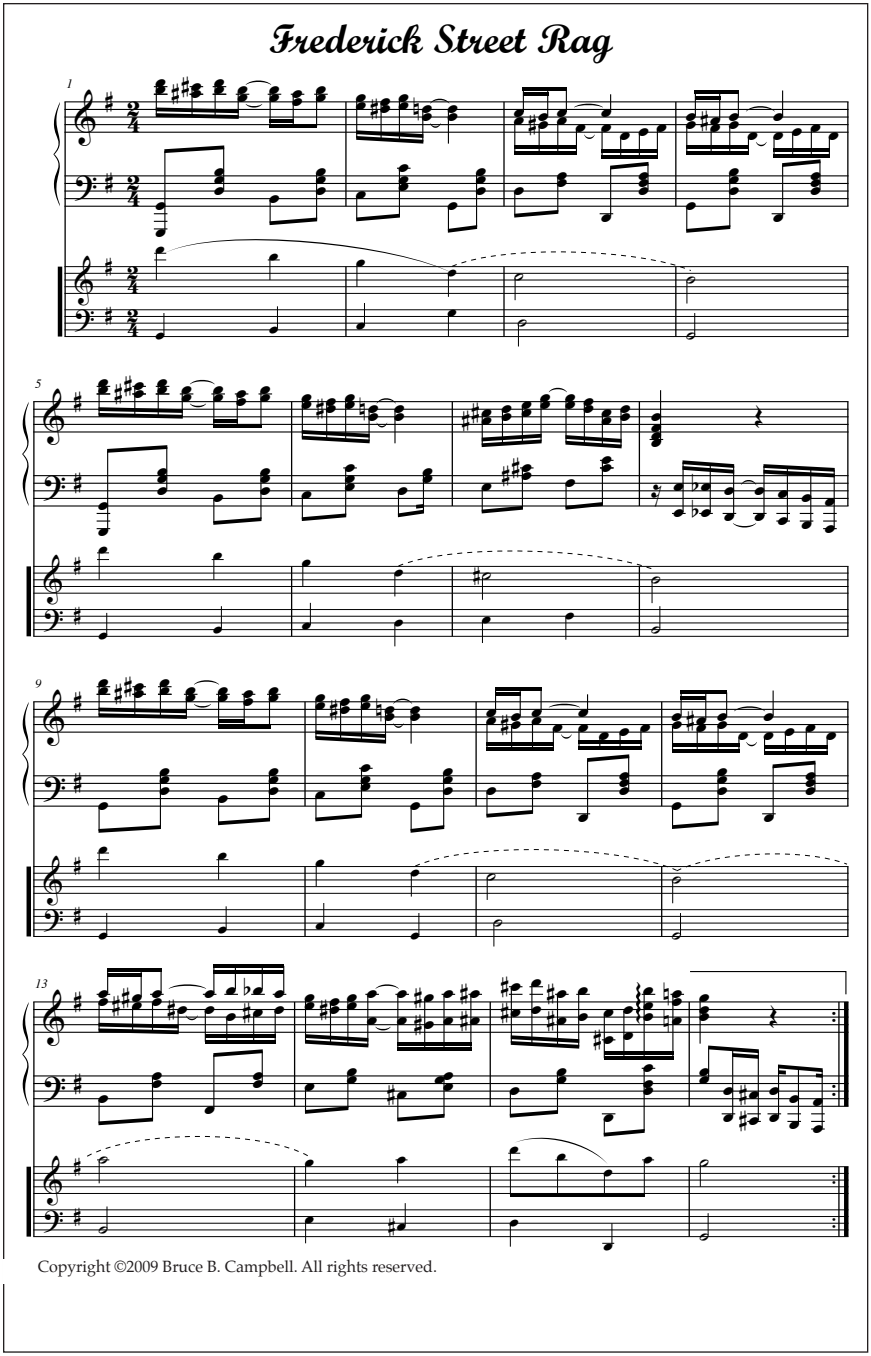
6) Add slurs, dynamic markings and articulations as appropriate to a "real" musical composition.

7) Copy over neatly onto a separate piece of music paper – everything will count! (Your teaching assistant will define what "everything" means.)

Example 11 - Suggestions for the student

An approach to composition that might help students is what might be called the pitch-outline or framework method. Example 12 gives the first section of a ragtime piece, and the systems below the music provide a very simple outline of contours and important notes. This technique is by no means to be equated with linear analysis: quite the opposite, it is devised to generate material. Quite often, an initial motif can be established from which the student can devise a framework. That generative motif here is the descending arpeggiated triad from D6 to D5 (what might be called the *thesis*). An equally conventional stepwise progression of the third, D5–C5–B4, may be seen as a second distinct idea (antithesis, if you wish). In the terminal sub-phrase of the antecedent, the stepwise progression replaces C5 with C♯5, turning toward B minor. In the terminal sub-phrase of the consequent, the third-progression of D5–C5–B4 is continued with another one (through transfer of register), B4–A5–G5. In measure 15, both elements (the downward-arpeggiated triad and the third-progression) are combined (a *synthesis*). Because cadential progressions serve as formal articulation and are so commonplace, it is often a challenge to write music for them that connects motivically with what has gone before. The last four measures of a section move predictably toward the cadence, yet will commonly contain the dynamic and registral focal point (apex).[21]

[21] Actually, this example does not have a single high point, and the highest note occurs at the beginning! Viewing this as anomalous might lead to listening to a performance of the opening of the second movement of Bach's *Double Violin Concerto,* BWV 1043, which also begins on the highest note on the phrase, and considering the musical meaning that results.



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Example 12 - "Frederick Street Rag" and its generative outline

This excerpt is not an example of what the project described in this paper would bring about. (*Acquaintance Rag* is an instance of that.) Firstly, it is for piano solo. Secondly, the cadence of the antecedent, while less conclusive than the cadence at the end, is not on the dominant. If you provide your own A+ example to show students how it can be done (and to establish respect), there is a danger that some students will emulate it much too closely.[22]

The most useful and systematic work for undergraduate model-composition teaching that has engaged the author's attention for beginning tonal composition was written by Arnold Schoenberg. Frustrated with the lack of musical background among students in his classes at the University of California, Los Angeles in the 1940s, he wrote several textbooks that remain his least studied and cited works. His *Models for Beginners in Composition*[23] will repay a close examination manyfold. Schoenberg was convinced that the student of composition must master thoroughly the traditional techniques and organizational methods, and possess a wide and intimate knowledge of musical literature if he wishes to solve the more difficult problems of contemporary music.[24] He is much less preoccupied with pitch than many of his followers. His emphasis is much more upon process and the aggregation of components of structure, starting with his often-misunderstood *Grundgestalt* and continuing to formal design. For example, in the earliest chapters he deals with fashioning a motive from a triad, and with period and sentence structure. Some of his basic examples may assist students who feel stumped trying to devise a melody, especially if they have been given an analytical introduction to the topic of motive earlier.

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[22] This can occur with any style. For example, Bach's C Major Prelude (from the *Well-Tempered Klavier,* Book 1) is employed so often to show how what appears to be simply a chord progression actually has a long-range registral design. Without examining several more examples of Bach preludes, students may devise their own chord progression (the long-range registral design being lost on them) and figurate it accordingly.

[23] Arnold Schoenberg, *Models for Beginners in Composition*, London: Faber and Faber, 1967.

[24] From Gerald Strang's introduction to Arnold Schoenberg's aforementioned book (p. xiv). Conveniently, the awareness of compositional structures and styles furnishes the graduate with some tonal facility that could serve as the foundation for subsequent teaching duties.

Conclusion

Music theory classes frequently devote too much time to analysis, considering it to be the summit of musical study. This does not give students pleasure: they strive to figure out and remember what the teacher wants to hear, regarding theory as an intellectual game. The discovery approach through model composition, be it by means of chorale harmonization, stylistic counterpoint, or the echoing of more so-called accessible styles, is as important and necessary to musical maturation as the hands-on approach in the instrumental or vocal studio. Ragtime is a practical way to engage the beginning student in the process of linking musical elements. From several decades' experience, I have observed that virtually all students respond well to the Joplin model. Even insecure students will devise pieces that are recognizable as ragtime. This success may provide encouragement for more ambitious studies later: it is just a beginning step, of course. The only areas of serious composition for which there is even the slightest demand from the public at large — band music, church music, and secondary school music — are often written not by professional composers but by practioners: choral or band directors. They may have so-called practical aspects (read: easy to pull together with few rehearsals) gained from years of experience, but the part-writing is sadly often the least competent component. If in the near future the level of craft improves in these pieces, then the attempt to connect voice leading to meaning in theory classes will have been worthwhile.

Rhythm Syllable Pedagogy: A Historical Journey to Takadimi Via the Kodály Method

BY JOSHUA PALKKI

The pedagogy of teaching rhythm, especially to beginning musicians, is a complex and fascinating yet often overlooked area of study. Said Robert Gauldin, "when listening to a piece, we frequently take for granted the regulated rhythmic foundation that underlies its melody."[1] Rhythm gives music a sense of organization and must be methodically taught. Because a significant portion of the university music theory curriculum is devoted to teaching aural skills, further study in this area is appropriate and necessary. Like solmization systems and pitch solfège theories, rhythm pedagogy is an ever-evolving field of study.[2] This article explores the importance of a *sound before symbol* approach to rhythmic instruction, the history of rhythm syllable systems and the importance of effective rhythm syllable pedagogy. Furthermore, it shows how Takadimi, an innovative rhythm syllable system, has evolved based on principles espoused by Zoltán Kodály.

In many American universities, rhythmic instruction occurs only in conjunction with pitch—most often during the teaching of dictation. Students unable to write rhythms will utterly fail in dictation, therefore rhythmic skills are essential to that activity. Michael Rogers asserts:

> Rhythm study is a topic that should certainly be mastered intellectually. Understanding the mathematical foundation of rhythm and meter…is essential for any musician. For almost no other topic, however, is it so important to translate conceptual knowledge into sound

[1] Robert Gauldin, *Harmonic Practice in Tonal Music* (New York: W. W. Norton, 1997), 17.

[2] Rhythmic instruction, while a pedagogical technique that is useful to music theorists, also has undeniable performance ramifications. As conductor Robert Shaw (1976) said, "…I think we would agree that our single most unifying and communicative force is rhythm—which is also at present our most urgent need." His statement exemplifies a sad truism that many musicians (vocalists most notably) are often labeled as poor rhythm readers and that many music educators neglect music literacy instruction.

> and musical effect. To make sense, rhythm must finally be felt as a physical activity and not just understood as a formation of symbols.[3]

While we do not teach students to begin reading music at the collegiate level, we are teaching new generations of undergraduates, who may themselves be struggling with music reading, how to teach music literacy. While pitch solmization systems have equipped teachers with vocabulary enabling them to diagnose interval and intonation issues, there seems to be no equivalent momentum on the side of rhythmic solmization. Thus this terminology is not as readily available to theory teachers. There is a growing community of instructors who view Takadimi as the common vocabulary through which rhythm can be taught.

The goal of rhythmic drill in the ear-training class is to teach students to hear durations in patterns. This application of the generally accepted pedagogical rubric, that skills are more effectively taught beginning with aural skills such as rote echoing, has been explored in numerous publications over the last 20 years.[4] As patterns are echoed and rehearsed, they become transferred to working memory and eventually to long-term memory. Because patterns remain in the short-term memory for a brief time (2-5 seconds according to most studies), they should initially consist of small units-- perhaps two beats-- and grow more complex over time. Barak Rosenshine et al. write, "when teaching new or difficult material, a teacher should teach only a small amount and arrange for student practice after each part. In this way, the amount of information covered at any time is manageable for working memory."[5] Echo, drill, and listening activities facilitate the recall and comprehension of rhythmic cells, which exist within the context of meter, a key perceptual organizer in music. Joyce Jordan-

[3] Michael R. Rogers, *Teaching Approaches in Music Theory: An Overview of Pedagogical Philosophies* (Carbondale, IL: Southern Illinois University Press, 2004), 143.

[4] Carr (1989), Goolsby (1994), Jordan-DeCarbo (1997), Gordon (1997, 2003), DeNardo & Kantorski (1998), Jordan-DeCarbo & Nelson (2002), Sweeney (2002), Ester (2010)

[5] Barak Rosenshine, H. Froelich, & I. Fakhouri, "Systematic Instruction," in *The New Handbook of Research on Music Teaching and Learning*, ed. by Richard Colwell & Carol Richardson (New York: Oxford University Press, 2002), 302.

DeCarbo and Jo Ann Nelson have shown that the brain processes rhythm, pitch, and lyrics/syllables separately and that "tonality and meter serve as key perceptual organizers for music literacy content." They also claim "the ability to gain in notational ability appears to be mediated by aural perception ability."[6]

Music learning theory suggests a sound before symbol approach is most effective when teaching students to read and notate music.[7] While many educators advocate such a method of teaching, few have found a solid pedagogy for teaching sound in isolation from notation, at least initially. Mícheál Houlahan and Philip Tacka model this type of instruction in their texts *Kodály Today* and *From Sound to Symbol*. Such scholars acknowledge the foundational work of eighteenth-century researcher Heinrich Pestalozzi who believed sounds should be introduced before symbols.[8] Maureen Carr discusses the application of sound before symbol philosophies in a university aural skills setting:

> Some students appear to have been 'born' with the type of innate musicality that allows them to 'hear with their eyes,' while others are still in the process of developing that ability when they enter college. Students who have yet to fulfill their potential for associating sounds with symbols tend to treat the musical score as visual phenomenon. Consequently, they are unable to arrive at a distinct aural understanding of the music that they are reading and the voice-leading exercises they are writing.[9]

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[6] Joyce Jordan-DeCarbo & Jo Ann Nelson, "Music and Early Childhood Education," in *The New Handbook of Research on Music Teaching and Learning*, ed. by Richard Colwell and Carol Richardson (New York: Oxford University Press, 2002), 223.

[7] Music learning theory is a term championed by Edwin Gordon, professor emeritus at the University of Iowa who has written many volumes on music literacy instruction. According to Gordon, "just as the audiation of tonality is the basis of tonal syntax, so the audiation of meter is the basis of rhythm syntax."

[8] Charles Plummeridge, "Schools," In *Grove Music Online*, Oxford Music Online, http://www.oxfordmusiconline.com/subscriber/article/grove/music/43103 (accessed November 6, 2009).

[9] Maureen A. Carr, "The Importance of Sound Before Symbol in Developing Intuitive College Musicians," in *Readings in Music Learning Theory*, ed. by Darrel L. Walters and Cynthia Crump Taggart (Chicago:

Carr describes the aural skill curriculum of the Pennsylvania State University School of Music in the late 1980s and how it helped "students develop a background of organized meanings to enable them to audiate from notation" utilizing a Schenker-oriented undergraduate theory curriculum.[10] "In the fall of 1986 students did not see any patterns in notation until December 1st."[11] Students were given several *months* of purely aural, pattern-oriented training. University aural skills courses could greatly benefit from rhythmic instruction that begins with the aural presentation of basic patterns. This is the first step in the Houlahan/Tacka cognitive model of instruction, which develops kinesthetic, aural and visual awareness, before proceeding to the use of rhythm syllables. This model of instruction is clearly laid out in *From Sound to Symbol*, a text currently being used in both public school and university settings. The point here is that a well thought out method of presentation and delivery is as important as the syllable system being used. Houlahan and Tacka also released a set of books entitled *Sound Thinking*, in which they introduce patterns in a sequential manner based on their frequency in the standard repertoire.[12]

Gary Karpinski explored memory as it relates to melodic dictation and emphasizes the concept that the brain organizes notes into "chunks." A typical melodic dictation example may be eight measures or more in length, containing a far greater amount of rhythmic and melodic material than can be processed by the brain. In exploring the teaching of melodic dictation in the aural skills classroom, Karpinski describes four phases: hearing, memory, understanding and writing, which "are sequential; each must be performed in turn or subsequent phases will not be viable."[13] When

GIA Publications, 1989), 352.

[10] Carr, 357. Schenker himself acknowledged the importance of hearing before students were to compose. "Is not learning to hear the first task, during which time the student might well dispense with composition?...no music school can be released from the obligation of teaching to hear correctly." (Schenker, 1979, as cited in Carr, p. 363).

[11] Carr, 361.

[12] Mícheál Houlahan and Philip Tacka, *Sound Thinking: Music for Sight-singing and Ear Training (Volumes I & II)* (New York: Boosey & Hawkes, 1990/1991).

[13] Gary Karpinski, "A Model for Music Perception and its Implications in Melodic Dictation," *Journal of Music Theory Pedagogy* 4:2 (1990): 194-202.

teaching dictation, do we jump from hearing to writing without proper time and consideration for the vital two inner steps? If so, we are missing the opportunity to discover where students are having difficulties. Likewise, if consistent syllable pedagogy for rhythm is not employed, we may miss vital teaching opportunities.

Music Cognition and Rhythm Syllables

The way students learn rhythm should affect how rhythm is taught. As previously stated, music is understood in patterns. Our natural tendency towards grouping is based on Gestalt principles, which posit that the brain has tendencies toward self-organization.[14] David Temperley asserts that early Gestalt researchers were well aware of the impact their research on grouping would have on music.[15] In her new book exploring the aging brain, Barbara Strauch cites current cognitive studies:

> When sensory input first comes into the brain—to put all this in its simplest form—it goes to its outermost layer, the cortex. The input then travels to the hippocampus, which consolidates information, memories, and learning. The hippocampus binds the varied sensory experiences together into a sensible chunk—and then sends that back to the cortex for long-term memory storage.
>
> But before the information even gets to the central hippocampus, it is first filtered by the gatekeeeping dentate gyrus, which is thought to perform an opposite task—it breaks sensations into even smaller pieces. It is, as Gage puts it, 'a pattern separator.' Brain cells in the dentate take note of subtle differences and similarities—a leaf a bit greener, tea slightly hotter. Mature brain cells in the dentate encode those minute differences and pass them on to the hippocampus.[16]

[14] Alf Gabrielsson, "The Complexities of Rhythm," in *Psychology and Music: The Understanding of Melody and Rhythm*, ed. by Thomas J. Tighe and W. Jay Dowling, (Hillsdale, NJ: Lawrence Erlbaum Associates, 1993), 95.

[15] David Temperley, *The Cognition of Basic Musical Structures* (Cambridge: MIT Press, 2004), 55.

[16] Barbara Strauch, *The Secret Life of the Grown-up Brain* (New York: Viking/Penguin Group, 2010), 136.

Effective rhythm instruction using rhythm syllables reinforces this encoding process and, in turn, improves overall music reading and performance. The main point here is that the gate- and file-keeping functions of the dentate gyrus appear to fragment information into smaller chunks that are stored in different parts of the brain. If this is true, then the links that one is able to forge between these far-flung repositories are extremely important, with the more links the better. With multiple links, complex skills and information can be reconstituted with greater speed and reliability. It is one thesis of this article that Takadimi, which maps labels onto rhythmic events, provides this added layer of linkage.

Don Ester has studied sound before symbol methodology, asserting, "because sound comes before sight, both the rhythm and the tonal syllables must be sound-based rather than notation-based."[17] Many rhythm syllable systems fail to meet this key criterion. Rhythmic and tonal syllables serve as a main pillar of Ester's *Sound Connections* system of teaching music literacy because they are crucial in the encoding process.[18] Michael Dickel intimates:

> When associations (either verbal or visual) can be made between the new items and information in memory, the new items become more meaningful. Words or syllables are more meaningful because we can make associations with these forms of information more easily than we can numbers.[19]

Ester agrees, noting that, "rhythm…syllables serve as mediators between sound and symbol. They perform the key cognitive

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[17] Don P. Ester, *Sound Connections: A Comprehensive Approach to Teaching Music Literacy* (Fishers, IN: Educational exclusives, 2010), book in .pdf format. Available online at http://www.educationalexclusives.com/products/sound-connections/ (accessed May 3, 2010), 6. The author is indebted to Dr. Ester for sparking his interest in this topic and for ongoing guidance. He is also extremely grateful for Dr. Timothy A. Smith, Dr. Mícheál Houlahan, and Dr. James Froseth and their support of his research and writing.

[18] The main theme of Ester's insightful text is summed up in a diagram with three pillars: sound, symbol, and syllable all connected by arrows. He believes (and I agree) that one cannot exist without the other two.

[19] Michael J. Dickel, "Principles of Encoding Mnemonics," *Perceptual and Motor Skills* 57 (1983): 114.

function of verbal association."[20] Such writings exemplify the relevance and superiority of a syllable-based system rather than a number-based system because rhythm syllables serve as more effective link between audiation and the reading/writing of music than do numbers. Cynthia Crump Taggart concluded:

> Rhythm audiation is improved when rhythm syllables are included as a part of the music learning process… because the use of rhythm syllables enables students to remember (retain in audiation) a larger vocabulary of rhythm patterns than would be possible without the use of rhythm syllables… In the same way words serve as labels to help one classify and remember things in the environment, rhythm syllables serve as a label that can help one classify and remember rhythm patterns in his audiation.[21]

A history of rhythm syllables provides some insight into the development of rhythm instruction.

Rhythm Syllable History[22]

Rhythm syllable usage can be traced to the nineteenth-century French mathematician Pierre Galin, whose system of rhythm pedagogy had been in use since the early 1800s in France (though not published until 1844). Pierre's wife Aimé Paris and physician Emile Chevé later adapted these syllables.[23]

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[20] Ester, 32.

[21] Cynthia Crump, "Rhythm syllables: A Comparison of Systems, " in *Readings in Music Learning Theory*, ed. by Darrel L. Walters and Cynthia Crump Taggart (Chicago: GIA Publications, 1989), 55.

[22] While this is not an exhaustive list, it does highlight the main systems being used in the United States. Note that some syllable systems have been adapted and changed many times.

[23] The French Time-Names system is sometimes referred to as the Galin-Paris-Chevé system. For the sake of consistency, the former label will be used throughout this article.

> This system, often referred to as French Time-Names, evolved through versions that included both sound- and symbol based traits; as a result, it serves as the seed from which most all other systems have grown over the past 200 years.[24]

Rhythm syllable systems can be separated into three categories: (1) systems with words used as syllables, (2) number-based systems and (3) systems employing original syllables. A chart comparing the basics of various rhythm syllable systems can be found in Appendix 1. It is necessary here to distinguish between beat- and symbol-based syllable systems. When syllables are derived from a metric hierarchy and how notes function within a measure, a system is considered *beat-based*. When syllables are assigned based on the type of note regardless of meter, such a system is *symbol-based*.

Systems with words used as syllables

Galin's original system assigned French words with an appropriate number of syllables to note values, making it usable only with very basic rhythmic patterns. "Perhaps because of this, the system eventually published by Paris and Chevé in 1844 incorporated traits related to metric function, initiating an evolutionary process that can be traced through virtually all systems to the present."[25] In Pierre Galin's system, quarter notes were assigned the word "noir" and eighth notes, "croche." Inspired by the work of Jean Jacques Rousseau, Galin said in 1818,

> We should not recommend teaching a child to speak by means of reading, or place a book before him to show how to pronounce words. Yet this is what is done in music teaching: the child is require to perform from written notes; he is made to read before his knows how to sol-fa, that is, before he can speak…. Does anyone believe that a child can be taught to count by placing before him a set of figures to read, if he does not already know the precise significance of the names which the figures bear? No, certainly not! By such means the child will only learn

[24] Ester, 53.

[25] Ester, 54.

> to give names to various arrangements of the symbols without knowing their value—the relationship of those symbols to external things.[26]

This notion reveals Galin's belief in a rhythm syllable system and the Pestalozzian idea that names and sounds should precede the reading of notation. Luther Whiting Mason and Zoltán Kodály adapted and further modified the system, but doing so created syllable-driven rather than word-based systems as syllables like "ta" were used to denote the beat. Appendix I illustrates how both men adapted Galin's original system.

A simple word-based approach involves chanting notes with their formal note name; for example, eighth notes are chanted as "eighth." While this system is simple to learn, since the name directly represents the object, someone using this system is forced to focus on individual durations rather than experiencing music in patterns. Also, note names often do not correspond to the note values they represent. For example, "quar-ter" has two syllables but may represent one beat (as in 4/4). "Consequently, those syllables cannot be used as a tool to help one to recognize the meter of the music."[27] In addition, the term "eighth" could represent the beat, a division of the beat, or even its subdivisions.

Carl Orff (1895-1982) considered rhythm a vital element of music that could be isolated and taught apart from melody, and that children learned from naturally occurring speech patterns. His *Schulwerk* employs words for rhythmic values depending on their syllabification (combinations of strong and weak) and their place within a meter. For example, four quarters can be represented as, "ti-ger-lil-y" or "Al-a-ba-ma," as both words follow the strong-weak-strong-weak pattern.[28]

> Language becomes musical when it is recited to accompanying pulse-beats. . . . Rhythm in language comes about through the interplay of longer and shorter syllables, some of which are more accented than others.[29]

[26] Pierre Galin, *Rationale for a New Way of Teaching Music*, trans. Bernarr Rainbow (1818; repr., Kilkenny, Ireland: Boethius Press, 1983), 54-57.

[27] Crump Taggart, 58.

[28] Bridgitte Warner, *Orff-Schulwerk: Applications for the Classroom* (Englewood Cliffs, NJ: Prentice-Hall, 1991), 20.

[29] Warner, 17.

To emphasize his philosophy on language-driven rhythmic patterns, time signatures are not used in Orff's method.

Swiss music education scholar Emile Jaques-Dalcroze (1865-1950) developed a system called eurhythmics, which incorporated dance and movement with rhythm instruction; the system was designed to improve musical expression and rhythmic accuracy. Dalcroze also valued a sound before sight approach:

> Jaques Dalcroze…insisted that in most cases the teacher of eurhythmics (which means literally 'good rhythm') improvise the music to which the pupil was to respond and that these responses should be both free and flexible; and that such free and flexible movements should at first be stimulated by music *heard* rather than by notes *seen*.[30]

Although there was no formal set of rhythm syllables used, his eurhythmics system did employ mnemonics such as "run-ning" (for two eighth notes) and "gal-lop-ing" for three eighth notes in compound duple meter.[31]

Number-based systems

An approach used by many American instrumentalists is the "1 e and a" system, wherein numbers mark the strong beats and other syllables and words are used to represent subdivisions. For example, in 4/4 meter four quarter notes would be chanted "1-2-3-4," a set of sixteenth notes in the same meter on beat one would be chanted "1-e-and-a," and six eighth notes in 6/8 would be chanted "1-2-3-4-5-6." While the system is easy to learn, it is inappropriate in terms of music learning theory, because "students must see rhythm in notation in order to associate the appropriate numbers with the macro beats."[32] A macro beat is the fundamental

[30] Karl Wilson Gehrkens, "Rhythm in Music," *Music Educators Journal* 49:5 (April/May 1963): 46.

[31] Emile Jacques Dalcroze, *Rhythm, Music, and Education*, trans. Harold F. Rubenstein (London: Riverside Press, 1967), 12-13.

[32] Crump Taggart, 61.

pulse of music that stays mostly constant.[33] Micro beats are the subdivisions within macro beats. For example, in 6/8 meter, macro beats could occur on the first and fourth notes with micro beats occurring on all six eighth notes. The "1 e and a" system—inextricably tied to notation—was designed for use in simple meter.

The "1 e and a" system was modified by Eastman School professors Allen McHose and Ruth Tibbs in the mid-1940s to assist with the feeling of strong beats within the context of counting.[34] What is now referred to as the McHose/Tibbs System or the Eastman System has a different set of syllables for simple and compound meter. Eighth notes are chanted "1-te, 2-te" and four sixteenths are chanted "1-ta-te-ta." Triplets and groupings of three eighth notes in compound duple meter are chanted as "1-la-lee." In their *Sight-Singing Manua*l, the authors suggest the following: "(A) Make the *conductor's beat* with the right hand, (B) Tap the *background of the beat* with the left hand, *two equal time values* for a *simple beat*, (C) Recite the *time values of the notes*, using the rhythmic syllables."[35] Edwin Gordon promoted a similar system (sometimes called Tometics) in the 1970s. Four eighth notes in 2/4 were chanted as "1-ne 2-ne" and six eighth notes in 6/8 as "1-na-ni 2-na-ni."[36] Gordon later abandoned this system in favor of the Froseth/Blaser phonetic rhythm syllables (discussed below).

[33] James Froseth offers another way to think of a macro beat: "determine how the conductor's ictus would indicate the beat (sometimes referred to as the big beat…)." (James Froseth, e-mail message to author, July 24, 2010). For example, 6/8 could be conducted with two or six ictuses to a measure.

[34] Allen Irvine Mc Hose & Ruth Northup Tibbs, *Sight-Singing Manual* (New York: Appleton-Century-Crofts, 1957), 6-7.

[35] McHose & Tibbs, 7.

[36] Paul Varley, "An Analysis of Rhythm Systems in the United States: Their Development and Frequency of Use by Students, and Authors; and Relation to Perceived Learning Preferences" (PhD dissertation, University of Missouri-Saint Louis, 2005), 81.

Systems employing original syllables

Recall that Englishman John Curwen adapted the French Time-Names system for use in Great Britain. He said,

> We have long wanted a language of *Time* which should correspond in simplicity and directness with the Tonic syllables which form our language of Tune. We want it for Time Analysis or Time spelling. . . . We want it also as a mnemonic, a help to the memory of Time. Just as the constant use of the Tonic syllables helps our early pupils to remember and produce intervals of *tune*, so may the frequent use of these Time syllables help them to remember and produce intervals of *time*. . . . The following scheme of Time names is copied, with slight alterations, from M. Paris's invention. . . . Notice that the vowel sound *ah* is always used for the first half of a pulse, and *ay* for the second.[37]

His system "incorporated a combination of letters to signify pitch (D for Do, R for Re, etc.) and punctuation marks to signify rhythm and stress of the beats. For example, a colon before a letter would indicate a weak accent."[38] Chevé employed a similar system of punctuation placed above tonal staves to enable simultaneous rhythmic and melodic reading.[39]

Luther Whiting Mason subscribed to Pestalozzian ideas espoused by Lowell Mason, with whom Luther studied. He adapted the French Time-Names system several times for use in the United States and Japan.

> Mason learned of the Chevé method through the work of Meylan, Professor of Music at the College of Geneva, and Mason's library includes several books by Meylan. In Meylan's *Cours de musique chiffre*, Mason explains in marginal annotations how his system differs from the

[37] John Curwen, *The Teacher's Manual of the Tonic Sol-Fa Method* (1875; repr., Clarabricken, Co Kilkenny, Ireland, 1986), 156.

[38] Varley, 20.

[39] Edwin E. Gordon, *Learning Sequences in Music: Skill, Content, and Patterns* (Chicago: GIA Publications, 1997), 74.

> French system. In the French system, the unit is a pulse or beat; in Mason's system, the unit is the measure.[40]

Experimentation with several variations occurred throughout the late nineteenth century, some of which were published in subsequent editions of Mason's *New Music Reader*. The 1886 version employed original syllables, which are included in the appendix. Vowel changes in the second half of the measure (or a group of subdivisions in compound meter) were employed to make downbeats feel stronger, in keeping with his 'measure as unit' philosophy.[41] In 4/4, four quarter notes were chanted "ta-ta-te-te," four eighth notes on beats one and two were chanted "ta-fa-ta-fa," while four eighth notes on beats three and four were represented with "te-fe-te-fe." Figure 1 is a page from Luther Mason's *New First Music Reader of 1886* (published in 1889).

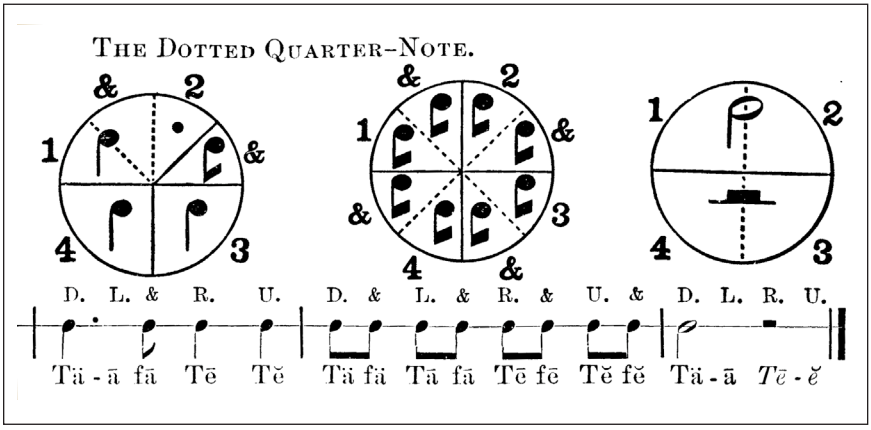

Figure 1: Example from Mason's *New First Music Reader*[42]

Notice that in addition to his rhythm syllables, he uses pie-shaped graphics to represent different note values as well as instructions for conducting (D = down, L = left, R = right, U = up). Mason believed students should kinesthetically feel the beat when practicing rhythm, noting: "The children must have been drilled in

[40] Sondra Wieland Howe, "Luther Whiting Mason: Contributions to Music Education in Nineteenth-century America and Japan" (PhD dissertation, University of Minnesota, 1988), 59-60.

[41] The exception to this rule is 2/4, where the beat remained constant as "ta."

[42] Luther Whiting Mason, *The New First Music Reader: Preparatory to Sight-Reading* (Boston: Ginn & Company, 1889), 17.

beating time, so as to be able to do it with precision. This exercise should then be copied upon the blackboard, and the class required to beat the time, first naming the beats, and afterward speaking (not singing) the Time-names."[43]

Luther's mentor Lowell Mason also modified Curwen's system of syllables in the mid-1800s. "While Mason's system was extremely complex, continued modifications eventually resulted in the Simplified French Time-Names system – an approach currently used by a small percentage of teachers in the United States."[44] Unlike the syllables adapted by Mason, the Simplified French Time-Names system is fundamentally beat-based as the beat remains chanted as "ta" regardless of meter. Figure 2 illustrates this via a comparison of the Kodály syllables to the Simplified French Time-Names syllables. Because the syllable assigned to the beat stays constant as "ta," the Simplified French Time-Names system is a beat-based system, and that Kodály's adaptations created a symbol-based system.

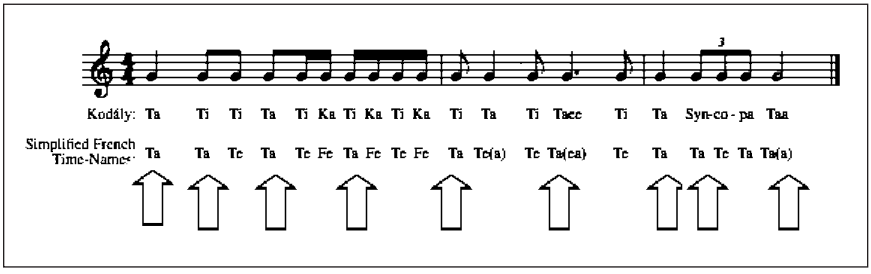

Figure 2: Comparison of Simplified French Time-Names and Kodály syllables

James Froseth and Albert Blaser devised their system of phonetic rhythmic syllables in the 1970s.[45] Theirs is a beat-based

[43] Mason, 43.

[44] Ester, 54.

[45] According to a workshop handout from Dr. Froseth entitled *The Evolution and Origin of the Froseth/Blaser Phonetic Rhythmic Syllables*, "the initial inquiry… was to develop a phonetic set of duple and triple rhythmic syllables that could facilitate the teaching of instrumental jazz articulations." They were first published in 1979. Many scholars incorrectly attribute Froseth and Blaser's set of syllables to Edwin Gordon. Regrettably, I was one of these educators enlightened only in 2009, when I met Dr. Froseth. Gordon's duple and triple syllables are identical, but the idea for the original set of syllables belongs to Froseth and Blaser. Dr. Froseth further pointed out via personal communication that in the original publication of the "Gordon" syllables, Froseth is credited with the *research* behind said syllables. Subsequent publications omitted the credit.

system because syllables chanted on the beat ("du") stay constant regardless of the subdivision of the beat. Different syllables represent subdivisions of the beat. Four eighth notes in 2/4 (two beats to the measure) are sung "du-de, du-de." Eight sixteenth notes in 2/4 are chanted "du-ta-de-ta, du-ta-de-ta," and six eighth notes in 6/8 (two beats to the bar), are chanted "du-da-di, du-da-di." Twelve sixteenth notes in 6/8 are chanted "du-ta-da-ta-di-ta, du-ta-da-ta-di-ta." Edwin Gordon adopted the duple meter "du-de" and triple meter "du-da-di" system in the 1980s, making a distinction between macro beats and micro beats, and between "usual" (e.g. 2/4) and "unusual" (e.g. 5/8) meters.

In the early 1960s Zoltán Kodály created a national music education model in his native Hungary and published many volumes on music literacy. He believed in several basic tenets, including:

- music education is the right of every human being;
- music education must begin with the voice;
- music training must begin very early in life;
- music should be taught through a child's mother tongue; and that
- quality music (folk and composed) should be used with children.[46]

Kodály viewed rhythm as an outgrowth of movement/dance and flow of spoken language as well.[47] He considered rhythm a vital part of his philosophy, stating: "…one of the most important tasks of rhythmic education is the systematic preparation of children for comprehensive music reading."[48] He believed that "bad reading is mainly caused by rhythmic clumsiness and hesitation. Thus rhythm is always of the greatest importance."[49]

Kodály's writings indicate that he endorsed a sound before symbol approach, given his belief that musical experience should

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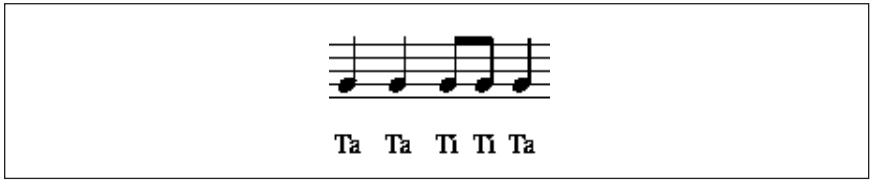
[46] Lois Choksy, *The Kodály Context: Creating an Environment for Musical Learning* (Englewood Cliffs, NJ: Prentice-Hall, 1981), 6-8.

[47] Zoltán Kodály, "Folk Music and Art Music in Hungary," *Tempo* 63 (Winter 1962-1963): 33.

[48] Paul Weiss, *Kodály -- Questions of Adaptation and the Pedagogy of Rhythm* (Willowdale, Ontario: The Avondale Press, 1977), 30.

[49] Weiss, 30-31.

precede symbolization.[50] Ironically, the Kodály rhythm syllable system is fundamentally *symbol-based*. That is, syllables do not reflect metric function and are assigned to note types regardless of meter. Consider the following example:



Here a student is required to recognize that an undivided beat is chanted as "ta" and that a divided beat is chanted as "ti." This is a clear indication that students are simply assigning syllables to memorized symbols (note types) rather than learning about metric function. In this system, the symbol comes before the sound, and therefore contrary to Kodály's ideals. The musical examples in Figures 3 and 4 illustrate my point. Kodály syllables provide no context for reading within a measure because they merely identify the rhythmic symbol and not its function. They also become impractical when students encounter repertoire that is difficult or impossible to chant using Kodály syllables. They are difficult to use in music with changing meters, and are particularly confusing in compound meter as illustrated here.

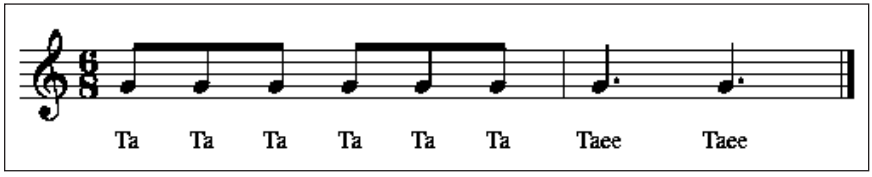


Figure 3: Kodály syllables in compound meter

The repeated "ti" provides no context of location within the measure, and the "ta-ee" syllable representing the dotted quarter note was designed to teach the dotted quarter, eighth note pattern (ta-ee ti). "Ta-ee" is chanted for dotted quarter notes in both simple and compound meter. The "ee" in the "ta-ee" pattern is designed to illustrate the length of the dot.[51] Figure 4 shows more pitfalls of the Kodály symbols that occur in all but simple meters that employ only simple divisions of the beats. In compound meters with multiple

[50] Choksy, *The Kodály Context*, 10.

[51] Some educators have taken to using "tum" rather than "ta-ee."

levels of subdivisions within each macro beat (such as 12/8). Again, Kodály's repeated "ti's" provide no assistance in discerning the macro beat. In measure three, one can see the confusion involving repetition of the counter-intuitive syllable "tim" (pronounced "team"). Here the R of "tim-ri" is also problematic-- it requires the tongue to bend backward directly before an initial T is to be chanted.

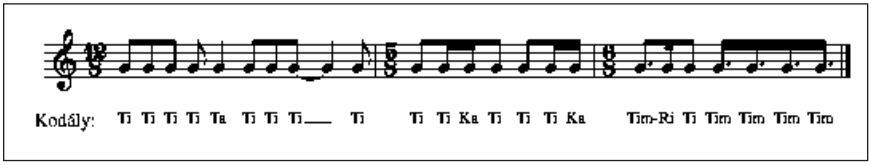


Figure 4: 12/8, 5/8, and 6/8 comparison

Contemporary Views of Rhythm Syllables in the Kodály Community

Over time, the writings of several leading Kodály specialists reveal an evolving philosophy about rhythm pedagogy. Hungarian Kodály expert László Eősze's book *Kodály's Principles in Practice* (1973) discusses practical application of the methodology, including a sample teaching sequence in which students walk and/or clap a steady beat in preparation for reading rhythm with "stick notation." Eősze's text contains no mention of echoing or aural preparation for notation reading.[52] Lois Choksy clarified North American application of Kodály practices in *The Kodály Method* (1999) stating that, "because of the differences between the North American setting and the Hungarian model, different teaching techniques must be employed."[53] Kodály's model is tied to Hungarian folk songs, many of which are in duple meter; this is not consistently applicable in the United States because American Kodály educators base their lessons on American folk music, which is more commonly in compound meter (often 6/8). As discussed, Kodály syllables are difficult to apply in compound meter. To address such shortcomings, current Kodály scholars Mícheál Houlahan and Philip Tacka, authors of *Kodály Today: A Cognitive Approach to Elementary Music*

[52] László Eősze, *Kodály's Principles in Practice: An Approach to Music Education Through the Kodály Method* (London: Boosey & Hawkes, 1973), 23-25.

[53] Lois Choksy, *The Kodály Method I* (Englewood Cliffs, NJ: Prentice Hall, 1999), 26-27.

Education (2008), model Kodály teaching sequences using Takadimi syllables.[54] Though their *Sound Thinking* texts from the early 1990s employ Kodály syllables, Philip Tacka has stated,

> The Takadimi rhythm system solves the problems associated with the Kodály rhythm syllables. We believe that were Kodály alive today, he would certainly encourage his students and colleagues to use the Takadimi system.[55]

Mícheál Houlahan elaborates:

> [We use] the Takadimi system to label sounds, without any recourse to notation, only after students have had very specific kinesthetic, aural and visual experiences. This was the missing link in Kodály and Gordon![56]

While one might assume that the preceding argument applies only to the K-12 teachers, it should become quickly apparent that Houlahan and Tacka's new approach to the Kodály system widens the audience to include college-level students.

The Takadimi System

Richard Hoffman, William Pelto, and John White devised the Takadimi system after noticing the shortcomings of other available rhythm syllable systems. They note, "all systems value the recognition and labeling of rhythmic patterns but choose to emphasize or facilitate one aspect of the rhythm learning process at the expense of another."[57] They suggest that successful rhythm

[54] Mícheál Houlahan and Philip Tacka, *Kodály Today: A Cognitive Approach to Elementary Music Education* (New York: Oxford University Press, 2008), 119-142.

[55] Don P. Ester, John W. Scheib and Kimberly J. Inks, "Takadimi: A Rhythm System for All Ages," *Music Educators Journal* 93:2 (November 2006): 62.

[56] Mícheál Houlahan, e-mail message to author, June 12, 2010.

[57] Richard Hoffman, William Pelto, and John W. White, "Takadimi: A Beat-Oriented System of Rhythm Pedagogy," *Journal of Music Theory Pedagogy* 10 (1996): 13.

syllable systems should:

- lead to accuracy and musicality in performance;
- provide understanding of rhythmic structure;
- facilitate aural identification of rhythmic patterns;
- use precise and consistent language;
- address non-traditional issues such as multi-meter, modulation of meter/tempo, complex syncopation, and complex tuplet beat groupings.[58]

Notice in Figure 5 that Takadimi syllables employ varied initial consonants to represent the micro beat, helping students to feel the difference between each subdivision. Unlike the Kodály syllables, Takadimi syllables are beat-based, because the strong beat is chanted with the invariant "ta" with vital syllabic variation occurring in divisions and subdivisions. The inventive system of syllables supports previous research on music learning because it "features two related sets of syllables, one for simple beat division and one for compound," and "the syllables are assigned to location within a beat, not the notational value."[59] By naming the dotted quarter "ta" in 6/8, students are able to feel the macro-beat rather than getting mired in subdivision (as in Kodály's "ta-ee"). It is also important to note that Takadimi syllables offer a definitive indication of place within the beat and Kodály syllables do not.

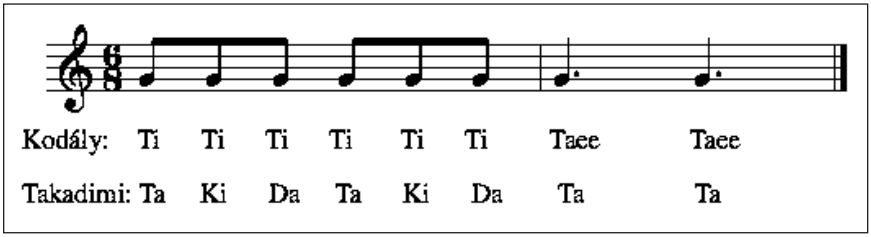


Figure 5: Kodály/Takadimi compound meter comparison

Figure 6 further shows how Takadimi aids in teaching advanced rhythms.

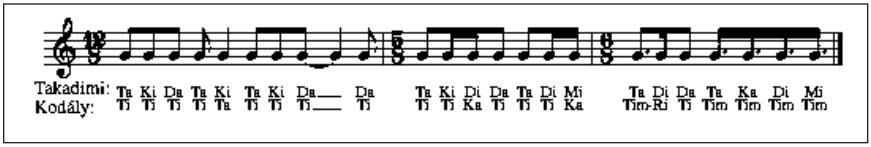


Figure 6: Kodály/Takadimi comparison in various meters

[58] Hoffman et al., 7-8.

[59] Hoffman et al., 14.

With Takadimi, the pattern at the end of measure two is felt as a complete grouping rather than as three equally important rhythms. In the end of measure three, Takadimi utilizes the same syllables ("ta-ka-di-mi") for the dotted sixteenths in 6/8 as for un-dotted sixteenth notes in 4/4. This provides ease of performance and accuracy; the two patterns sound the same, so it stands to reason that they are chanted with the same syllables. Such inconsistencies are causing many Kodály experts to seek out a new system of rhythm syllables. Takadimi can surely remedy these shortcomings. Due to their metrically hierarchical design, I believe Takadimi syllables provide a more effective heuristic for teaching rhythm than do the Kodály syllables. Figure 7 shows application of Takadimi syllables in various meters.

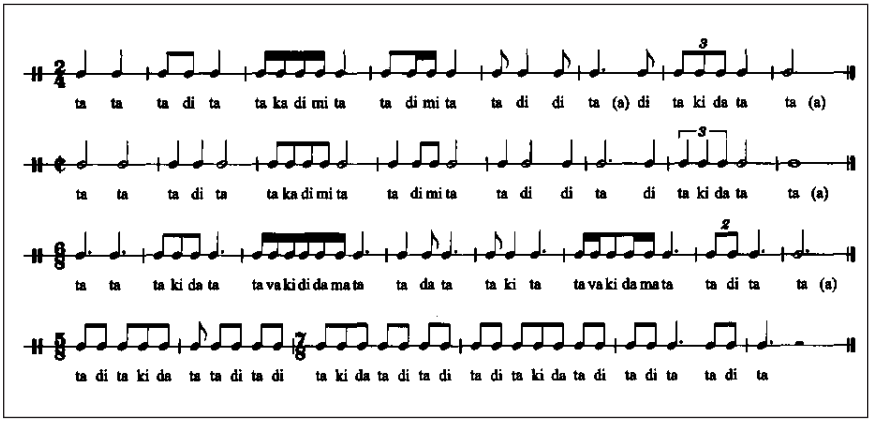


Figure 7: Takadimi rhythm syllables[60]

Justin London corroborates the importance of the Takadimi system in his discussion of music cognition, saying, "Takadimi is psychologically proper in the primacy it gives to the beat level of the metric hierarchy."[61] Likewise, Gary Karpinski (2000) maintains:

[60] Don P. Ester, John W. Scheib, and Kimberly J. Inks, *Music Educators Journal* (93:2)

* pp. 60-65, copyright © 2006 by SAGE Publications.
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[61] Justin M. London, "A Psychological Addendum to Takadimi: A Beat-Oriented System of Rhythm Pedagogy," *Journal of Music Theory Pedagogy* 10 (1996): 33.

> Functional systems, chief among them Takadimi, model the metric positions of attack points. They require the readers to understand the proportional metric values of notes and rests as they read. Functional systems are particularly attractive since they use uniform labels for specific rhythmic patterns (and thus for identically performed music) regardless of their different notational incarnations within various meter signatures.[62]

> Although many of the preceding rhythmic solmization systems aspire to represent rhythmic function, in Takadimi we have a functional system of rhythmic solmization that most closely models the aural understanding listeners engage in when they apprehend rhythms in relation to pulse and meter.[63]

Using Takadimi, the beat is always chanted as "ta"; thus students who struggle with rhythm can chant at least the steady beat in early stages of aural skills instruction. The system features a different syllable for each subdivision of the beat, providing context within a measure. The use of "di" as the mid-point of the beat in simple meter allows for precise understanding and performance of duplets and triplets. In compound meter, the vowels are grouped together (t**A**-k**A**-d**I**-v**I**-d**A**-m**A**), reducing tongue movement and making the pattern easier to speak (see Figure 8a for the hierarchy of subdivision in simple and compound meters).

One criticism of the Takadimi system is that it does not clearly indicate specific beats within a measure. One solution is to have students conduct the pattern for the meter being chanted (engaging them kinesthetically), or to have students on occasion replace "ta" with the number of the beat (see Figure 8b below).

[62] Gary Karpinski, *Aural Skills Acquisition: The Development of Listening, Reading, and Performing Skills in College-Level Musicians* (New York: Oxford University Press, 2000), 169.

[63] Karpinski, *Aural Skills Acquisition*, 82.

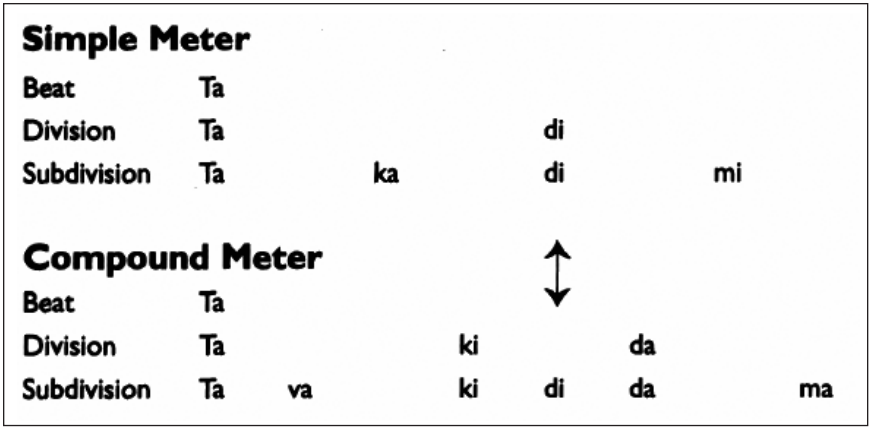


Figure 8a: Syllable subdivision in the Takadimi system[64]

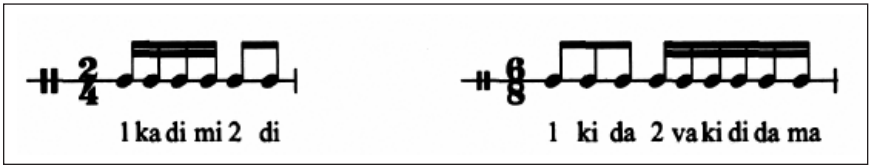
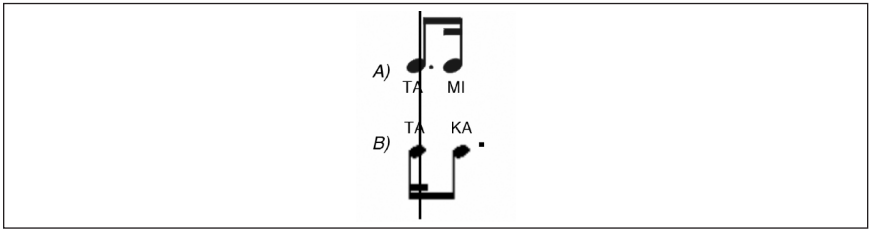


Figure 8b: Example of beat replacement for "ta"[65]

Takadimi is both a pattern and a metrically contextual approach. "Reading rhythm syllables with Takadimi helps you to recognize rhythmic patterns and see groupings of notes, not simply read note to note."[66] Consider the following example:



[64] Don P. Ester, John W. Scheib, and Kimberly J. Inks, *Music Educators Journal* (93:2)
* pp. 60-65, copyright © 2006 by SAGE Publications.
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[65] Don P. Ester, John W. Scheib, and Kimberly J. Inks, *Music Educators Journal* (93:2)
* pp. 60-65, copyright © 2006 by SAGE Publications.
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[66] Richard Hoffman, *The Rhythm Book*, 2nd ed. (Franklin, TN: Harpeth River Publishing, 2009), vi.

Rhythm A (dotted eighth-sixteenth) is often confused with rhythm B (sixteenth-dotted eighth). In pattern B, students may want to place the dotted eighth on the downbeat, feeling the sixteenth note as a pick-up rather than a downbeat. Using Takadimi, students can clearly hear and feel the difference between the groupings above (Ta---Mi vs. Ta-Ka---) as well as the strength of the downbeat ("ta"). The reason they are able to feel this is because they have a vocabulary to clearly identify such patterns. Here the sound before symbol paradigm is clearly demonstrated; in correctly naming a rhythmic structure, we enable the student to form an aural image of that sound. Hoffman *et al*. write, "[students] come to regard rhythm as identifiable and interrelated units of sound rather than a simple stream of attack points."[67]

Because Takadimi is a fairly new system (and solely concerned with rhythm pedagogy with no pitch component), it is not used as widely used as other rhythm syllable systems. Nevertheless it has powerful implications for the university aural skills curriculum, as the system is as effective with young students as with university-level music majors. Ester *et al*. expound upon Takadimi's pragmatic elements: "because patterns in 2/4 and 2/2 sound exactly the same, the syllables associated with these patterns are exactly the same, as they should be."[68] Furthermore, Takadimi provides an "unintentional advantage" in aiding brass and flute players with multiple tonguing, a technique employing nearly identical syllables.[69] As stated above, the most effective teaching method is to introduce something in terms of what students already know. Since tonguing is something brass and woodwind students are very familiar with, Takadimi would be much easier for these students to learn.

[67] Hoffman et al., 29.

[68] Ester et al., 60.

[69] Ester et al., 63-64.

Takadimi and Cognitive Connections

In my view, Takadimi syllables help make connections between disparate parts of the brain involved in rhythm learning and performing. Barbara Strauch writes,

> It now appears that new neurons may actually act to tie disparate information together—and place that information in a specific time frame. Gage now believes that new neurons help us make associations. If we hear a Beach Boys song and smell the salt from the beach, those two impressions—Beach Boys song and salt smell—will be forever tied together in time and place.[70]

Strauch cites research by Fred Gage:

> Researchers have shown that cells destined to become neurons travel from the ventricles to the olfactory bulbs, a pair of structures that receives input from odor-sensing cells in the nose. Although no one is sure why the olfactory bulb requires so many new neurons, we can more easily speculate why the hippocampus needs them: this structure is crucial for learning new information, so adding neurons there would presumably spur the formation of connections between new and existing neurons, increasing the brain's capacity to process and store novel information.[71]

Such connections are crucial, given that the more links we have to the same information, the more it becomes readily available. Takadimi, as a name for something, is apparently stored in a different place than the sound itself. This is an area for future research that could have a profound impact on rhythmic instruction.

Rhythmic skills are vital to quality musical performances and thus should become a higher priority in collegiate aural skills instruction. Building on ideas of Zoltán Kodály, Takadimi seems to be gathering momentum and gaining credibility in the music community. Because rhythm is one of the most important unifying factors in music, in some styles no doubt the very foundation, it must be taught with care, ingenuity and precision.

[70] Strauch, 136.

[71] Fred H. Gage, "Brain, Repair Yourself," *Scientific American* 289:3 (September 2003): 50.

APPENDIX 1: RHYTHM SYLLABLE SYSTEM COMPARISON

						6/8 time	6/8 time 	triplet
Galin-Paris-Chevé [word-based]	Noir-noir-noir-noir	Cro-che	Dou-ble cro-che	Bla-nch, bla-nch	(?)	(?)	(?)	(?)
1 e and a [number-based]	1-2-3-4	1 &	1-e-and-a	1__3__	1___	1-2-3-4-5-6	(?)	Tri-po-let
McHose/Tibbs [number-based]	1-2-3-4	1-Te	1-Ta-Te-Ta	1__3__	1___	1-la-lee, 2-la-lee	1-Ta-La-Ta-Li-Ta, 2-Ta-La-Ta-Li-Ta	1-La-Lee
Simplified French Time-Names [new syllables]	Ta-Ta-Ta-Ta	Ta-Te	Ta-Fa-Te-Fe	Ta__Ta__	Ta___	Ta-Te-Ti, Ta-Te-Ti	Ta-Fa-Te-Fe-Ti-Fi, Ta-Fa-Te-Fe-Ti-Fi	Ta-Ra-La
Luther Mason-adapted French Time-Names	Ta-Ta-Te-Te	Ta-Fa	Ta-Za-Fa-Na	Ta__Te__	Ta_e__	Ta-Ra-La, Ta-Ra-La	Ta-Fa-Ra-Fa-La-Fa, Ta-Fa-Ra-Fa-La-Fa	Ta-Ra-La
Curwen-adapted French Time-Names	Ta-Ta-Ta-Ta	Ta-Te	Ta-Fa-Te-Fe	Ta__Aa__	(?)	(?)	(?)	(?)
Froseth/Blaser [new syllables]	Du-Du-Du-Du	Du-De	Du-Ta-De-Ta	Du_Du_	Du___	Du-Da-Di, Du-Da-Di	Du-Ta-Da-Ta-Di-Ta, Du-Ta-Da-Ta-Di-Ta	Du-Da-Di
Takadimi [new syllables]	Ta-Ta-Ta-Ta	Ta-Di	Ta-Ka-Di-Mi	Ta__Ta__	Ta___	Ta-Ki-Da, Ta-Ki-Da	Ta-Va-Ki-Di-Da-Ma, Ta-Va-Ki-Di-Da-Ma	Ta-Ki-Da
Kodály [new syllables]	Ta-Ta-Ta-Ta	Ti-Ti	Ti-Ka-Ti-Ka *	Ta__Ta__ **	Ta____	Ti-Ti-Ti, Ti-Ti-Ti	Ti-Ka-Ti-Ka-Ti-Ka, Ti-Ka-Ti-Ka-Ti-Ka *	Syn-co-pa

*Some Kodály proponents use “Ti-Ri” for sixteenth notes rather than “Ti-Ka”
*Similarly, some use “toe” rather than Ta__ for half note

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Strategies for Introducing Pitch-Class Set Theory in the Undergraduate Classroom

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Even as pitch-class set theory has been widely integrated into undergraduate music theory curricula, it has remained one of the more difficult topics of the typical undergraduate program for instructors to illuminate and for students to master. A number of factors contribute to this phenomenon: the atonal repertoire for which it was devised is shunned by many students; the overt affinity with mathematics in many presentations of the theory makes it anathema to some; the theory's particular employment of inversional equivalence has no clear antecedent in musical theories already familiar to undergraduates; and the theory's jargon seems mysterious and dense to the uninitiated. As Joseph Straus once put it, "Atonal set theory has a bad reputation."[1]

My purpose here is to offer practical suggestions regarding the initial presentation of the theory to help students quickly acquire an easy fluency with both its fundamental tenets and its analytic value. The teaching ideas offered here, depending on the instructor's own curricular priorities, may serve as a springboard to more advanced exploration of related theoretical concepts or to beginning analyses of post-tonal music. In either case, to be successful students must master the conceptual framework of the theory and develop some fluency in its fundamentals. These are my goals as I introduce this powerful analytic tool to my own students.

The Pedagogical Obstacles

During an office hour many years ago, an above-average student in my undergraduate theory course asked me what topics remained for us to cover in that semester. When I mentioned pitch-class set theory, she asked with great trepidation, "Is that the atonal

Many of the ideas in this essay were first presented in a poster session at the 2007 conference of Music Theory Midwest at the University of Kansas. I am indebted to the participants in that session as well as Tim Best, Melissa Hoag, and the anonymous reviewers of this article for their help in articulating this pedagogical approach and its rationale.

[1] Joseph N. Straus, "A Primer for Atonal Set Theory," *College Music Symposium* 31 (1991): 1.

music with all the math in it?" This response represented several overlapping apprehensions she had inherited from upperclassmen who had already completed the course. Of course, the repertoire to which this theory is most often applied is no more or less intrinsically "mathematical" than tonal music. As I learned, this student was attempting to articulate two fears: that the music we were about to study would sound like cacophonous nonsense, and that to understand it she would need to be a mathematician. While it is impossible to generalize about the perspectives of every student beginning a unit on set-class theory, a great many have one or both of these misconceptions.

Prior to beginning our post-tonal analyses early in their fourth semester of the theory curriculum, a large number of my music students know little more about the Second Viennese School than perhaps Schoenberg's name. Most of these students have never listened closely to an entire atonal work or studied such music in any detail. Even those students who have had some exposure to atonality or non-triadic music testify that they find it baffling, frustrating, and unattractive. It is no small wonder that, when they learn to what repertoire we are about to turn, many immediately become less interested, less receptive, more skeptical, and—as a result—more unlikely to engage meaningfully with the very theory that could "open up" this music for them.

If the impending focus on atonal repertoire is disconcerting to some students, the perception that our analysis will somehow translate the music into a mathematical equation is absolutely frightening. Straus puts it well:

> …set theory has had an air of the secret society about it, with admission granted only to those who possess the magic password, a forbidding technical vocabulary bristling with expressions like "6-Z44" and "interval vector." It has thus often appeared to the uninitiated as the sterile application of arcane, mathematical concepts to inaudible and uninteresting musical relationships. This situation has created understandable frustration among musicians, and the frustration has grown as discussions of twentieth-century music in the professional theoretical literature have come to be expressed almost entirely in this unfamiliar language.[2]

[2] Ibid., 1.

The explicit use of a science (mathematics) to explain an art form (music) is troubling and even offensive to some students. The abstraction required to turn pitch classes into numbers may strike some as illogical or at least counterintuitive. As David Mancini previously observed in this journal, "[Students] may have difficulty thinking about musical relationships in terms of integers, the traditional symbols of set theory. A particular stumbling block for some students is modulo 12 arithmetic…. A sensitive instructor should be aware of not only these specific difficulties, but of the frustration emanating from them as well."[3] (Straus's own textbook all but apologizes for asking students to "add" two notes together.[4]) Additionally, there are many music students for whom classes in math and other sciences, whether in their secondary or post-secondary education, were difficult and fraught experiences. For these undergraduates the artistry and instinctive aspects of music-making have always matched their aptitudes better than those needed for success in science-related fields, and mark the very reasons they are in degree programs training them to become opera singers or band directors rather than structural engineers or systems analysts. The prospect of mathematics impinging upon their musical studies is thus established as an obstacle in their minds even before pitch-class set theory is introduced in the classroom.

To mitigate these difficulties, I have developed the approach to introducing set theory described below. It addresses the problem of atonal music's "inaccessibility" by creating intimate familiarity with a brief—but complete—movement by Webern, and draws students into making their own analytic observations, first by asking the same questions we might ask about a tonal work, then by challenging them to identify and label the small groups of intervals (the set types) that govern the music's structure. The introduction of the theory itself delays mathematical abstractions such as integer representation of pitch classes and the ubiquitous clock-face metaphor for pitch-class space. Instead, I employ standard musical notation and a collection of playful, memorable metaphors to dissolve the "air of the secret society" that Straus describes. In certain respects, some methods provided here for explaining fundamentals of set theory are hardly revolutionary. Experienced instructors will recognize aspects of

[3] David Mancini, "Teaching Set Theory in the Undergraduate Core Curriculum," *Journal of Music Theory Pedagogy* 5, no. 1 (spring 1991): 96.

[4] Straus, *Introduction to Post-Tonal Theory*, 3d ed. (Upper Saddle River, NJ: Pearson Prentice Hall, 2005): 48–49.

the given procedures for determining normal order, labeling set types, and so on. I do not believe a total overhaul of this subject's pedagogy is required; moreover, there is a finite number of good ways to explain each fundamental concept of set theory. Instead, the motivations for this essay are to suggest a carefully charted order in which to introduce the interrelated concepts of pitch-class set theory for the first time; to provide a detailed strategy for orienting students to the musical significance of each element of the theory; to exposit a small body of metaphorical images that students and instructor can draw upon together, facilitating easy discussion of the theory and its implementation; and (in sum) to provide a conceptual gateway to the theory that is neutral enough to dovetail with a wide variety of subsequent readings, musical analyses, and presentations of the theory's other features.

Before describing the teaching approach in detail, allow me to make clear that I find integer representation and the clock face appropriate tools in set theory and its pedagogy. My explicit avoidance of these common metaphors should not be read as an implicit objection to their use. Indeed, the comparisons below of sets to buildings and to M&Ms are no less abstractions than is a mod-12 system in which C = 0. I have found, however, that early avoidance of specifically mathematical abstractions, coupled with consistent representation of sets in musical notation, helps to break down the barriers described above. By building facility in finding prime forms and performing basic transformations using *at first* only musical notation, many students develop greater cognition of the theory's operations as they manifest in pitch space (and often do so with less anxiety). One goal of this introduction to the theory is to prepare students for detailed analytic work using set classes, which certainly may involve abstraction to mathematical representations that—thanks to this foundation—will more clearly represent musical entities in the students' minds.

Cocoa Puffs and the Need for the Theory

Whether this theory's reputation is deserved or not, the apparatus required to apply it fluently is substantial. While some of its components have analogs in tonal theory (transposition and modulation might be viewed as a precursor to T_n, for instance), set theory's applications and vocabulary differ considerably from analytic methods with which students are already acquainted.

The result is a steep learning curve. As students wrestle with the conceptual hurdles, a worthwhile question emerges: "Why are we doing this?" For all the (perceived) difficulty in learning this theory, what will it really tell us about a given musical work?

It is helpful to students to address these questions of musical relevancy even before they typically think to ask them. Instead of describing the theory in the abstract "from scratch," beginning the inquiry via investigation of a carefully selected work can demonstrate the analytic need for a method of classifying groups of notes according to their interval content. To that end, I begin with the third of Webern's *Fünf Sätze für Streichquartett*, Op. 5.[5] Figure 1 shows the opening of this movement.

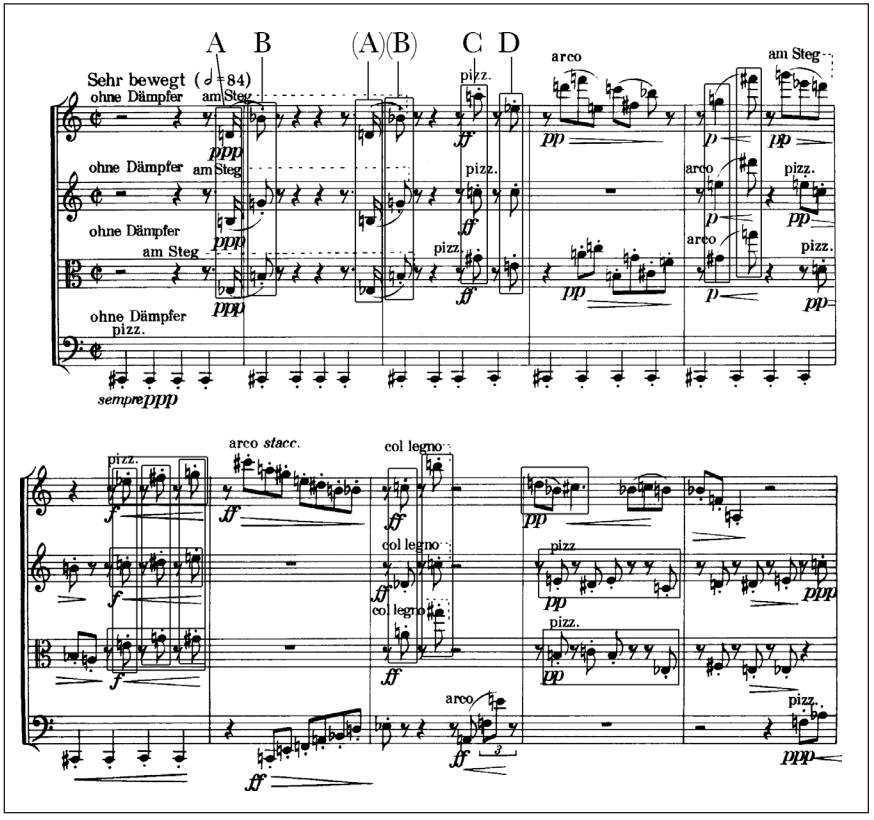

Figure 1 - Webern, *Fünf Sätze für Streichquartett*, Op. 5, No. 3, mm. 1-10; instances of (014) marked.

[5] Miguel Roig-Francolí offers a detailed analysis of this movement in chapters 3 and 4 of *Understanding Post-Tonal Music* (New York: McGraw-Hill, 2008) to which the in-class work I describe here might serve as an introduction.

As preparation for class, students listen to the entire movement several times while following along in a score. The in-class discussion opens with broad questions that I've asked students to consider in advance:

• Do you think C# has a special significance to this movement? Why or why not? If so, is its significance *audible*? Is it a pitch center or a "tonic?" How does it frame the movement?

• How would you describe this movement formally? How many sections are there? How are they delineated?

• Describe the texture at each moment of the work. Are any portions homophonic? heterophonic? monophonic? polyphonic? Are there any ostinati? canons?

• Are there any elements of repetition in this music? Is any musical element (chord, melody, rhythm, section) ever repeated or recapitulated? What might a listener "latch onto?"

These kinds of questions would be appropriate for any of the tonal repertoire students have already studied for several semesters, and thus serve to make students more comfortable and familiar with this movement. Even as we grapple with this music, though, it becomes clear that none of the analytic methods students emphasized in the music theory curriculum to this point is quite satisfactory to this music. C# is crucial to this movement, but not in the same sense as a traditional tonic, and while it is possible to speak of the work's large-scale organization by noting sectional divisions and motivic repetitions, its harmonic and melodic content resists analysis using students' current vocabulary. Aside from stating the obvious—the music is chromatic and atonal—the class realizes it lacks the theoretical language and tools to describe individual sonorities or melodic lines with any rigor.

As students express their first ideas about the work's organization in this discussion, I guide them to consider the harmonies that open the work above the cello's C# pedal point. Students can tell quickly that the upper strings' sonorities in mm. 1–3 are not tertian, but there is something consistent about their construction. After playing these chords in isolation at the keyboard and reducing them to a single staff on the chalkboard (see Figure 2), that commonality becomes clear. Each chord is made of three pitches that can be arranged as either a minor third stacked atop a half step or as a half step atop a minor third.

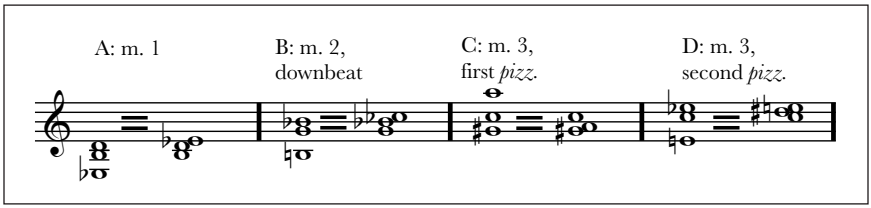

Figure 2 - Preliminary analysis of four sets from Webern, Op. 5, No. 3.

This small discovery helps me to define to my students the need for pitch-class set theory. Clearly Webern is working here with a certain "type" of chord in a consistent way. I encourage students to invent a temporary label for this chord type—an enthusiastic student once called it a "Cocoa Puff"—but we have no *meaningful* way to label it. Following Stefan Kostka and Miguel Roig-Francolí,[6] I demonstrate that the label *major triad* is analogous to the label that is lacking here. *Major triad* does not refer to any specific pitch or registral deployment, but rather a whole category of sonorities that share certain intervallic features among its members. Students readily recognize that the pitches D, F#, and A, however arranged in pitch space, constitute an instance of a major triad. C, E, and G together constitute another different major triad: even though these two entities do not share common pitches or (necessarily) similar registral arrangement, they both belong to that class of musical objects we call major triads.[7] This is the sort of label we need for Webern's chords—and this is the label that pitch-class set theory can provide. By explaining to students that set theory provides a single logical name for all four of the chords in Figure 2, the instructor orients students in advance to the power of the theory: providing a way in which groups of notes dissimilar in pitch content and register can be viewed as "equivalent" based upon their intervallic content.

[6] Stefan Kostka, *Materials and Techniques of Twentieth-Century Music*, 3d ed. (Upper Saddle River, NJ: Pearson Prentice Hall, 2006), 185; Roig-Francolí, 74.

[7] In fact, set class names are more directly analogous to the category "major and minor triads," as major and minor triads are inversionally equivalent in this theory—but to avoid early confusion I choose not to introduce the issue of inversional equivalence to students at this stage.

Defining Types of Equivalence

Many domains of equivalency crucial to pitch-class set theory also pervade theories of tonal music. Octave equivalence and transpositional equivalence are transparent to most students because they are essential to understanding tonal repertoire. Thus, they have no trouble recognizing that multiple manifestations of {C, D, E} can be viewed as equivalent regardless of the registers in which any of its elements appear. {C, D, E} and {F#, G#, A#} have a contrasting obvious equivalence based upon their successive interval content. It is worthwhile to point out and define these equivalencies to students, but most intuitively negotiate them without difficulty. The ease with which a typical class will generate Figure 2 demonstrates this phenomenon.

The next step, then, is for students to describe with precision the kinds of "sameness" that led them to apply the same arbitrary label to all four chords ("sets") in Figure 2. One way to do this is put the question negatively: "What differences among these four sets do we have to ignore in order to say they're 'the same?'" Students' responses lead them to a catalog of equivalence types, most of which are familiar from tonal theory. For instance, when someone points out that the sets' registral arrangements are not all the same, a discussion of octave equivalence follows. I explicitly define each equivalence class as class members "discover" them:

- *Octave equivalence*. No matter in which octave any given note of the set appears, the set is still the same set. For instance, in Figure 2, the movement of Set A's E♭3 up an octave to E♭4 doesn't change the set's identity.
- *Enharmonic equivalence*. Put simply, the spelling of a note does not change its identity. Our work with Sets B and D in Figure 2 made use of this equivalence. (Some students, after weeks of respelling enharmonic diminished seventh chords to imply different keys, are relieved to learn that they may now use whatever enharmonic spellings they find convenient!)[8]

[8] A by-product of enharmonic equivalence is that, for the purposes of this theory, we may treat intervals as enharmonically equivalent as well. Throughout my presentation of this theory, I convert chromatic intervals to diatonic equivalents (e.g., augmented fifths become minor sixths) to facilitate easier comparison of interval sizes—a crucial component of classifying sets—as well as to remind students of this contrasting attitude toward enharmonicism in relation to tonal theories.

At this stage it becomes possible to define (or reintroduce[9]) the term *pitch class* for students. Assuming octave equivalence and enharmonic equivalence, every pitch that *sounds* like a C regardless of its register or spelling is a member of the same pitch class. (To test for comprehension, ask students how many different pitch classes exist in traditional equal temperament.)

• *Transpositional equivalence*. Our label "Cocoa Puff" doesn't tell us anything about which pitch classes appear in the set. The term *major triad* again serves as a helpful analogy. Just as there are twelve possible transpositions of that object we call a major triad, there are twelve possible transpositions of a given set (tacitly putting aside the potential for transpositional symmetry at this stage). The label we are seeking for our set will brand it according to its interval content, not its pitch classes.

Students are already versed in each brand of equivalence explored thus far, and these three categories are sufficient to pull Sets A, B, and D into a single category. To account for Set C, however, we must invoke a fourth category: *inversional equivalence*. This type of equivalence declares as "the same" any two sets whose consecutive intervals reflect one another when read in opposite directions (low to high and vice versa). Inversional equivalence accounts for the observation about the Webern sets provided as Figure 3: whether the set places a minor second atop a minor third or a minor third atop a minor second, the set remains a Cocoa Puff.

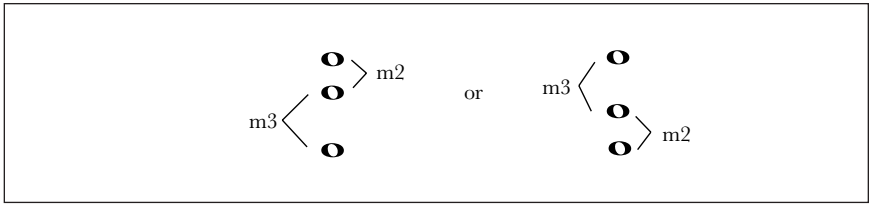

Figure 3 - Summary of intervallic content of sets from Figure 2.

[9] Many tonal theory textbooks appropriate the term *pitch class* to clarify fundamentals of pitch naming and notation as they are introduced, though explicitly outlining its relationship to octave and enharmonic equivalences is essential to this introduction to pitch-class set theory.

Set theory's employment of inversional equivalence is more difficult for many students to grasp at first. The conceptual difficulties reside both in terminological overlap and with the lack of correlation to tonal theory (not to mention the difference in sound between a given nonsymmetrical set and its inversion—this becomes especially apparent to students when they learn that major and minor triads are inversionally equivalent). By the time most curricula reach the topic of pitch-class set theory, students have been required to become conversant with intervallic inversion, triadic inversion, melodic inversion, and textural inversion. The meanings of these applications of inversion overlap in ways that sometimes perplex students. (This is to say nothing of row inversion, a crucial component of serialism that is often introduced shortly after pitch-class set theory.) Yet none of these applications of *inversion* is precisely the same as reversing the sequence of intervals in a temporally unordered set.[10] Some students are understandably bewildered when asked to think of inversion in one more slightly different way.

After briefly introducing the concept of inversional equivalence and demonstrating how it is needed if we are eventually to give Set C the same label as the others in Figure 2, I leave it aside for the moment and gently deflect the questions and objections that frequently arise. The power of this category of equivalence becomes clearer when we use it to generate a meaningful label for the set type we've been calling Cocoa Puffs.

Pyrophobic Architecture, Normal Order, and Prime Form

As I explain to students, the problem with an arbitrary label for our set type such as "Cocoa Puff" is that it is arbitrary. We cannot reasonably expect another analyst to independently come up with the same label, nor could we expect her to know what we mean by

[10] This definition of inversion holds up in pitch space and pitch-class space. Once a starting point is selected—whether a pitch in pitch space or a node in pc space—and the intervals of the original set are rewritten in the opposite order from that point, the set has been inverted. The careful and limited conflation of pitch space and pitch-class space implied in this definition of *inversion* is required because all operations will be illustrated to students in staff notation, i.e., in pitch space. Such conflation is virtually transparent to students as they progress from staff notation toward integers and clock-face notation.

this term unless we stop to explain ourselves. The utility of a label like "C-minor triad" is that the musical community has reached a consensus on what this label connotes, and its meaning can be recomputed independently. We need a label with similar utility for our set type.

To that end, I provide students a three-step process, reinforced on the blackboard or in a handout, to create such a label. The entire process is summarized (as I might in a handout) in Figure 4. I inform students that, for the moment, I am "skipping" step 2 (comparison of the set's normal order with the normal order of its inversion). Skipping this step gives students two advantages: they get to view a final product of the analytic process sooner and more easily, and they are clued in that step 2 will require some special conceptual effort.[11]

Step 1: Rearrange the set into normal order.
Make the building as short/safe as possible. Get all the notes into the same octave, with the smallest possible interval from lowest to highest note. If there's a tie for "shortest building," then pick the building that's safest for the CEO. If there's *still* a tie, then pick the building that's safest for the vice-president (and so on).

Step 2: Compare the normal order of the set with the normal order of its inversion.
Invert the set by writing its intervals backwards (placing the highest interval of normal order at the bottom of the inversion and so on). Check to see that the inversion is itself in normal order. Then, compare the normal order of the original set with the normal order of its inversion: which building is safer? (Which is the "m" and which is the "w?") Use the safest possible building for step 3.

Step 3: Label the set with its prime form.
Count the number of half steps each note is above the first note. Prime form labels always begin with "0" (the first note is always zero half steps above itself!).

Figure 4 - A three-step process for determining (Rahn's) prime form.

[11] When teaching via this approach I tell students, in as many words, "We're skipping step 2 because it deals with inversional equivalence, which is a little tougher for us to wrap our heads around. Let's get to step 3 so you can see the finished product, and that will help us understand how step 2 works. In the meantime, you should know that—for the moment—I'm cherry-picking sets that make step 2 moot." When put this way, students have no trouble negotiating the procedure for finding prime form.

Step 1: Rearrange the set into normal order. I ask the class members to imagine they are architects with hypersensitivities to fire safety. Their goal is to design a building (i.e., rearrange the notes of the set using octave equivalence) so that it is as short as possible (i.e., exhibits the smallest possible interval from lowest to highest note), thus allowing people on the highest floors of the building to exit quickly. This arrangement, known as *normal order*, is analogous to mentally stacking a complex triadic structure in root position so as to determine its makeup.

After pointing out that the class has already instinctively put the Webern sets in normal order (as shown in Figure 2), I ask students to try doing the same for the sets shown in Figure 5. Finding normal orders for Sets E and F presents no special difficulty. These sets also allow me to introduce the trick of writing the set's pitch classes into a single octave (duplicating at the octave whatever note I arbitrarily select as lowest), locating the largest interval between consecutive notes, and using the higher note of the interval as the lowest note of normal order. Determining normal order for Set G presents a new complication; as shown in Figure 5, there are two orderings of this set that produce a "shortest" building. Extending our fanciful architecture metaphor can help us determine normal order in this case. If (and only if) there's a tie for shortest possible building, our pyrophobic architect then selects the design providing the CEO in the penthouse—represented as the second note from the top of the registral ordering—the best chance of getting out in the event of a fire. In the case of the two orderings of Set G shown in Figure 5, the penultimate note of order 1 is a minor third away from the "ceiling" while the penultimate note of order 2 is only a major second away, so we prefer the "safer" order 1. In the event that the two CEOs are equidistant from their exits, we then compare the "safety" of the next-lowest notes in the set (the "vice-presidents," perhaps?), and so on.

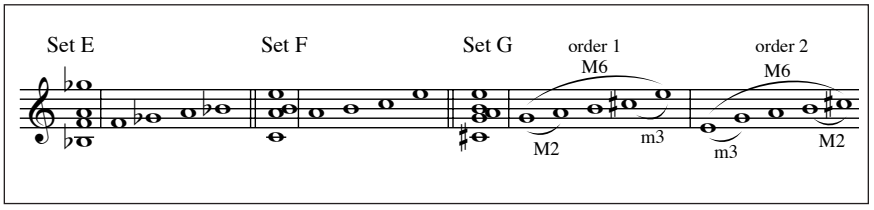

Figure 5 - Three sets demonstrating normal order.

Note that this approach to normal order reflects that of John Rahn's *Basic Atonal Theory*, adopted by many recent textbooks, which provides different results for a small number of set classes from those originally presented by Allen Forte in *The Structure of Atonal Music*.[12] If the instructor prefers that students eventually arrive at Forte's prime-form labels, they should be instructed to favor the safety of "the first-floor receptionist" (i.e., the second note from the bottom of the registral ordering) rather than that of the CEO. For Set G the result is the same—order 1 shows the receptionist a major second away from the bottom of the building, a half-step "safer" than order 2's receptionist.

Step 3 (remind students that we're skipping step 2 for the moment): *label the set with its prime form*. For the sets we've encountered thus far, this is easily accomplished by examining the normal order and counting the number of half steps each note is above the first note. Set E's prime form is (0145), Set F's prime form is (0237), and Set G's prime form—derived from order 1—is (02469). Note that these sets were carefully pre-selected so as to momentarily render moot the issue of inversional equivalence. Students will learn when we introduce step 2 of our three-step process that this issue requires further testing of the set's normal order before we can apply a prime-form label with certainty. Briefly leaving aside inversional equivalence allows students to see the goal product of this process without simultaneously needing to attend to this complication.

It is worth pointing out to students that once the prime form label has been determined, it applies to any manifestation of the

[12]John Rahn, *Basic Atonal Theory* (New York: Schirmer, 1980), 33 ff.; Allen Forte, *The Structure of Atonal Music* (New Haven, CT: Yale University Press, 1973), 3–5. Forte's treatment of normal order is derived from Milton Babbitt, "Set Structure as a Compositional Determinant," *Journal of Music Theory* 5, no. 1 (1961): 72–94, reprinted in *The Collected Essays of Milton Babbitt*, ed. Stephen Peles (Princeton: Princeton University Press, 2003). Texts employing Rahn's approach to normal order include the sixth edition of Stefan Kostka and Dorothy Payne's *Tonal Harmony with an Introduction to Twentieth-Century Music* (New York: McGraw-Hill, 2009), the third edition of Kostka's *Materials and Techniques of Twentieth-Century Music*, the third edition of Straus's *Introduction to Post-Tonal Theory*, Roig-Francolí's *Understanding Post-Tonal Music*, and J. Kent Williams's *Theories and Analyses of Twentieth-Century Music* (Fort Worth, TX: Harcourt Brace, 1997). In contrast, Jane Clendinning and Elizabeth Marvin's textbook *The Musician's Guide to Theory and Analysis* (New York: W.W. Norton, 2005) uses Forte's approach. See also note 13.

same set in any registral ordering. For instance, the prime form for Set G's order 2 is *also* (02469): despite the reordering of its pitches, the same label still applies. A compelling way to illustrate this fact is to provide students with a list of set classes (available in many textbooks[13]). If we derive a "prime form" from the arrangement of intervals that constitutes order 2, we arrive at (03579). This "set class" doesn't appear in any set-class list because there's no such thing as a (03579) set type; as we've already established, this is a registral re-ordering of (02469). (In the same way, a major triad remains a major triad even when its third appears in the bass. The label major triad, like prime form labels, makes use of octave equivalence and thus does not depend upon registral distribution for its identity.)

We have now erected enough of a logical set-labeling system for students to recognize the objective of our method: a numerical label that accounts for the number of half-steps from one note of the set to each other note in the set when the set is arranged in a particular registral order. Understanding the structure behind the label we intend to derive will aid students in assimilating the concept and consequences of inversional equivalence.

Chocolate Candies and Inversional Equivalence

When we return to the Webern sets of Figure 2, students quickly realize that our labeling system is not yet rigorous enough to provide a single rational name for Sets A through D. Set C takes the prime-form label (014), but the other three sets each appear to work out to (034), another "false" prime form that doesn't appear in any set-class list. The problem is clear: Sets A, B, and D are (transposed) inversions of Set C. As I remind students, the goal of our theory is to provide a single label for all four of these sets given their identical intervallic construction. Apparently, the label we will favor is (014), since the set-class list includes this label and not (034). According to

[13] I allow students to refer to set-class lists to check their work as they begin finding prime form labels, but warn them that they will soon be expected to identify set classes correctly without access to a list. Set class lists appear in Clendinning and Marvin, A85–A87; Kostka, 319–22; Kostka and Payne, 597–600; Roig-Francolí, 362–65; Straus, *Introduction to Post-Tonal Theory*, 261–64; and Williams, 337–39. The *fifth* edition of Kostka and Payne's *Tonal Harmony* (2004, 557–60) includes a pitch-class set catalog that shows prime forms as both Forte and Rahn would label them.

the property of inversional equivalence, then, all four of these sets *should* take the label (014)—there is no such thing as an (034).

M&M candies can lucidly and whimsically ingrain the principle of inversional equivalence. In this approach, students are each asked to place two candies on a desk, with one oriented so that the printed "m" faces the student and the other rotated so that it resembles a "w." Asked, tongue-in-cheek, "How many 'm's are on your desk?" students acknowledge that there are two; one is simply upside-down. In the same way, the set we might initially label (034) is in fact an "upside-down" (014)—that is, (034) is a "w," and the "m" is (014). We have been conditioned by a candy company, Mars Incorporated, to recognize the printed letters on their candies as ms, no matter their orientation. Similarly, there exists a convention (developed by Forte and refined by Rahn) that allows us to favor one "orientation" of each set class to stand as a label for all its manifestations.

Learning how to apply this convention involves the missing step 2 from our three-step labeling method already explored. Consider Set H in Figure 6. Step 1 of our labeling method, placing the set in normal order, is already accomplished in the figure. Step 2, which we omitted previously, is to *compare the normal order of the original set with the normal order of its inversion*. Figure 6 illustrates one relatively quick way to realize the inversion: start on the lowest note of the normal order already written (in this case, A) and write out the ascending intervals of normal order backwards. The highest/last interval of Set H's normal order is a major second, so the lowest/first interval of its inversion will be a major second; the penultimate interval of normal order is a minor second, so the second interval of the inversion will be a minor second, and so on. When inverted correctly, the resulting set should start and end on the same notes as the original normal order—this constitutes an easy way to check one's work.

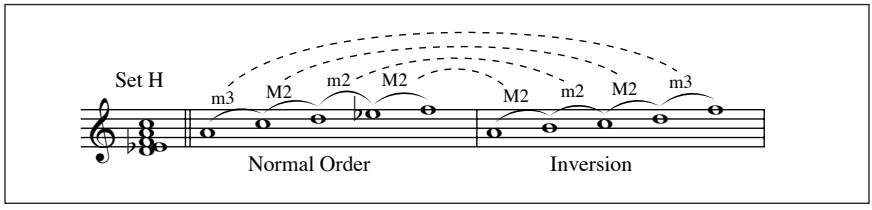

Figure 6 - Comparison of a set with its inversion.

A student objection that occasionally emerges at this point is that, in inverting this set, we have changed its pitch-class content. This confusion might be articulated with the question, "How can the inversion be the same set? It has different notes in it." In an important sense, this student is correct: the set we have created by inverting Set H is a different set. The confusion results from failing to remember that the prime form label we are seeking to affix to Set H is based on its successive interval content, not its pitch-class content. By inverting the set we have preserved that successive interval content; it has only been registrally flipped "upside-down." To pull off this inversion we had to hang the intervals on different pitches, creating a new set, but doing so did not change the set *type* by which we are hoping to identify Set H. Our eventual label is meant to describe a set class (i.e., a group of sets) of which Set H *is* but one instance.[14] To find that label we need to compare Set H with other sets in that class, including H's inversion.

Once the set has been inverted, that inversion should be compared against the original normal order using the same pyrophobic architectural principles we employed in step 1. The two "buildings" in Figure 6 naturally exhibit the same overall height (a minor sixth); this will always be the case when comparing a set against its direct inversion. As before, we next consider the relative safety of the two buildings' CEOs, and find that the D of Set H's inversion is a half-step closer to the bottom than the E♭ of the original normal order. (Those who favor Forte's set-class types over Rahn's will ask their students to compare the C of normal order with the B of its inversion, but will still find the inverted form of the building safer and will come to the same set type.) As we complete step 3 (labeling the set with its prime form), we should therefore use this inverted form to determine the numbers of the label: (02358).

The crucial corollary of labeling Set H's inversion as (02358) is that Set H itself also takes the label (02358). Without performing

[14]Driving students towards this realization is a main motivation for showing sets *as* pitches (on a staff) rather than as integers. I want students to realize that a set's inversion does contain different pitches (pitch classes), and for them to wrestle through the logical and musical consequences of this fact. When beginning students are "allowed" to convert sets to numbers representing their intervallic content, they become less cognizant of the distinction between a given set and the label we're working to ascribe to it. More-abstract intervallic representations of sets and set classes will naturally follow this introduction to the theory.

step 2, we might easily conclude that the prime form of Set H is (03568). Invoking the M&M metaphor, step 2 showed us that Set H's normal order was in fact the "w" for this set, and so we found the "m" by turning the "w" upside down—that is, by inverting it. Figure 7 highlights this inversional relationship as I might at the blackboard, emphasizing the fact that "(03568)" is actually (02358) turned on its head.

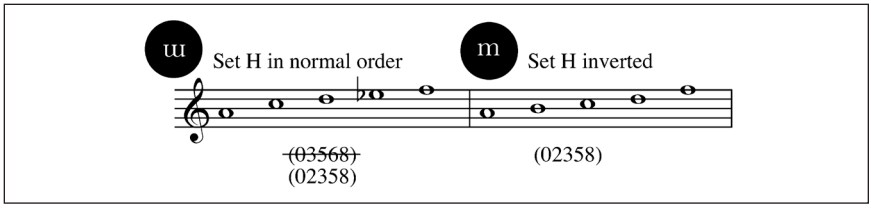

Figure 7 - Finding prime form of Set H.

Sets E, F, and G were selected because each is already an "m." Inverting any of these sets produces a less-safe building than the original normal orders (allowing us to temporarily skip step 2 at that stage of learning the theory). Looking back once more at the Webern sets, however, shows that we have now fleshed out enough of the theory to derive the same logical label for each of Sets A, B, C, and D. As Figure 8 shows, all four sets are instances of (014), and the "(034)" label we had tentatively assigned to three of these sets turns out to be the "w." "Why not label these sets as (034)?" a student might ask. After all, thus far in the Webern movement we've found more instances of this set type arranged with the half-step at the top of normal order rather than at the bottom. The answer to this question, of course, is established convention. Just as convention arbitrarily dictates the names we ascribe to the three varieties of augmented sixth chords, so we are constrained by the conventions invented by Forte and Rahn that determine how we label set classes. This constraint is hardly a weakness of the theory—without it, we wouldn't be able to agree on a single prime-form label for all instances of a set class.

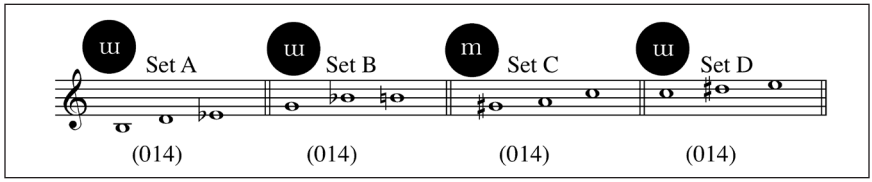

Figure 8 - Labeling the sets from Webern, Op. 5, No. 3.

Promoting Fluency and Demonstrating Relevance

Now that students are acquainted with the fundamentals of labeling a set with its prime form, they are equipped to research the significance of a single set type—now identified as set type (014)—to the musical landscape of Webern's Op. 5, No. 3. Figure 1 shows the many additional instances of this set class in mm. 1–10. Measure 6's dependence upon (014) is especially noteworthy in that the harmonic pizzicato (014)s are themselves planed to create melodic (014)s in each participating instrument. This set type also serves as the source of a cello ostinato that underpins the second half of the movement, as illustrated in Figure 9.

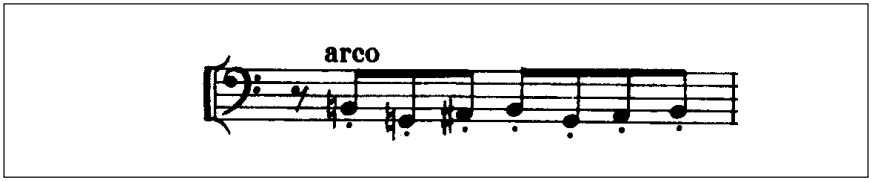

Figure 9 - Webern, Op. 5, No. 3, cello ostinato beginning at m. 15.

This analysis leads naturally to a discussion of segmentation: the selection of pitches from the score to form what the analyst believes to be a musically relevant set. The selections of the notes of Sets A through D in mm. 1–3 were virtually transparent because these pitches "belong together" rhythmically and timbrally. Measure 6 illustrates that sets may be presented horizontally as well. This music also allows the instructor to foreground the fact that the line between appropriate segmentation and gerrymandering is a subjective one. Is it significant to note that the cello C♯ and the first two melodic notes of violin 1 (D and B♭) also form an instance of (014)? Does it matter that those three pitch classes become more closely united as the head motive of violin 1's melody in m. 9? Students need not always agree about the appropriateness of a given segmentation, as long as they are aware of the temptation to justify questionable segmentations so as to fit an analytic conclusion they're hoping to find.

When students segment this movement looking for (014)s, they inevitably find other trichord types lurking as well. Set class (015) seems especially to play a prominent role alongside (014). The miniature canon of mm. 5–6 consists of melodic (015)s, as does the inversion canon between violin 1 and cello in mm. 7–8.

(In fact, any three adjacent notes in either of the inversion canon's melodic lines constitute an instance of (015).) (015) is emphasized again in the isolated cello motive of m. 8, and violin 2 uses it to conclude the section ending at m. 14. As students begin to realize the dual importance of (014) and (015) to this movement, the instructor might draw their attention to the violin 1 melody of mm. 9–10, which returns to provide the climactic unison ending to the movement shown in Figure 10. This pivotal melody fuses (014) and (015) with (013), the trichord type that most emphasizes the interval type shared by (014) and (015). The movement's ultimate C♯ is also accounted for in this analysis, as it completes a final statement of (014) that overlaps with the melody's (015). Even if Webern never labeled the building blocks of this movement in the manner provided by this theory, students' analytic work makes clear that these trichord types are essential to understanding how the music is constructed. Moreover, this analytic exercise provides students' practice in segmentation and in quickly finding prime form for a given trichord, while demonstrating how this theory offers an appropriate method for investigation of atonal music.

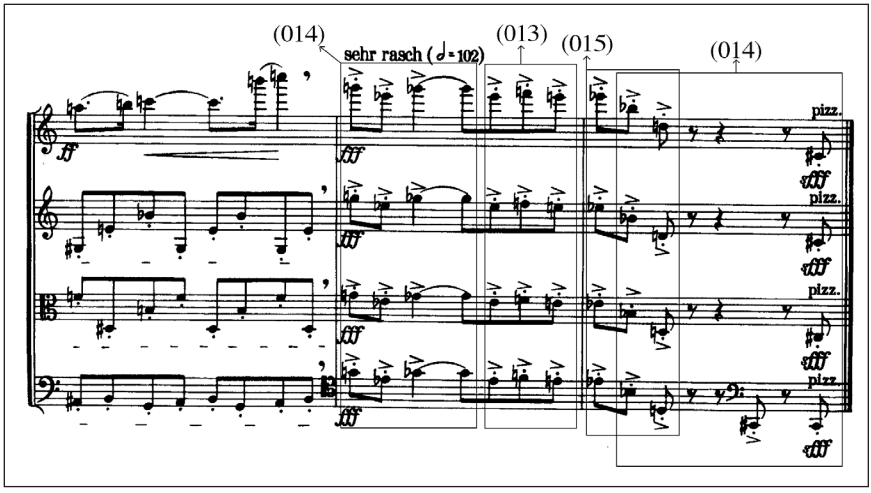

Figure 10 - Webern, Op. 5, No. 3, conclusion (mm. 21-23) with analysis.

A next step in building fluency in the theory is analysis of the sets provided in Figure 11, each of which demonstrates a special quality. Set I, when placed in normal order, replicates itself under inversion—that is, its interval read the same forwards or backwards (m2/m3/m2). Such a set is *inversionally symmetrical*. Set J is presented as a measured melody to remind students that sets can be harmonic or melodic units. This set, shown in normal order, is *transpositionally symmetrical*: when transposed a certain distance (in this case a tritone), the set reproduces its pitch classes as illustrated by the slurs. Of course, a great many set classes exhibit both transpositional and inversional symmetry—(0167) is a famous example. As an instructor, I find it helpful to first display set classes that exemplify only one brand of symmetry, but I then challenge students to think of set classes that demonstrate both types: "What triad type is both inversionally and transpositionally symmetrical? Which traditional seventh chord exhibits both kinds of symmetry?"

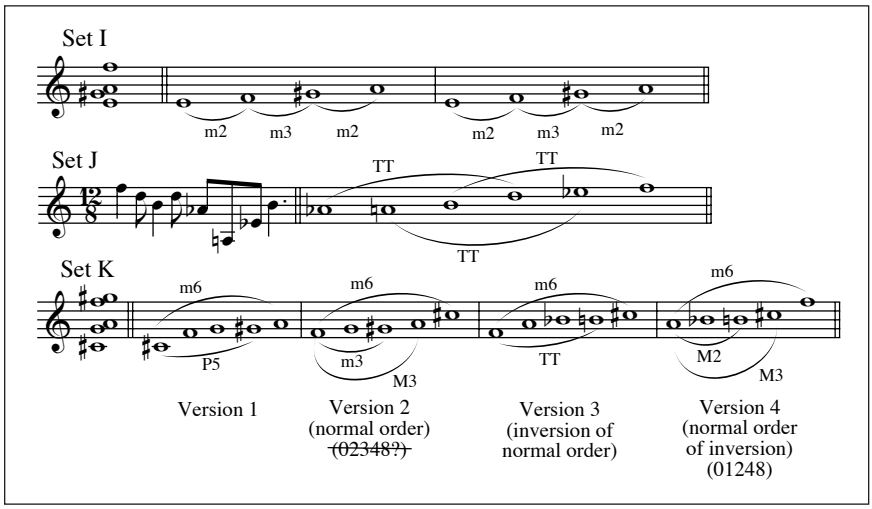

Figure 11 - Three sets analyzed.

Set K presents an additional challenge, and I therefore usually save this final difficulty in set-class labeling for another day of instruction. Students readily determine that there exists a tie for "shortest building," but settle on version 2 as the set's normal order because of its smaller distance between the CEO and the front door (i.e., a major third rather than a perfect fifth from lowest note to next-to-highest note). Version 2's direct inversion also holds the CEO further from the front door (compare version 3's tritone versus

version 2's major third), leading us to believe that we should derive the prime form label from the set's original normal order. The trouble is that the label we pull from version 2, (02348), is nowhere to be found in our set-class list. Where did we go wrong?

The answer lies in the fact that version 3 itself is not yet in normal order. Put another (seemingly paradoxical) way, the inversion of normal order is not the normal order of the inversion. Version 4 of Set K places version 3 in normal order. The CEO in this final manifestation ties the CEO of version 2 (both exhibit a major third between the lowest and next-to-highest notes), but also gets its "vice-president" a half step closer to the front door (a major second versus a minor third). The prime form version 4 suggests, (01248), is validated by a set-class list and thus represents every version of Set K presented in Figure 11.

The complication represented by Set K occurs only in sets that exhibit a tie for "shortest building" (and are not inversionally symmetrical), so students will be alerted to this issue as they begin working with a given set.[15] If the "shortest building" tie doesn't hold, then the normal order's direct inversion will be itself in normal order. In this case, students can quickly visualize the inversion by comparing the highest and lowest intervals of the original normal order. Reconsider Set H in Figure 7. When written in normal order, we can see immediately that the "CEO interval" from A to E♭ is larger than the CEO interval will be in the inversion (represented in the original normal order's interval from C up to F). Without writing out the inversion, we have determined that the original form of the set is the "w," and we can derive prime form—(02358)—by calculating intervals downward from the F at the top of the original normal order (F down to E♭ is two half steps; F down to D is three half steps, and so on). But in the event that the original set demonstrates a "shortest building" tie, the simplest advice to offer students is to explicitly work out the inversion's normal order before selecting the "safest" building.

[15]Other sets that may serve as examples of this problem include {A C C# F}, which is a member of the (0148) class (and not "(0348)" as it may first appear), and {B C# D F G#}, a member of the (01369) class (rather than the apparent "(02369)" class). Students may also find it reassuring to learn that, among set types of five elements or fewer, this issue obtains in only one tetrachord—(0148)—and only four pentachords: (01248), (01568) (this set type is labeled (01378) by Forte), (01369), and (01469).

Next Steps for Exploration

I have found it helpful to delay students' first reading in atonal set theory until its basic tenets have been introduced in class as described above. Because of its unfamiliarity and its complexities, students often struggle simply to complete an initial reading on this theory if the instructor has not yet introduced it. Once students are already able to put a set in normal order and identify its prime form label, however, several texts can provide appropriate reinforcement and further development of the theory. I most often assign the "Nonserial Atonality" chapter from Kostka's *Materials and Techniques of Twentieth Century Music*; as noted above, the in-class approach described in this essay is indebted to Kostka's own treatment of this topic. This chapter also introduces interval classes and interval class vectors, Forte labels, inclusion and Z relationships, and aggregate completion as a compositional strategy. Other recent theory textbooks largely devoted to tonal music also provide introductions to set theory as summarized in Figure 12. When choosing a supplementary reading, instructors should consider carefully the speed with which they expect students to replace with integers and mathematic abstractions the principles they have now conceptualized using musical notation, as well as the extent to which they intend to immerse students in additional aspects of the theory (Forte numbers, complementation, inclusion relations, T_nI, transpositional combination, voice-leading between sets, etc.).

In addition to probing interval class vectors and inclusion relationships, in my program students must aurally recognize and sing on demand any trichord in normal order. Besides stretching students' aural skills towards the exotic flavors of atonal music, this requirement leads students to intimate familiarity with at least one cardinality of set classes and reinforces the principles of set-class identity. Being asked to sing both the "m" and "w" versions of (016), for instance, reminds students that this set class can exhibit a half step either at the top or the bottom of normal order, and that this dissonant-sounding trichord does contain a perfect consonance.

As with the in-class introduction of the theory itself, the first analytic assignments should also ask students to bring to light insights only available through application of the theory. The assignment I use, based on the fourth movement of Webern's Op. 5, asks students to identify inclusion relationships among musically significant set classes and to recognize a particular septachord type

Tonal Theory Texts	Clendinning and Marvin, *The Musician's Guide to Theory and Analysis* (chapters 30–32)	Demonstrates both integer notation and musical notation to find prime form, introduces clock faces, T_nI, ic vectors, and set complementation
	Kostka and Payne, *Tonal Harmony*, 6th ed. ("Post-Tonal Theory")	Uses musical notation to find normal order; introduces integer notation, clock faces, and T_nI; mentions ic vectors but does not explain how to derive one
	Turek, *Theory for Today's Musician* ("Twentieth-Century Techniques")	Uses musical notation to find normal and prime form, no clock faces
Post-Tonal Theory Texts	Kostka, *Materials and Techniques of Twentieth-Century Music,* 3d ed. ("Nonserial Atonality")	Uses musical notation to find normal order and prime form; introduces ic vectors, no clock faces
	Roig-Francolí, *Understanding Post-Tonal Music* (chapters 1, 3, and 4)	Favors integer notation and clock faces to determine normal order and prime form, introduces T_nI, ic vectors, set complementation, inclusion relations
	Straus, *Introduction to Post-Tonal Theory* (3d ed.)	Uses integer notation and clock faces to determine normal order and prime form, introduces T_nI, ic vectors, set complementation, inclusion relations

Figure 12 - Treatment of some basic principles of pitch-class set theory by selected textbooks.

as a cadential, form-defining element to this piece. Discovering and contrasting the "favorite" set classes of Bartók and Schoenberg, and later identifying set classes' role in certain brands of serialism, also reinforce the musical and analytic value of this theoretical apparatus. While sterile drill in labeling prime forms may be required to develop fluency, the theory's musical relevance must be demonstrated again and again in guided and prescribed analyses if students are to "buy into" the theory's value.

Finally, instructors might consider illustrating this theory's flexibility and utility in treating music not typically described as atonal. Finding specific set types used with internal consistently in pitch-centric works helps reinforce the theory and its wider relevance. Roig-Francolí actually introduces this theory using Debussy's "La cathédrale engloutie," using it to demonstrate how the prelude coheres through motives that focus on (025), (027), and (013).[16] Stravinsky and Bartók make use of transpositional combination of tetrachords to generate octatonic collections in the Symphony of Psalms and various *Mikrokosmos* pieces respectively.

[16]Roig-Francolí, 15–17.

At the least, set-class labels provide a convenient method of identifying important harmonies or melodic segments in all kinds of post-tonal music, and the act of labeling such musical elements in this way can draw the analyst's attention to intervallic relationships and connections that might otherwise be missed.

Conclusion

The goal of this essay has been to demonstrate how pitch-class set theory might be introduced in a typical undergraduate curriculum so as to convince students of the value of the theory itself and to nurture facility with its fundamentals. Nestled into a four- or five-semester sequence, this topic might only be treated for two or three class meetings before the instructor is compelled to move on to serialism, post-tonal pitch centricity, or other essential topics; even so, subsequent analytic work may continue to make use of this theory as appropriate. Given several weeks or an entire semester to devote to this topic, this introduction could be followed by a greater exposure to numerical depiction of pitch classes. The abstraction of operations like transposition and inversion to mathematical representations can prove useful and powerful to students. Such abstraction opens the door to extensions of the theory such as similarity relations, pitch-class set genera, and transformational ("Klumpenhouwer") networks.

One of my aspirations as an instructor of music theory is to equip students to deal responsibly with any repertoire they may encounter as professional musicians and disseminators of music. Another is to immerse students in unfamiliar music with analytic tools that allow them to ascertain and describe its features, thus broadening their tastes and increasing their appetites for new aesthetic experiences. I find that working with pitch-class set theory in the ways described above meets these goals in a way that enhances the myriad musical and analytical encounters (using this theory and others) I hope to provide my students each term.

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Schenkerian Analysis at the Sorbonne

Luciane Beduschi and Nicolas Meeùs (University Paris-Sorbonne)

For over fifteen years, an optional course in Schenkerian analysis has been offered to the third-year students in the Music Faculty at the Sorbonne.[1] It consists of a one-semester introduction, proposed as a choice within a list of a dozen options that include other disciplines such as paleography, continuo playing, musical informatics, didactics, sociology of music, rock and pop music, etc. Beginning in fall 2010, however, it has been decided that part of the course in Schenkerian analysis would become compulsory for all third-year students.

For several reasons, such a course represents a challenge. Colleague's opinions about Schenker are mixed, and naysayers consider that it does not add much to current French methods of analysis while others claim that the technique is too difficult for undergraduate students. Another reason for the defiance, however, may well be that Schenker remains quite unknown, even among the teachers. It will be our responsibility, therefore, to demonstrate that Schenkerian analysis, as difficult as it may be, can be performed by our students, and that it has its place along other current methods.

The purpose of the present paper is to explain the situation in the Sorbonne and to discuss some of our ideas for this new course. Our intention is not to describe the steps of the planned course itself, but to discuss its purpose in relation to the more traditional techniques of our current classes. Starting from a consideration of what could be expected from our students at the end of the second year, we will envision the aims of a course in Schenkerian analysis in the third year. As an illustration, we will discuss the *Marcia funebre* from Beethoven's Sonata op. 26, which had been given a few years ago as the subject of the second year examination in analysis of 19th-century music: we will compare what had been expected from our second-year students with the results of a Schenkerian approach, we will discuss the difficulties of this approach, and we will try to demonstrate how it can prolong and complement the traditional one. We do not mean that this piece would form a good starting point for the new course: it is too difficult for the purpose, but it will allow us to illuminate many of our points.

[1] The European directives concerning higher education have been understood differently in the different European countries. In France, undergraduate studies ("Licence") count three years, followed by a Master degree in two years.

Music Analysis in Undergraduate Studies

Music education in French universities differs from that in the United States in that we do not train performing musicians: musical performance is the realm of Conservatoires. Universities teach *musicologie*, a blend of musicology (in the American sense) and music theory. Much effort has been devoted, since the creation of our Music Faculty by Jacques Chailley in the early 1970's, to retaining a balance between music history and musical technique. Analysis has always been an important part of the curriculum and, in the mid 90's, under the leadership of Jean-Pierre Bartoli and Nicolas Meeùs, a full curriculum was designed covering "theory and evolution of the musical language," a course of study that parallels the one in music history. It involves commentary and analysis of musical works and classes on the history of music theories, covering Baroque and Classicism (two semesters), Romanticism (one semester), Middle-Ages and Renaissance (one semester), and late 19th and 20th centuries (two semesters). This sequence, followed in parallel both in the classes of history and of theory, and obviously not chronological, is supposed to reflect an increasing difficulty of the repertories.[2]

It is not the purpose of the present paper to discuss these choices, but to say that they leave little place for Schenkerian analysis, which, at an elementary level at least, does not overtly reveal a historical approach. It is in this context, nevertheless, that this introduction to Schenkerian analysis had been created, first given by Nicolas Meeùs and taken over by Luciane Beduschi in 2007. From the start, the course had been made compulsory for our students by correspondence,[3] a decision that required the somewhat hurried redaction of a textbook by Nicolas Meeùs, available (in French) on the web.[4]

[2] Other classes in music theory, not submitted to the same succession, include ear formation, written harmony and harmony at the keyboard.

[3] About one third of our undergraduate students study by correspondence through the CNED, the Centre National d'Enseignement à Distance (http://www.cned.fr). They are not offered the same choice of options as the ordinary students.

[4] http://www.plm.paris-sorbonne.fr/schenker/sch.html. A Portuguese translation was prepared by Luciane Beduschi and her students during a summer course at Unicamp University in Campinas, Brazil, available at http://www.plm.paris-sorbonne.fr/SchenkerUnicamp/index.html. Nicolas Meeùs also proposes to the students of the first year of the Master degree an optional introduction to Schenker's theory (as opposed to Schenker's analytic practice), dealing with more abstract questions such as his theory of tonality; see http://www.plm.paris-sorbonne.fr/SchenkerMaster/index.html.

The Music Faculty at the Sorbonne is confronted with large student enrollments, a result of the French democratic conception of the University (another point that we won't discuss here): about 200 students in the first year, about 150 in the second year, and close to 100 in the third year. We divide them into groups of no more than about 25, so that many classes, including those of analysis, are given eight times in the first year, six times in the second, and three or four times in the third. These several groups come together at the moment of the written examinations and are expected to be able to answer the same questions: the contents of the classes necessarily must remain somewhat framed, even although we count a dozen teachers in analysis over the three undergraduate years, each with his or her own sensibility and technical background. As long as Schenkerian analysis remained optional, it concerned only one group of students and this difficulty was avoided. In the new curriculum, however, the compulsory class (16 hours) will be taught three times in the first semester, for three different groups of students. An optional continuation (26 hours) will be proposed for one group in the second semester.

Although the authors of the present paper hope to remain in charge of the course for the coming university year, it is clear that the situation is bound to change, that more teachers will get involved in the project, and that a tighter framing of the whole therefore will become necessary. What we need is a textbook that will for a while set the frame of Schenkerian teaching at the Sorbonne. We might have considered translating one of the existing American texts; it seemed, however, that the situation here is not entirely comparable to that in the United States, mainly because of the teaching that our students have received during the first two undergraduate years (not to mention the classes that many of them simultaneously follow in Conservatoires). We decided therefore to write a new one, a thoroughly revised and augmented version of the one mentioned above. This new version will be tested in the classes during the coming university year; its publication may follow in the fall of 2011.

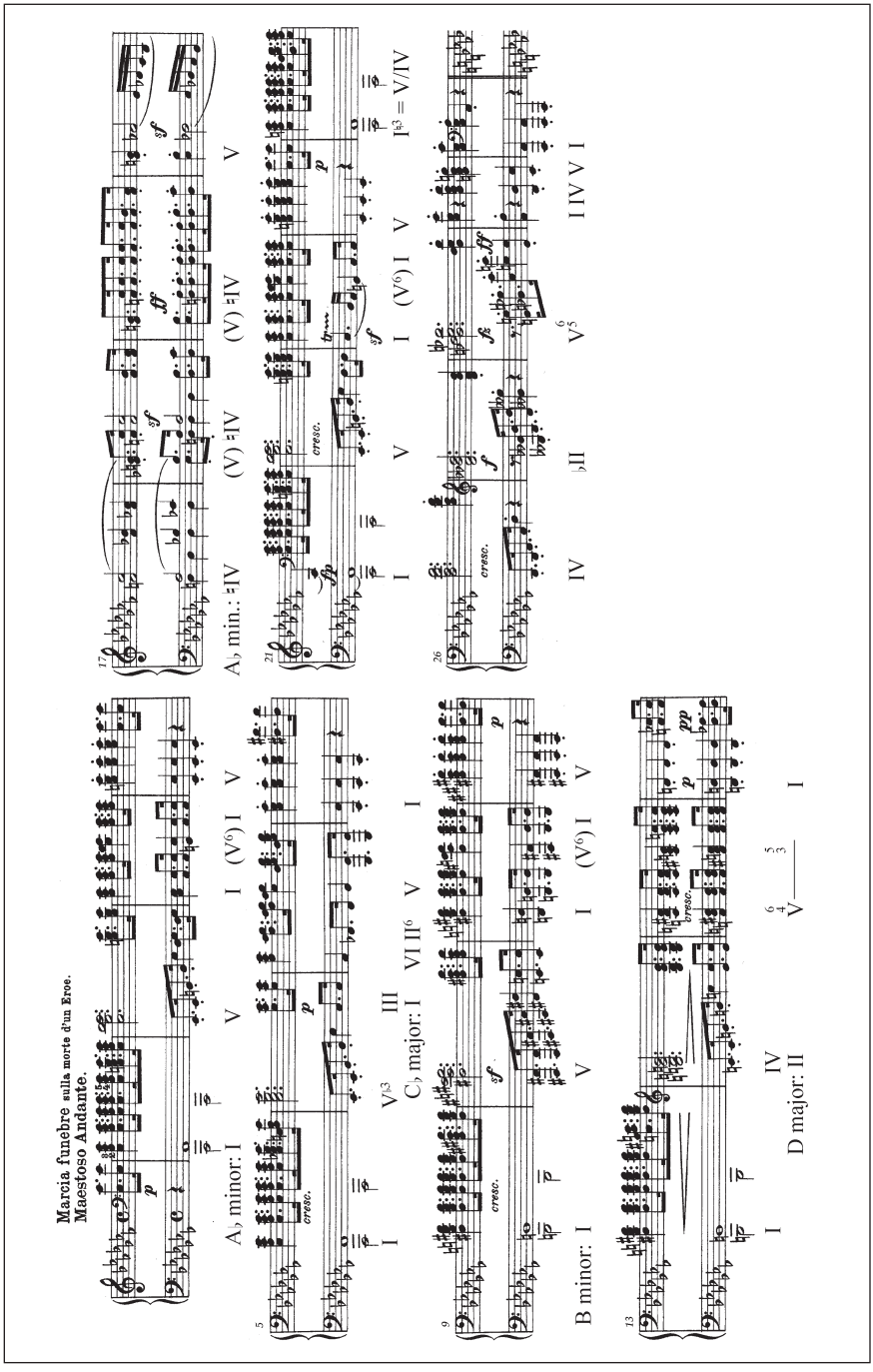

Figure 1: Beethoven, Sonata op. 26, 3d mvt., *Marcia funebre sulla morte d'un Eroe*, Roman numeral analysis of mm. 1-30

Current Analytic Techniques

In order to set the scene, let's consider the first part (mm. 1-30) of Beethoven's *Marcia funebre sulla morte d'un Eroe*, the third movement of his Sonata op. 26, as it had been presented for the final examination of the second-year semester devoted to Romanticism at the end of the university year 2005-2006. The questions asked about this piece were the usual ones:

1) *Perform, on the score itself, a Roman numeral analysis of these 30 measures.* Figure 1 shows what was expected, but not necessary obtained: many of the students were troubled by the unusual key signature and the enharmonics, even although the harmony itself remains quite simple.

2) *Chart the overall form of the passage, describing the tonal plan and indicating the cadences*. The expected result would have been more or less like Figure 2:

MM	1-4	5-8	9-12	13-16	17-20	21-24	25-30
Form	A_1	A_2	A'_1	A'_2	B	A_1	C
Tonal Plan	A♭ min.	A♭ min. →C♭ maj.	B min.	B min.→ D maj.	A♭ min.	A♭ min.	A♭ min.
Cadences	HC	PC	HC	PC	HC	HC	PC

Figure 2: Beethoven, Sonata op. 26, 3d mvt., *Marcia funebre sulla morte d'un Eroe*, mm. 1-30, schematic presentation (HC = Half cadence; PC = Perfect cadence)

3) *Provide a stylistic commentary, stressing the elements by which the piece could be viewed as foreshadowing the language of later composers.*[5] Opinions vary among the teachers about what really is expected of such an exercise: the "stylistic commentary" may range widely, and include a literary discourse about the work, or a display of personal musical culture, or a more technical discussion of the piece. Each of these opinions corresponds to a specific definition of 'style'. Some of the points that the students may have commented upon include:

> 1. The programmatic title of the piece and its expression through specific devices: low register; obstinate rhythm; compact chords, often in root position and often without dissonance.

[5] The question made reference to later composers because the examination came at the end of a course on Romantic music, and it might have been argued that Beethoven's Sonata does not really belong to that period.

2. the unusual key of A♭ minor, the unusual tonal plan, the modulations to B♮/C♭ major (the "flat mediant major" in Schoenberg's terminology[6]).

3. the enharmony.

4. the minor dominant chord (Schoenberg's "five-minor") in m. 5.

5. the "Neapolitan" chord in root position in m. 27.

Without beginning a debate about definitions of 'style', we must stress that there is an essential methodological difference between the first two questions and the third one. Roman numeral analysis and schematic description are reproducible procedures, the steps of which can be taught in detail; the commentary, on the other hand, remains quite individual and unpredictable, even if recommendations can be made. In any case, it proves somewhat difficult to relate the commentary to the results of the first procedures, or to deduce the commentary from these results, unless there is a specific focus on a small number of points, such as those in the list above. The answers to the first two questions are of the order of inventory and nomenclature: the parts of the work and its phrases have been identified; the tonal plan has been described; the chords have been labeled. But this nomenclature does not easily lead to a discussion of the logic or the 'style' of the whole: one does not know why tonalities, phrases or harmonies follow each other in this order, nor how they combine to create a unified tonal trajectory.

It is here, needless to say, that Schenkerian analysis will prove its usefulness, not as an alternative or a substitute to the usual procedures, but as a clarification and a justification of their purpose. Schenkerian analysis, even if it seems basically devoted to musical structure, opens paths to stylistic commentaries in its concern for compositional intention, for musical effects and their perception, and for musical "content" and meaning.

Schenkerian Analysis

Of Beethoven's *Marcia funebre* from op. 26, Schenker published the following graph (Figure 3), which will appear rather mysterious to students (and teachers) whose knowledge is limited to the methods just described.

[6] Few of us base our teaching on Schoenberg's *Structural Functions*; the terminology is used here merely for the ease of the description.

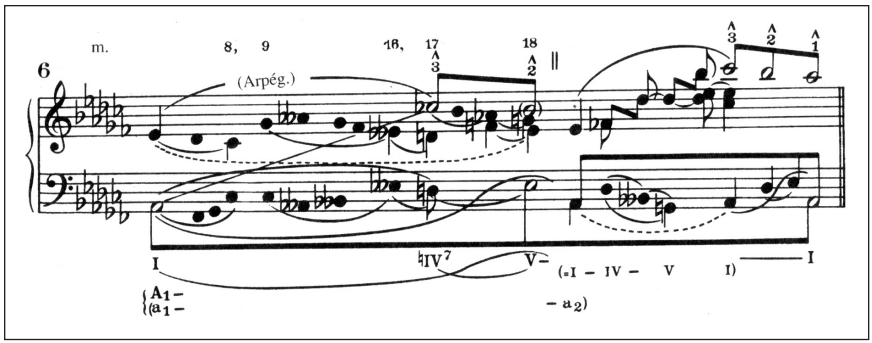

Figure 3: Heinrich Schenker, *Free Composition*, example 40.6.
The graph reproduced here is from the French translation by N. Meeùs, *L'Écriture libre*, Liège, Mardaga, 1993.

The challenge is twofold: first, to show that this graph does represent the same work as that which has been analyzed above, and second, to explain how such a graph may complement and amplify the results of the more traditional analysis. But, first of all, we will have to refute some received ideas about Schenkerian graphs:

1. Schenkerian graphs do not propose an alternative notation of the work and cannot replace the score itself. The score, on the contrary, remains the sole point of reference, to which the analysis constantly must be related. The Schenkerian graph has no other purpose than to explain some aspects of the score and cannot be read but with score in hand. It includes only that which requires explanation: if elements of the score are not represented, it is not that they are considered unimportant, but that they do not require explanation for a competent readership.

2. Even if the analysis at times proceeds by pointing at notes in the score, the graph cannot be viewed as a mere reduction, as the result of a process of pruning notes considered to be less important. The graph is not made of those notes that survived an elimination process and it would be illusory to try to precisely identify each note of the graph as one single specific note in the score.[7] The

[7] Schenkerian technique has been presented in modern writings as reductional – and, even worse, as based on strict binary hierarchies. We consider this the result of a very unfortunate misreading of Schenker's theories, prompted by the scientistic ideology which Robert Snarrenberg rightly denounced

> graph proposes an abstract representation of the functions of melodic, harmonic and contrapuntal elements in the work: the concordance between the graph and the score is quite high, of course, but not as a pointillist image.
>
> 3. Values of duration (half notes, quarter notes, eighth notes, quarter notes without stem) indicate a hierarchy with respect to what the graph tends to demonstrate, but no direct conclusion can be drawn concerning the hierarchy of these notes from other or more general viewpoints. Schenker, in addition, often stressed that less important notes from a structural point of view are the most important for the meaning of music.

Example 40.6 of *Free Composition* (Figure 3) represents only an intermediate stage in a full process of analysis of which Schenker did not present the other stages. The graph, in addition, is meant to stress a very specific point, the arpeggiation that links $C\flat_5$ in m. 17 to $A\flat_2$ in m. 1, as indicated by an oblique line between these notes. We will return to that specific point, which raises an important issue and is at the core of a full understanding of the piece. For the time being, it should be noted that the graph also includes indications that belong to a more general analysis and that should not pass unnoticed: reading a Schenkerian graph requires attention and one of our first tasks will be to help students in this respect.

Several aspects of the graph address the form of the passage: at the bottom of the graph, A_1 – B – A_2 denote a tripartite form, of which B is the Trio (the word "mixture" refers to the fact that the trio is in A♭ major). Part A_1 is divided into two sections, a_1 and a_2, separated by the sign ‖ which indicates an interruption (half cadence)[8] at the end of a_1. Commas inserted between the measure numbers on the top line ("m. 8, 9 16, 17 18") point to the fact that a_1 begins with two groups of eight measures each (mm. 1–8 and 9–16); what Schenker represents as mm. 17-18 actually stands for mm. 17-20: Schenker considers it unnecessary to reproduce mere repetitions. The fact that no measure numbers are given after the interruption confirms that Schenker was interested mainly in this first section; the reason why he nevertheless gave a summary graph

(*Schenker's Interpretative Practice*, Cambridge UP, 1997, p. xvii-xviii).

[8] Schenker himself rejects the expression "half cadence" in this case where the chord of V, he says, is not truly a dominant and where there is no cadence (no closure) properly speaking. See also note 9.

for the rest of the piece probably is that he had undertaken a more complete analysis, of which he wanted to give some idea.

For beginners in Schenkerian analysis, the steps that lead to such a graph must be made more explicit. We will therefore propose one or several graphs, closer to the score, showing how Schenker came to example 40.6. Let's concentrate the discussion on mm. 1-30, for which one such intermediate graph is given above in Figure 4 the score itself, to make the relation more apparent (but at the risk of stressing a "reductional" nature that we dislike: see note 7). After carefully checking the relation between this graph and the score, the students will have to compare it with Schenker's own in order to realize the relation between example 40.6 and the score. The comparison will lead to the following conclusions:

– Schenker does not represent mm. 1-6; his graph seems to start at m. 7. This is because the chords of V in mm. 2, 3, 4 and 6 are prolongational, for two reasons that the Roman numeral analysis of Figure 1 could not completely show:

> (1) all the melodic movements that produce the harmonies are neighbor-notes or passing-notes; the bass E♭ in mm. 2, 4 and 6 belongs to the arpeggiation of the A♭ minor chord[9].
>
> (2) these V chords appear within "pendular" movements I–V–I: there is no "pre-dominant" chord.

– Schenker considers these measures to prolong the A♭ chord: the one shown at the beginning of his graph actually stands for mm. 1-7. We will discuss how, in Figure 4, the beam starting from $E♭_4$ in m. 1 and continuing to $E♭_4$–$D♭_4$–$C♭_4$ in mm. 7-8 indicates both the prolongation and the melodic movement that Schenker retains in his graph. The Schenkerian concept of prolongation is dramatically wanting in our current analytic techniques, which

[9] Schenker calls "divider at the fifth" the chords formed by neighbor or passing notes in the upper voices, made consonant by an arpeggiation trough the 5th of the prolonged chord; this also is the case of the V at the interruption. One will note that, in his example 40.6, Schenker draws a continuous beam in the bass from the starting I through the V of the interruption to the final I; we retained this usage in Figure 5. (For other examples of uninterrupted beams in the bass, see *Free Composition*, examples 24-27, etc. We found no example where Schenker interrupts the bass beam, unless the continuation after the interruption is not shown.) There is some confusion about this in the modern American Schenkerian literature.

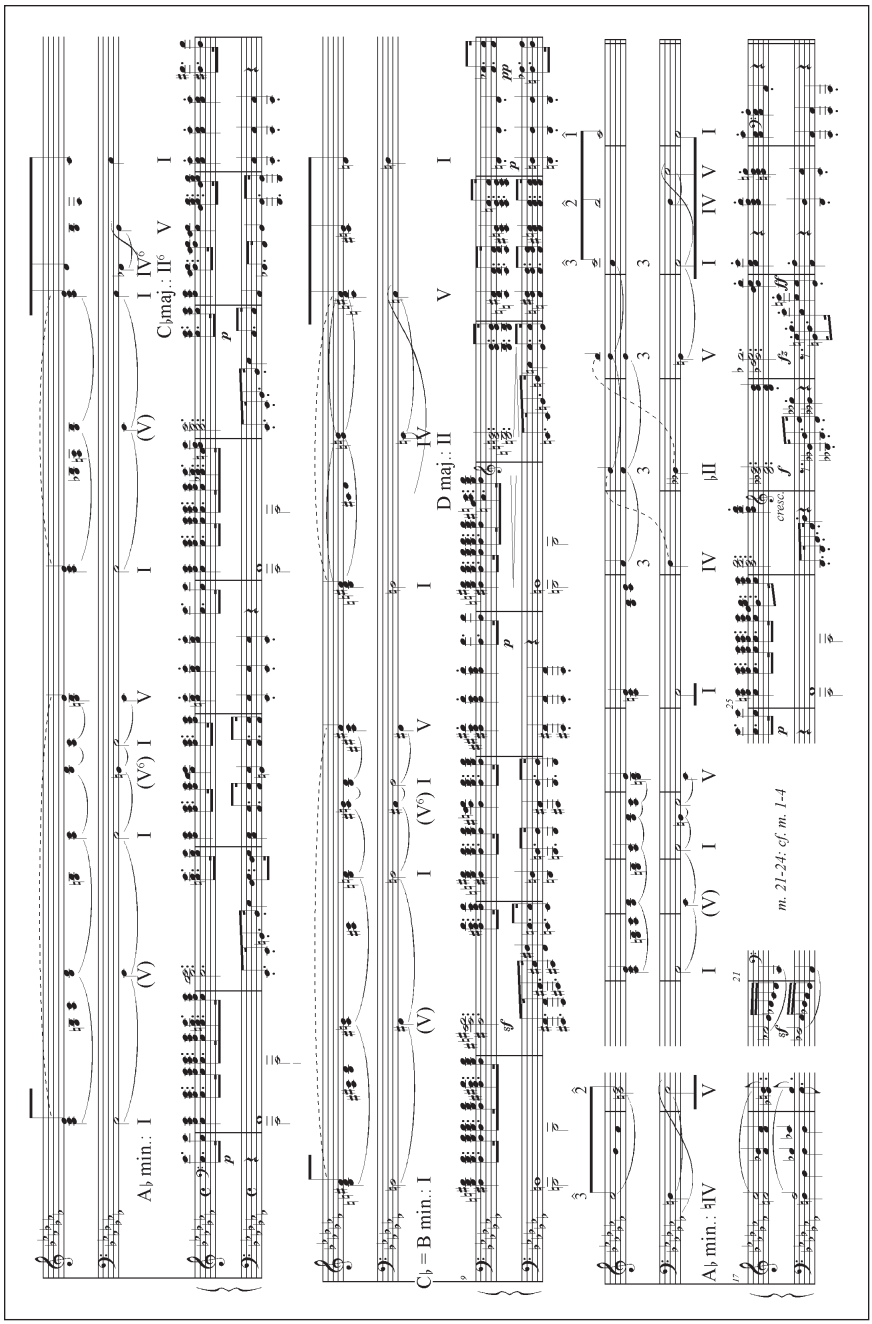

Figure 4 : Beethoven, Sonata op. 26, 3d mvt., *Marcia funebre sulla morte d'un Eroe*, mm. 1-30, intermediate graph between the score and Schenker's example 40.6

remain unable to establish clear hierarchies among the chords and their progressions. In Figure 1, the harmony is read from chord to chord almost without any gradation: a few Roman numerals have been bracketed, when they obviously concern neighboring chords, but such analysis is insufficient. The concept of prolongation and its corollary, the notion of levels, are essential to the very practice of analysis.

– The second group in mm. 9-13 (which Schenker writes in C♭ instead of B), similarly begins with a prolongation, denoted in Figure 4 among others by the beam from F♯$_4$ in m. 9 to F♯–E♮–D♮ in mm. 15-16; but Schenker's graph (Figure 3) fully develops mm. 13-16 because of the neighbor note G♮ above IV in m. 14. The final cadence of this second eight-measure group extends to mm. 13-16, while that of the first group covered only mm. 7-8.

– For both prolongations, dotted slurs in Figure 4 stress the maintained upper note, first E♭, then F♯, but they articulate the prolongation at the fourth measure in order to stress the half cadence at this point. Reading this will of course involve a comparison with the table in Figure 2. Once again, the problem at stake is one of hierarchy. Figure 2 implicitly names the two eight-measure groups A and A′ and subdivides each in A_1 A_2 and A'_1 A'_2, but viewing this in terms of articulation, of weak and strong caesuras, allows a more refined description.

The final cadence of each of the two eight-measure groups, each performing the modulation to the relative major, is characterized by a pre-dominant chord, denoted in the graph by the double slurs,[10] ⌣. This is true also of the half cadence that ends the first section, mm. 17-20, where the dominant is prepared by the natural IV chord and the final I is missing, and of course of the final cadence of the passage in mm. 29-30.

[10] The usage of these slurs in figure 4 is not entirely orthodox because the cadential progressions do not start with a tonic chord: the modulation happens on the pre-dominant chord which in both cases is IV in the previous minor key and II in the new major one. Schenker's double slurs, which he first proposed in *Das Meisterwerk in der Musik* II, 1926, pp. 21-22, probably were inspired by a similar sign in Alfred Lorenz, *Das Geheimnis der Form*, vol. I, 1924, p. 16, a sinusoidal curve denoting the passage from tonic to subdominant to dominant to tonic.

Something else that is wanting in our current analytic techniques is an explicit methodology of melodic analysis. Figure 4 shows that the cadences always support a descending line in the upper voice, from degree scale degree 3 to scale degree 1 of the local key – interrupted at scale degree 2 at the half cadence of mm. 17-18 (the repetitions of this half cadence in mm. 18-19 and 19-20 are not represented). It may not yet be necessary at this point to introduce a discussion of the theory of the fundamental line (unless in order to explain the circumflexed numerals); it may be more interesting, on the contrary, to stress the motivic character of the descending line at each of the perfect cadences,[11] E♭–D♭–C♭ in mm. 7-8, F♯–E♮–D♮ in mm. 15-16 and C♭–B♭–A♭ in mm. 29-30.

The graph in Figure 4 also explains the construction of the second section, mm. 21-30: it begins with an almost exact repetition of mm. 1-4, but the following, concluding group counts six measures instead of four; this fact invites considering that the last group has in a sense been extended. Schenker's example 40.6 (Figure 3) explains this in a somewhat cryptic way: a dotted slur from $A♭_2$ to $A♭_2$ in the bass indicates that mm. 25-28 form a prolongation of the IV chord; the stems attached to $A♭_2$–$G♮_2$–$A♭_2$ mark the passage as a neighboring motion. Figure 4 explains how this expansion of the four-measure group is performed by a specific device of the voice leading, a "reaching over", where each voice in turn follows a descending path, while another voice originating in the left hand overlaps the previous one, as indicated by the dotted curves;[12] the bass voice follows the top one at the distance of a third in mm. 26-29.

The indications in Figure 4 are not fundamentally different from those in Figures 1 and 2, but accounting for the voice leading enlightens the strategy of each phrase. What remains unclear, however, and what even Schenker's example 40.6 does not fully describe, is the strategy of the fragment as a whole. For this, another graph will be necessary, coming after that of Example 40.6 (Figure 3) and further summarizing all that has been shown until now. It will have to be stressed once again that his final graph cannot be read without the score, and the students should be made aware that relating it to the score involves a constant rereading and reevaluation of all the intermediate graphs.

[11] This, in addition, corresponds to Schenker's early conception of the *Urlinie*, which he often associated with a discussion of motives.

[12] Schenker's presentation of the reaching over in Example 40.6 is somewhat unusual, making use of signs that are more often used for unfoldings.

Figure 5 proposes a final graph that soon proves to convey much more than a simple summary: it is a very concise image of a complex tonal and melodic progression. Schenker himself described it as an arpeggiation, linking the A♭$_1$ of m. 1 with the C♭$_4$ of m. 17, but without explaining the nature of the arpeggiation. Beethoven's strategy is to prepare the diminished seventh chord, D♮–F♮–A♭–C♭, in m. 17. What needs preparation in this is perhaps more D♮ than C♭: the latter is the common note from mm. 1 to 17, as indicated by dotted slurs in Figure 5: it forms the minor third in the A♭ chord, then the root of the C♭/B♮ chord. Most of the melodic movements in the right hand until m. 16 are neighboring movements around C♭/B♮, under E♭ as "cover tone". D♮ is gained by the double modulation at the minor third, from A♭ to C♭ in mm. 1-8 and from B♮ to D♮ in mm. 9-16. At the arrival on D♮ (♮ IV), when it would seem that no possibility is left to retain C♭ any longer, Beethoven's genial gesture is to reintroduce it as the top note of the diminished seventh:[13] this forms the emotional climax of the piece, which may give rise to various hermeneutic interpretations.[14] C♭ is regained, again through a complex gesture, at the beginning of the second section (mm. 21-29) during the prolongation of degree I, for the complete cadence in mm. 29-30: the primary note C♭ dominated the passage for 29 of its 30 measures but, as in a kaleidoscope, with an ever-changing function and signification. From a mere chord member in the A♭

[13] Charles Smith, "Musical Form and Fundamental Structure: An Investigation of Schenker's Formenlehre", *Music Analysis* 15/2-3 (1966), p. 211, derides Schenker's analysis and writes that "delaying the arrival of the primary note until bar 17 […] seems eccentric". He proposes to read the overall form in three sections, mm. 1-8, 9-20 and 21-30, instead of two with the main articulation at the interruption in m. 20. The fundamental line would then start from scale degree 5, descending scale degrees 5–4–3 (E♭–D♭–C♭) in mm. 1-8, with an "interruption" on C♭ major (♭III), and scale degrees 5–1 in mm. 21-30 (see Smith's Example 12b, ibid., p. 214). The fact is that, because of the modulation to C♭/D major, there can be no satisfying scale degree 4 (D♭) between m. 7 and the interruption on V in m. 17-20. This compels Smith to minimize the interruption on V and to view mm. 9-20 as forming a single section. Schenker's solution, where mm. 1-20 forms a single section with three subdivisions (mm. 1-8, 9-16 and 17-20), is by far more elegant and, after a possible initial puzzlement, much more convincing.

[14] See Jeffrey Perry, "Beethoven and the Romantic Unique Subject: The Dialectic of Affect and Form in the 'Marcia funebre sulla morte d'un eroe', op. 26, III", *Indiana Theory Review* 18/2 (1997), pp. 47-73.

chord, it becomes the crucial dissonance at m. 17, that from which the movement derives most of its signification. It may be stressed that there is no way to avoid the enharmonic writing in the first section, be it from C♭ to B or, as here, from E♭♭ to D♮: Schenker himself noted that this is a case of real enharmonic modulation.[15]

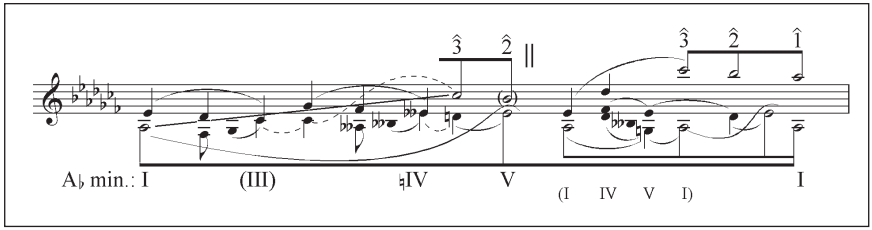

Figure 5: Beethoven, Sonata op. 26, 3d mvt., *Marcia funebre sulla morte d'un Eroe*, mm. 1-30, final graph

Projects for a Course in Schenkerian Analysis

Beethoven's *Marcia funebre* is a highly difficult case, way too difficult for an initiation to Schenkerian analysis. This in itself illustrates a problem that we will have to face: such a piece may be dealt with using the current analytic methods taught in the Sorbonne, as examined above, but it becomes too difficult for a Schenkerian analysis. While our colleague teachers may be made to understand that analyzing a musical work in depth raises problems that are not apparent in a more superficial approach, the students on the other hand may get the feeling that Schenkerian analysis represents a regression compared to what they already know. We will try to meet this problem by balancing the teaching of elementary techniques with analyses of complete compositions chosen so as to raise the least amount of specific problems at once.

[15] "We see that the C-flat key, which has been reached in measure 8, is followed by a B minor in measure 9. While at first glance we might ascribe this change to a desire for simplification – for, in the long run, the notation of C-flat major would be cumbersome – we find ourselves surprised soon after by the full and independent consequence of this new B minor key, in the form of the D major key, whereto the B minor really modulates in measures 13-16. Thus it follows that we are dealing here with a real modulation by enharmonic change, even though the primary motivation of this change may have been a postulate of the notation, i.e., a quite external consideration." Heinrich Schenker, *Harmony*, translated by E. M. Borghese, ed. by O. Jonas, The University of Chicago Press, 1954, 334.

We believe that the doctrine of *Free Composition* may not be the best state of the theory to begin with. Our starting point rather will be the theory of the "tonal space", as described by Schenker in the last two volumes of *Der Tonwille* and the first two of *Das Meisterwerk in der Musik*, in a text entitled *Erläuterungen* (*Elucidations*).[16] Prolongations are described there first as the filling in of the tonic triad by neighbor or passing notes – and this also will represent the first step of our course. Further developments involve, on the one hand, extended filling lines (from or to an inner voice, or reaching over, with or without register transfer, etc.) and, on the other hand, consonant meetings of dissonant voices within a given tonal space, creating imbedded spaces of lower level, open for further prolongations. We hope to be able, at several stages of these discussions, to propose analyses of complete works based mainly on the prolongational devices just described.

Our aim will be twofold:

> First, enabling students to read Schenkerian graphs. Some of the analyses of complete works that we intend to present will involve full graphs by Schenker himself – as did the analysis of Beethoven presented here. A detailed exegesis of a Schenkerian graph often proves a most enlightening exercise.
>
> Second, teaching them to create their own graphs. This often is considered one of the major difficulties of Schenkerian analysis, and rightly so. Our textbook will propose exercises in graphing elementary prolongations, which the students at first probably will judge excessively easy and naïve, but through which we hope gradually to lead them to graphing difficult cases – perhaps as difficult as that of Beethoven's *Marcia funebre*.

* * *

This whole project is fascinating and tantalizing. Writing this presentation for the *Journal of Music Theory Pedagogy* proved extremely fruitful for us both, as it compelled us to clarify our ideas and to share them. Our hope at this point is to be able to report significant results in a year from now.

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[16] *Der Tonwille* 8-9 (1924), p. 49-51 ; 10 (1924), p. 40-42; *Das Meisterwerk in der Musik* I (1925), p. 201-205; II (1926), p. 193-197. The text is identical in all four publications.

Reflections on Music Theory Pedagogy: Virtual and Archeological Known Unknowns

Jonathan Dunsby

Preliminaries

Teachers of music theory in the college sector fall into demographic groups, such as those who are notable researchers and those who are not, or those who call themselves music theorists and those who don't.[1] The familiar cross-currents of college life include what are perhaps more significant musical divergences also, those that may be revealed for instance by the sometimes elusive margin between Western art music and vernacular music. We may encounter, too, the sometimes sharply contrasting needs among different student groups. The performance major and the liberal arts student may subscribe to intersecting perspectives on music theory, the most common of common perspectives being the simple question—why am I being required to do this?—which is an anxiety not shared by the theory major. There are other, more obviously purposeful meeting points, for example the one that is gaining currency where teachers of markedly different stripes, and at least some of their students, ask what is to be learned from musical performance, usually meaning recorded performance, to deepen our theoretical and cultural understanding of the music. If intradisciplinary distinctions are not black and white, nevertheless they are familiar to most who have taught as well as studied music theory, and obviously readers would be able to think of more; representing more interesting tensions, it may be; or distinctions that are more relevant to individual professional experiences. The point about such an angle of approach, through contrasts and even paradoxes, is that even if it threatens a certain amount of agonizing and compromise pedagogically, it does deal in comprehensible challenges. It articulates unavoidable puzzles that we can realistically aim to address, if not solve.

[1] I am grateful to Mary Farbood of New York University and Arnold Whittall of King's College London for their advice and encouragement in the preparation of this material, though they do not necessarily subscribe to all the views it expresses, and any inaccuracies are mine alone.

It also seems, to this writer at least, the right kind of conceptual setting for considering what will be called here 'known unknowns' of theory pedagogy. Philologically, it would be appropriate to call these known unknowns 'aporias', that is, in this case, features of music that seems to present us with insoluble questions. Simply, known unknowns means features of music theory pedagogy we have no option but to reckon with, yet we can't expect to be able to explain them conclusively.

Technology

Pragmatically, in the music theory pedagogy arena, technology often appears in that guise. It would be revealing, one must suspect, to take a poll among *engaged* music students studying music theory in excellent schools of how many do use professionally oriented internet sites. For example, Solomon's Music Theory site[2] has been available for about a decade, and the question might be how many theory majors in that time have used it—for methodological explanation, as a portal for instance to online set calculators, for glossary advice, possibly for philosophical and aesthetic guidance. And how many of their professors? The specific answer may not matter too much, but the known unknown it could inform is the question of whether music theory pedagogy as a discipline has developed an adequate and pervasive culture of *evaluation* of online professional resources. Only a few years ago, sentiments such as the following seemed timely: 'as operating systems and programs become ever more closely tied to the Web, with teaching and learning in the education business inevitably following, all of us will need to use computers in the most efficient and effective ways possible.'[3] It is true that virtual connection has prevailed increasingly in everyday life. Is it true, though, that the education business has followed 'inevitably', in significant ways? Leaving that question for readers to think about from their own experience, I also add as a preliminary that there is a world of difference between research-oriented technology and classroom delivery

[2] http://solomonsmusic.net/theory.htm

[3] Dave Headlam, 'Multimedia for Music Study on the Web: Director from Macromedia', *Music Theory Online*, 3/5, 1997, [13.4].

technology. We shall begin here by thinking about sophisticated and specialized technological tools that students serious about understanding certain advanced topics need to learn how to use and possibly implement; then move on to the use of non-specialized computer tools for teaching that anyone with everyday knowledge of a computer can and probably should use. Yet different though those contexts may be, the need to evaluate technology in them is a common imperative.

A short diversion on so-called atonality

To take a particular case in point—because there is much to be learned from it even if you are not specially interested in atonal music—one may certainly observe 'atonal theory' being taught, with reference to pitch-class set theory, but without the use of set calculators. That serious students of atonal music who are prepared to assimilate some kind of pc set theory need to understand at least some of the set-theoretic and permutational assumptions and manipulations underlying it, calculating 'by hand' as it were, may go without saying. Yet it also goes almost without saying that pc set analyses done mentally and on paper can turn out to contain trivial, fatal errors in set identification or set relation calculations. Nor is this merely a matter of accuracy, even if perfect accuracy in pc set work is at a premium. It also matters whether students can move on from localized set identification and moderate engagement with pc set relations to contemplating the universe of pitch space. It is easy to find an analogy in the history of Webern analysis. For decades, Webern's dodecaphonic permutations were studied and written about, and taught in the classroom as probably they largely still are, without reference to the simultaneities of the real musical surface, to what it is quite in order to call Webern's 'harmony'. In the later serial works he writes polyphony that mostly adumbrates three- and four-tone 'chords', just like Heinrich Isaac. The proximate relations among these 'chords' may be much stronger features of the music than is their derivation from twelve-tone supersets. Pc set analyses and serial analyses, of any music, that do little more than identify sets and then log their basic inclusion and exclusion relations are surely miles away from the music's

actual harmony.[4] Without sophisticated modeling, that is hardly possible with pen and paper, and hardly possible anyway in a brief survey course, we are surely not going to understand the pitch space in which any composer imagines this or that piece of music. We shall not come even close to what we are intuiting musically.

Comment such as the above on so-called 'atonal theory' is a specific example where the pros and cons are relatively easy to describe or to leave as assumed. The known unknown of technology raises, though, not only rather elevated questions such as quality control in our evaluation of online resources, and questions about how far 'atonal' or spectral musics, or African rhythms for that matter, can be analyzed without computational aids. That known unknown also engenders generalized feelings about our relationship to technological potential. The computer toolkit available to the present-day college music teacher is astonishing, certainly when considering what little was generally available as recently as the end of the last century. We may take it for granted that listening practices have changed, and perhaps also that information resources have offered new ways of approaching Western art music.[5] What we should not take for granted, surely, is that we instinctively, or through simple common sense, know what to make of this new technological scenario pedagogically.

The audio in audio-visuals: from semiology to classroom analysis

Returning to the hortatory idea from 1997 that 'all of us will need to use computers in the most efficient and effective

[4] The balance between pitch connection and pitch derivation is at issue not only in twelve-tone music. A similar question was first asked about Messiaen's 'borrowed' tones by Rosemary Walker: see her article 'Modes and Pitch-class Sets in Messiaen: A Brief Discussion of 'Première Communion de la Vierge', *Music Analysis*, 8/1-2, 1989, 159-68.

[5] For recent discussion of listening practices in the age of technology, see Arved Ashby, *Absolute Music: Mechanical Reproduction* (Berkeley: University of California Press, 2010).

ways possible,'[6] and after broaching that subject in the rarified cause of so-called atonality, much simpler material needs to be considered also. It is worth thinking about the computer almost certainly within easy reach of almost every reader, and whether we have properly evaluated it from our professional point of view. The combination of presentation and audio-editing software nowadays is a powerful pedagogical tool, of which one's awareness may be a very slow burn indeed if based only on instinct and common sense. It is also worth recalling the creative impulse that lies at the heart of valuable music analysis, the activity through which music theory pedagogy learns its trade. Dora Hanninen, influenced by Benjamin Boretz, offers this wise description of music analysis, which underlines the crucial importance of its representational character:

> Music analysis might be described as the conceptualization and representation of musical relationships; alternately, one might say that the conceptualization and representation of musical relationships is a music analyst's (or the music analytical) way of 'making music.'[7]

An example of the interface with the known unknown, bearing in mind readily available computing facilities, is paradigmatic analysis, an approach with certain strict tenets and attitudes, and involving lots of jargon. It may not be familiar to most readers terminologically, but it basically means *comparative* analysis, and so any musician can acknowledge that it is what music analysis of every kind is to some extent always doing. Some may recognize paradigmatic analysis as a throwback to the allegedly structuralist impulse initiated in applied musical thought by, above all, Jean-Jacques Nattiez,[8] four decades ago. Without going

[6] See note 2 above

[7] Dora A. Hanninen, 'Orientations, Criteria, Segments: A General Theory of Segmentation for Music Analysis', *Journal of Music Theory*, 45/2, 2001, 345-433; 345.

[8] Nattiez's writings as a whole reveal a passion for interpretation that belies his reputation in some quarters at the end of the last century for taking a programmatic approach to explaining music's neutral, structural qualities. The brief account of his work in the *Revised New Grove Dictionary* goes a little way towards rectifying that view—penned, as it happens, by the current author, and overdue for thorough updating.

into further discussion here of musical semiology, it may be said that its characteristic paradigmatic analysis offers interesting inflections in the parsing of musics of all kinds, and has been one of the trends that stimulated the increasingly fashionable interest, in American music theory circles currently, in what is called music semiotics.[9] More to the point, paradigmatic analysis remains a lively area for inquiry, not only as part of the new wave of music-theory research ideas identified by Kofi Agawu, but for instance in the pedagogically oriented recent work of Nicolas Donin and Jonathan Goldman.[10] One of the central objectives in the methodology that Donin and Goldman have been developing in computer programming at IRCAM is a means of segmentation and analytical reconstruction of the musical score so that one may not only, so to speak, see through it, but also *hear* through it (Schenker would have called this 'synthesis'; and he did not in fact use the term analysis, contrary to popular misconception). In particular they sought to achieve this for complex new music scores, though in truth, in a world where even Mahler could not aurally 'read' a Schoenberg score more than a century ago,[11] their method has a long backwards reach, one that is later in this essay

[9] Paradigmatic analysis found its way into textbooks, including Nicholas Cook's influential *A Guide to Musical Analysis* (London: Dent, 1987; see also 1994, paperback ed.). A list of pioneers of music semiotics—which may be said to amount to the study of musical 'topics' and which some regard as a kind of positivist stylistics seeking to put a hard edge on the narrative urge of what was called 'new musicology' in the 1980s and 90s—would necessarily include Kofi Agawu, Robert Hatten and Eero Tarasti. For a rare example of music-semiotic exegesis by a true philosopher-musician, see Naomi Cumming, *The Sonic Self: Musical Subjectivity and Signification* (Bloomington: Indiana University Press, 2000).

[10] Kofi Agawu, 'Analyzing Music under the New Musicological Regime', *Music Theory Online*, 2/4, 1996; Nicolas Donin and Jonathan Goldman, 'Charting the Score in a Multimedia Context: The Case of Paradigmatic Analysis', *Music Theory Online*, 14/4, 2008.

[11] Schoenberg tells us that Mahler's exact words in 1905, concerning the former's First String quartet, were as follows: 'I have conducted the most difficult scores of Wagner; I have written complicated music myself in scores of up to thirty staves and more; yet here is a score of not more than four staves, and I am unable to read them': see Arnold Schoenberg, 'How One Becomes Lonely', *Style and Idea* (London: Faber and Faber, 1975), 30-53; 42.

going to be characterized as archeological. We would need to look only at the tortuous graphics of one of the first published music-analytical 'transfers of the paradigm to the syntagm' to appreciate how limited non-aural analysis is and can only be.[12] More modern, 'hearable' paradigmatic analysis has the musical virtue of being not only accessible but also, I would argue, more musically 'true'.

There follow two basic, indeed simple demonstrations from the writer's own undergraduate core theory teaching. Consider first the music-analytical observation in Example 1, quoted from a recent study. It maintains uncompromisingly how J.S. Bach is introducing a new theme of the kind that 'barges into' the music, in one of his famous double fugues. There is an unsavory element to that assertion, from the music theory pedagogue's perspective. Its author gives us to understand that the theorist, probably the theory teacher (cf. 'theoretical forearms', implying a well toned practitioner of the dark arts of thinking), would be somehow working against the composer's ideas. Needless to say, the heroic, Beethovenian Bach (shades of Peter Schickele, who will arise later also in this essay) can easily, by means of his inspired second theme that simply cannot be 'wrung' out of the first, run rings around the sterile theorist. Except that of course it does not need to be 'wrung' out because the connection is musically blatant. On the face of it, students just looking for the obvious would doubtless be thinking that a theme beginning with six equally spaced tones (quarter notes)—not all that common a feature of Baroque fugal practice—presumably generates at least rhythmically the other theme, in the same work, also beginning with six equally spaced tones (half notes). The point of Example 2, however, is to hear slightly beneath the surface, the ascending chromatic infill between dominant and tonic—we know from a mass of evidence that Bach thought

[12] That 'transfer' is semiological jargon for understanding how musical entities that are like each other, if you compare them out of time, perhaps by as it were laying them on top of each other and looking through them to see how they form similar shapes, may also serve as patterns in real time that control the succession of different kinds of shapes. My comments on the graphic limitations of such analysis are a self-accusation: see my methodologically original but musically opaque 'A Bagatelle on Beethoven's WoO 60', *Music Analysis*, 3/1, 1984, Example 15; nowadays I would want to publish that semiologico-Schenkerian analysis as an audio-visual example.

as it were 'vertically', paradigmatically, about the combinatorial potential of his fugue subjects. Pedagogically, it is not only a matter of seeing what happens in the music, or of playing the themes in isolation on the piano in the classroom, but of letting students hear the organ extracts literally next to each other, which without pedagogical leadership would not be feasible. Students are not obliged to hear a connection; but an aural paradigmatic analysis, even of such a rudimentary kind, may *enable* them to hear what is going on if they wish to do so. This is how the theory teacher, whose job it surely is to know the music inside out, synchronically as well as diachronically, can offer something to students, rather than tell them something in the manner of Example 1—let alone something so plainly contestable. Bearing in mind, purely from the point of view of graphics, that with a scanner, audio player and PowerPoint software musical examples like that can be made in a few minutes, one may be forgiven for childlike wonder at the visual pedagogical impact nowadays available on the desk of every college teacher in prosperous parts of the globe. The meaning of such examples needs to be heard, however, from the embedded sound extracts that can also be generated in a few minutes—edited to the millisecond and with fades and similar—using for example the freeware Audacity.

Consider, secondly, Example 3, through which the almost tiniest details of the opening of Schubert's Second Symphony could be heard if this were in a presentation rather than a printed medium as here: Example 4 shows the beginning of the development section of which Example 3 is indicating the etiology. In general, if you describe or annotate some of the motivic minutiae of this majestic symphony for an average group of undergraduate students there will be an understandable credibility gap—engendering first-principle stumbling blocks like 'did the composer do this on purpose?'[13] as well as perfectly reasonable caveats such as 'how can I be expected to assimilate so many vast amounts of musical detail?'[14] When students physically hear precisely what they are

[13] For the record, my favored answer in the classroom is 'Yes. Next question?', but obviously we must share with students curious about intentionality many stimulating readings—Gurney, Hanslick, Klee, Wimsatt….

[14] Example 3 used as an audio-visual example in the classroom was, I hasten to add, in a context where the students had learned Schubert's whole movement intensely for some weeks, and were considering special topics such as thematic derivation, modality, and rhythmic foreshortening.

being shown, on the other hand, the connectivity and elaboration can become fully musically comprehensible, just as they could have been to Bach or Schubert. It may seem a small step from what is heard in Example 3 to asking the students to consider the family resemblance of three-tone motives in this composition, starting with whether the first theme, with its substrate B♭-C-F (bars 11, 15 and 19 respectively), is the same musical idea in a wider pan.[15] Conceptually though, that step can be a typically impassable gulf. That is no surprise, for to articulate structural connections requires so much gawky verbal explanation, and so much experienced insight into creativity in Western art music; so much that music explainers from Hoffmann to Tovey, and beyond, may often have been achieving precious little.[16] One may feel they were recounting what trained musicians are aware of anyway and what others are never going to 'get'—and why should they? However, let the students *hear* this connection in aural apposition,

[15] It may seem obvious to many readers that Schubert took his tune, with its I-ii-V support, from the first theme of Beethoven's First Symphony, knowingly or not; but students will not easily find that hypothesis in the Schubert literature.

[16] A music-analytical overview of a piece, such as a Schenkerian graphic analysis always entails, is not as people sometimes give the impression a particularly abstract entity, counterintuitive, or in any other way objectionable to the reasonable person. Recall how the scriptwriters of the movie Titanic (1997) began a long, complex and barely believable true tale by screening a computer-animated simulation of what happens when Titanic goes down, complete with improbably broken hull, astonishingly vertical stern and so on. The simulation is shown to the old lady survivor Rose Calvert by the explorer Brock Lovett, and implants into the moviegoer's mind a chronological background image of the entire and shocking destruction of the indestructible. Thinking of Schenkerian middlegrounds and backgrounds as *simulations* is something of which I imagine their inventor would have approved.

and the moment passes in no time, completely believed, part of the potentially rich fabric of deeper understanding of the music.[17]

North American afterword/intermission on classroom ideals

Stepping aside from the main argument here, let us take stock of where ideas of this kind fit in the portfolio of aptitude and skills that ought to support good music theory teaching. Since this essay is somewhat journalistic, it may as well also indulge in being briefly parochial. At the Eastman School of Music, each year several hundred of the world's most able and experienced musical achievers study 'core theory', because that is believed to be integral to a rounded education in Western art music. Great attention is paid to the pedagogical efficacy of Eastman's theory teaching. It has to be, not least in that most of the school's distinguished faculty are performers and performance pedagogues who must take the value of their students' theory learning largely on trust. So much attention is paid that our theory teaching assistants, new and returning, attend an annual, week-long boot camp in the week before the start of the school year. The agenda of pedagogical essentials is a long one, among which key items are: framing a class, and content design; vocal technique and sight singing; what testing is for and achieves; workshops where students teach in front of their colleagues and faculty; policies such as grading. The continual, almost continuous emphasis is on student engagement with music and ideas. This makes us think about the sheer diversity of criteria that have to be on the theory teacher's mind, and the essence of it all: communication. No wonder that in the general scope of what good theory teaching is thus deemed to entail—and for sure in how value

[17] There are clearly going to be cases where illustrating musical relationships more abstractly than in 'real' sound bites, if more aurally concretely than purely on paper, will be appropriate. There is also the question, not to be dismissed as if it were somehow solved, between, as it is often put, thinking music and thinking about music. In relatively modern times perhaps no teacher achieved greater inroads into exploring that distinction and making an analytical virtue out of its empirical necessity than Hans Keller (1919-1985), notably through his technique of wordless functional analysis: see for example Hans Keller, *Functional Analysis: The Unity of Contrasting Themes; Complete Edition of the Analytical Score*s, ed. Gerold W. Gruber (Frankfurt and New York: Lang, 2001).

is inscribed in matters such as the difference between teaching and learning, or the necessity to make musical, aural reality a recurrent and integrated part of the students' classroom experience—the technology 'toolkit', as it was called earlier, will offer seemingly endless, new and genuine enhancements and solutions.

Canonical so-called tonality and the canonical dark of print

The other known unknown to be addressed in the main thread here is what we mean, or think we mean, by Western art music. Gone are the days when its entire contemporary canon could be embraced seriously. How much Machaut and Marenzio did Mozart know? And how much Massenet and Messiaen? Such absurd thoughts as the latter—Peter Schickele has taught us that they are not always as daft as they may appear to be, and playing with time will occupy the rest of this discourse—can give us some sense of the sheer scale of our contemporary canon, even before we incorporate also world musics and vernacular music. This is not a new observation, but it can remind us of the pace of change nowadays and some of the ways in which technology has produced unprecedented factors, in the information explosion, in information overload, in diversity of musical taste. Pedagogically, our strategies for taming those factors include canonization: the Bach chorales; the *Great American Songbook*. Wise counsels have been warning us: 'Music is part of being human, and there is no human culture in which it is not highly developed and esteemed. Its very ubiquity may cause it to be trivialized in daily life….'[18] You might be forgiven for wondering whether musicologists of recent decades who devoted so much attention to scorning canonicity sometimes forgot that to *devalue* beliefs about music is no laughing matter.

In a searching, nonconformist account of music theory contemplating the world of popular music, Dai Griffiths offers,

[18] Oliver Sacks, *Musicophilia: Tales of Music and the Brain* (New York: Alfred A. Knopf, 2007), 347. A striking feature of Daniel Barenboim's 2006 Reith Lecture series 'In the Beginning was Sound' (BBC, London) is his strongly expressed dislike of classical music being used promiscuously, and he is among a whole generation of the world's leading classical musicians who expressed the importance of not just hearing music, but listening to it.

among extensive arguments documented in scholarly detail, moments of acute caricature that capture such thoughts in a way that any reader will admit is at least memorable:

> [W]e still prepare for what Kant described, in the shorter working day which Marx looked forward to, filled with the activities of listening and composing and performing which the broadening of access to music aims for; in which a canon of specific pieces listened to again and again is important not for its content as much as the various human fragilities which give rise to those choices; in which being 'an attentive listener placed between two expensive speakers in a darkened room' is a good indication that the drugs are working.[19]

It is not only popular music though which makes us interrogate the canon of music theory's music. Richard Cohn expresses the shift in focus that should be leading us to abandon, as music theory pedagogues, the old tonal/atonal paradigm in favor of a view originally expounded, we shall see, by Schoenberg.

> Several developments in the late 20th-century academy – notably a suspicion of historicizing teleologies and the re-evaluation of the distinction between classical and vernacular – stimulated recognition of diatonic tonality as a living tradition. Perhaps the most important trend in practical harmony at the beginning of the 21st century is the reintroduction of contemporary music, in the form of folk music, jazz, show-tunes, rock and so on into manuals of practical harmony, in both Europe and North America, in the service of compositional and improvisational as well as analytical training.[20]

In the twentieth century, it turned out, tonality never did leave

[19] Dai Griffiths, 'The High Analysis of Low Music', *Music Analysis*, 18/3, 1999, 389-435; 416. Griffiths's quotation is from David Hesmondhalgh reviewing Allan Moore's *Rock: The Primary Text in Cultural Studies*.

[20] Carl Dahlhaus, et al., 'Harmony', *Grove Music Online*. *Oxford Music Online*, http://www.oxfordmusiconline.com/subscriber/article/grove/music/50818 (accessed July 13, 2010).

the field of play. Trained musicians tend to think that it did at least as far as overtly non-tonal music is concerned, that is, atonal music *and* serial music taken together. Yet serial music, many are now coming to think, is in particular the arena in which tonality was an ongoing consideration for composers, even if listeners would and will take some time to assimilate that feature. The idea that tonality was 'abandoned', a mantra threading its way through the historiography of early- and mid-twentieth-century music, in truth has been a highly localized perception, the overestimation of one feature of the then present—and that kind of overestimation is common enough in any contemporaneous cultural theory. Cohn's somewhat distracting emphasis, reflecting his focus on the classical/vernacular paradigm, is on 'diatonic' tonality, as opposed to tonality as a general feature embracing what Schoenberg told us all the time was quite wrongly called 'atonality'.[21] Tonality is and was, we can all now see, a surprisingly malleable phenomenon, and it is perfectly reasonable to say that it was no more abandoned even in apparently 'non-tonal' music than image was abandoned in then-modern visual art.

The 'canon of music theory's music', as it was called above, concerns not merely conceptual issues such as those just discussed, but it entails the actual musical materials we choose to study. Every time a modern anthology or textbook selects a new-looking item of music, it is excluding some other item that would not have drawn attention to itself—'just' another bit of Mozart string quartet, for example. A recent article from the young composer's perspective provides a thoughtful discussion of some of the implications, asking 'how individuals cope with all of the aesthetic, cultural, and political challenges of…Western art music in the 21st century.' The statement of the challenge could hardly be more clear: 'contemporary Western art music is sometimes portrayed as being in crisis—fragmented, its canons questioned, its sense of identity dissolved (which, many have argued, is a good thing)— and its lack of public appeal

[21] In 1911 Schoenberg theorized that you could not really call 'ultramodern music…atonal'; and in his revision published in 1922 he added explicitly that atonal is a word 'entirely inconsistent with the nature of tone….*Everything* implied by a series of tones…constitutes *tonality*', *Theory of Harmony*, trans. Roy E. Carter (London: Faber and Faber, 1978), 128 and 432 respectively, my emphasis.

is often cited as proof of its increasing marginality.' Yet as El-Ghadban argues, this situation is not necessarily reflected in the institutional practices of Western art music. Tellingly, he notes that 'for the most part, current rituals of Western art music have been left unexamined or, in the case of ethnographic studies of the tradition, have centered on the analysis of the inner intrigues of Western music institutions (Born 1995).'[22] So much has doubtless been said before in other ways, but the spin in El-Ghadban's article includes an important perception of agency: 'young composers or young performers, who are arguably on the front lines of Western music's rituals of recognition, have rarely, if ever, with the noted exception of prodigies, been at the center of these studies.'[23] Nor have theorists, one must suspect, for it seems more than likely that students understand the canon of music theory's music to be a strictly intradisciplinary phenomenon: yes, one has to analyze Webern in order to have been educated in core theory about twentieth century music; but no, that doesn't mean we sing or play Webern's music outside class. This is not the place to pursue any detailed repertoire statistics and filiations. Let one comparison of recent materials serve as emblematic. The number of composers in common between Benjamin's anthology of music for analysis[24] and Briscoe's anthology of music by women composers,[25] given, naturally, the differing aims and intentions of those publications? One. Amy Beach.[26]

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[22] The reference is to Georgina Born, *Rationalizing Culture: IRCAM, Boulez, and the Institutionalization of the Musical Avant-Garde* (Berkeley: University of California Press, 1995).

[23] Yara El-Ghadban, 'Facing the Music: Rituals of Belonging and Recognition in Contemporary Western Art Music', *American Ethnologist*, 36/1, 2009, 140-60; 140-1.

[24] *Music for Analysis: Examples from the Common Practice Period and the Twentieth Century*, ed. Thomas Benjamin, Michael Horvit and Robert Nelson (New York: Oxford University Press, 2010; 7th ed.).

[25] *New Historical Anthology of Music by Women*, ed. James Briscoe, with a foreword by Susan McClary (Bloomington: Indiana University Press, 2004).

[26] Beachcombing gets easier by the year. Her 'Scottish Legend', bars 1-8, crops up in James Mathes's *The Analysis of Musical Form* (Upper Saddle River, NJ: Pearson Prentice Hall, 2007), 57-8, a volume generously furnished with musical examples; though why that extract's 'phrase structure' should have made it into print is anyone's guess.

Thinking about repertoire in relation to the exigencies of music theory pedagogy involves even more complexity than canonicity alone, and one can hardly blame pedagogues if they despair of ever being able to think through the bewildering range of issues. We all have to trust our textbooks to some extent.[27] Yet why, after all, must repertoire be studied chronologically forward in time, as all textbooks tend to do?[28] It's not the way archeologists work, nor the way composers seem to think in general, and theorists too are constantly alive to the most recent ideas about music, on which their trawls backwards through the history of Western art music may be able to throw some new light. We do tend to impart methodology 'backwards': one might like to know what miniscule proportion of graduate students has ever made a close study of Romantic tonal theory up to and including Schenker's essential treatise *before* they studied more contemporary sources such as Forte/Gilbert or Pankhurst first;[29] or a study of how

[27] See for example Donald Traut, 'A Comparative Review of *The Complete Musician* by Steven G. Laitz, *Harmony in Context* by Miguel Roig-Francoli, and *A Musician's Guide to Theory* by Jane Piper Clendinning and Elizabeth West Marvin', *Journal of Music Theory Pedagogy*, 20, 2006, 151-60.

[28] I am not thinking so much of cross-cultural music theorizing, which has a long pedigree including for example the well-known *Sonic Design: The Nature of Sound and Music* by Robert Cogan and Pozzi Escot (Englewood Cliffs, New Jersey: Prentice-Hall, 1976), but of digging down, in other words backwards, in our exploration of music history. An imaginative example in popular historical musicology is Christian Darnton's *You and Music* (New York: Penguin Books, 1940), which did not, though, ignite any archeological fuse in music theory. In notable English-language fiction, some readers may be aware of Martin Amis's novel *Time's Arrow: or, The Nature of the Offence* (London: Jonathan Cape, 1991), which tells the story of a man's life from death to birth. The reader interested in an intense exploration of historicity in music analysis may enjoy Robert Morgan's 'The Concept of Unity and Musical Analysis', *Music Analysis*, 22/1-2, 2003, 7-50. Morgan's conclusion about adopting some kind of Foucaultian reverse discourse is that 'one should do no less for Mozart, Haydn, Beethoven and Brahms', 44.

[29] Heinrich Schenker, *Free Composition* (New York: Longman, 1979); Allen Forte and Stephen E. Gilbert, *An Introduction to Schenkerian Analysis* (New York: Norton, 1982); Tom Pankhurst, *Schenker Guide: A Brief Handbook and Website for Schenkerian Analysis* (New York: Routledge, 2008).

Classical phrasing works through the very long lamented Koch *before* the very current Caplin. Nevertheless, much as historians from Dwight Allen through Richard Taruskin have urged us to resist the Romantic legacy of the 'great man' theory of evolution of Western art music—to resist the illusion of music as a single, magic filament spun forward from one generation to the next—in general we do tend to teach theory chronologically in the sense of covering tonal music before post-tonal music, pre-Classical harmony (conveniently, it's mostly up-front T-PD-D-T) before the mysteries of the half diminished 7th chord, Classical form before contemplating Brahms's 'second development' sections in sonata form codas.

How are we to understand Brahms's second developments, though, if not archeologically? Is it necessary, even worth the time of day, to take on board some nouveau orthodoxy about Classical sonata form codas such as the following?:

> The mere existence of a coda—especially one of greater length—can provide a challenge to the preceding sonata, as though the normative bringing of sonata-space to completion at the end of the recapitulation were being arraigned as insufficient to the expressive task at hand.[30]

As any kind of guide to our theoretical understanding of Brahms's presumed Classical compositional models (always assuming we can buy into that rhetoric where we are asked to believe that bits of music can 'challenge' other bits and indeed 'arraign' them—a serious legal step, that one!)? My parenthetical remark is not offered for amusement, or not only so. What Brahms was thinking about Mozart's forms—and we know by inference that thinking deeply about Mozart's forms was one of Brahms's most important musical obsessions—matters so much more in our understanding of Brahms, and Mozart, than many theory writers' texts nowadays.

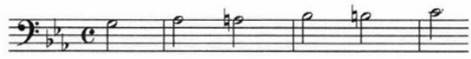
[30] James Hepokoski and Warren Darcy, *Elements of Sonata Theory: Norms, Types, and Deformations in the Late-Eighteenth-Century Sonata* (New York: Oxford University Press, 2006), 283.

Panorama

All being well, the reader who has made it to this last word will at least empathize with an attachment to exploring the known unknowns in music theory pedagogy. Admittedly, that concept 'known unknown' got an uneasy, mixed public reaction in the USA in 2002. All the same it has a respectable pedigree in fairly recent thinking—in philosophy, literature, economics. Its versatility alone qualifies it to be salvaged from political hubris.

Here, it was used to focus our attention on the *promise* of technology, an important promise in that we do not have to regard technology as cold science, but on the contrary technology *guarantees* us good outcomes, if we put it to good uses; and many believe that there is a moral imperative to do so. In principle we can know nothing about the future of technology while having every confidence in our ability to exploit its present virtues for future musical benefit. The ideas we develop now for the use of technology in music theory pedagogy will likely be those on which we shall build in the future—and of course the learning that technology produces currently will leave vital traces in that future, as certainly as anything can be certain. Ironically perhaps, the 'archeology' of music, spread backwards in its absolute entirety, in all its immutable truth, may sometimes seem to present us with fewer knowns. The idea of the known unknown can remind us of the truth content in the past, of the things that by definition we do know, while sometimes having yet to see perhaps their most important meanings for us now.

Consider, again, Bach's organ fugue in C minor, BWV 537. A work of this type is sometimes referred to as a double fugue, since midway through it, a second theme barges into the development section and takes the work to an entirely different dramatic plane. The second theme, consisting only of a series of chromatically ascending notes:



can hardly be wrung out of the principal theme, no matter how strong one's theoretical forearms might be:

And yet it ratchets up the dramatic impact of the work, leaving us with a whole entity that is much the greater for its intrusion.

Example 1 - James Manns, 'The Concept of Unity in Music', in *What Kind of Theory is Music Theory? Epistemological Exercises in Music Theory and Analysis*, ed. Per Broman and Nora Engebretsen (Stockholm: Stockholm University Press, 2007), 120

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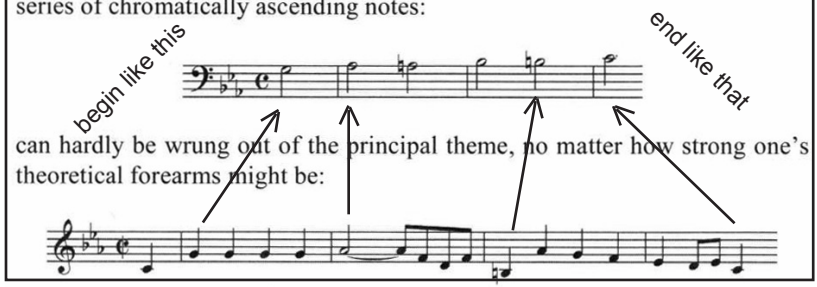
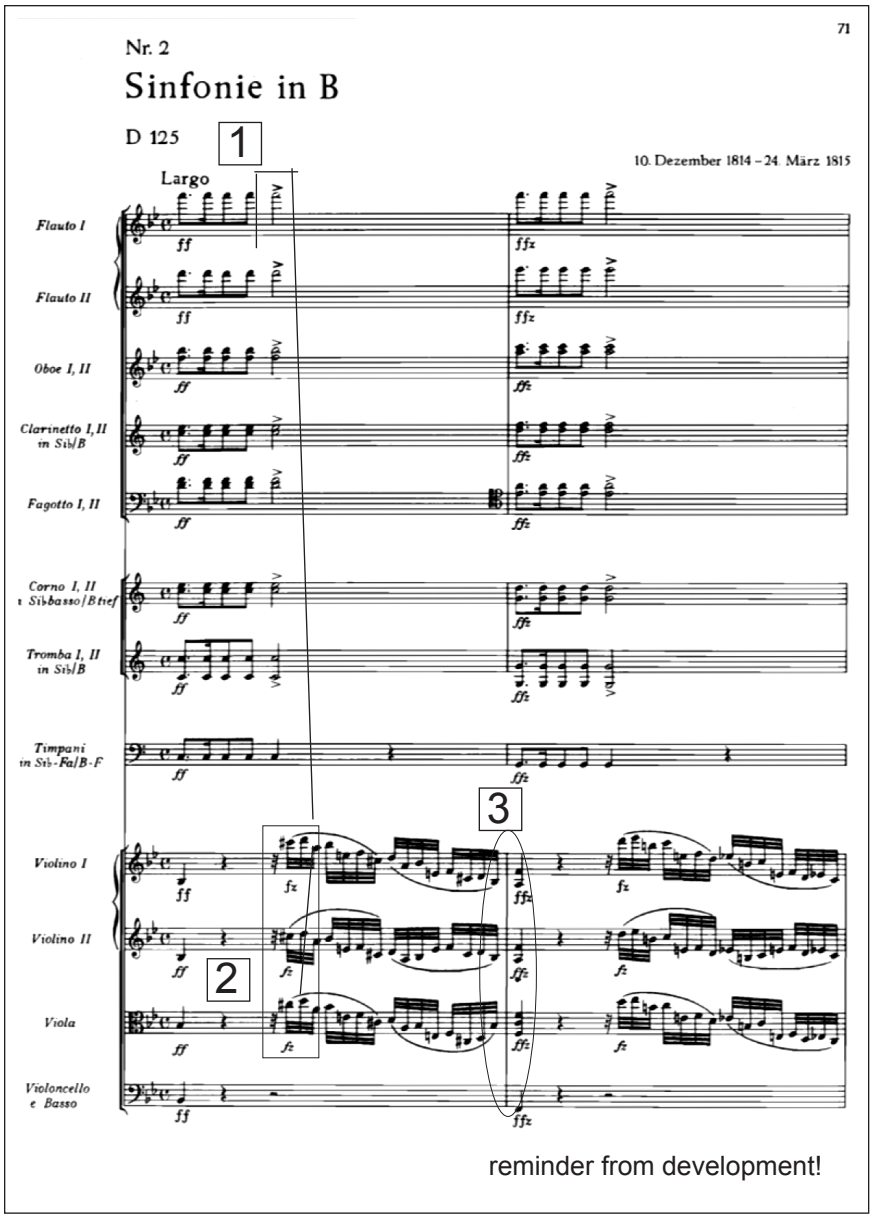


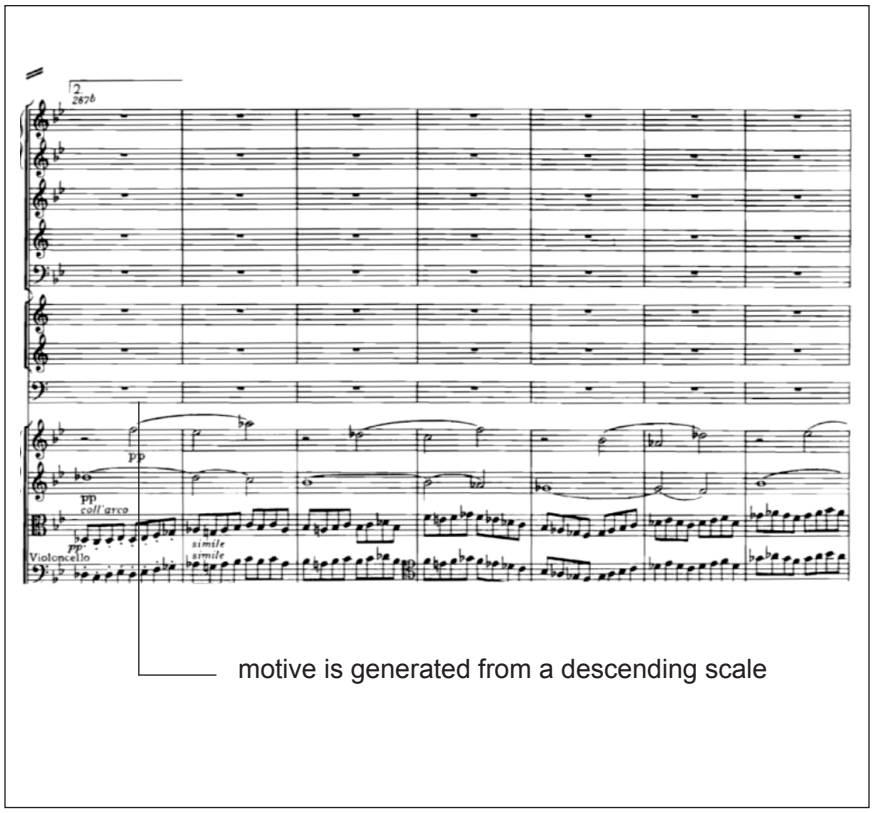
can hardly be wrung out of the principal theme, no matter how strong one's theoretical forearms might be:

And yet it ratchets up the dramatic impact of the work, leaving us with a whole entity that is much the greater for its intrusion.

Example 2 - Try using our ears?



Example 3 - When did we first hear that 3-note motive?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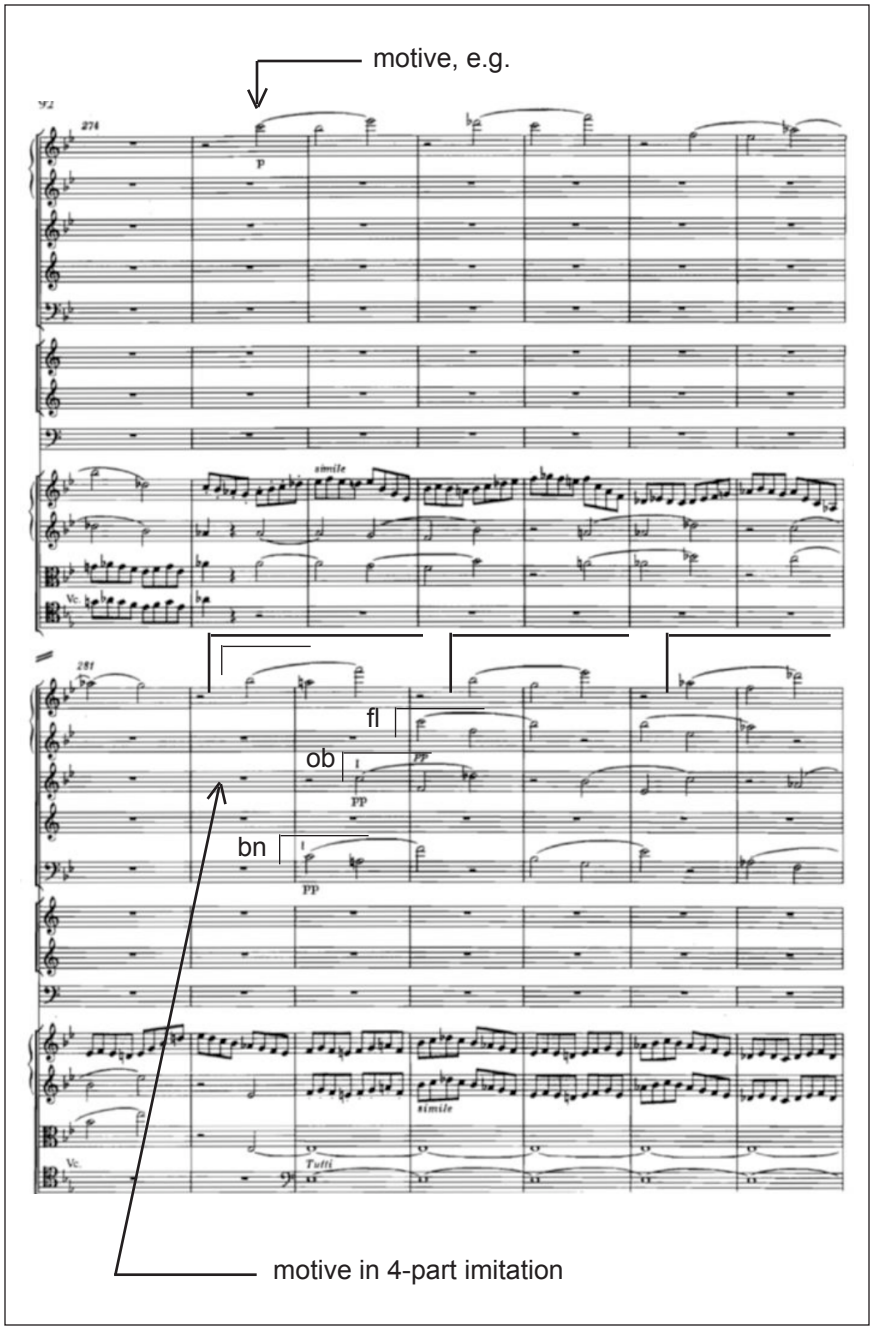
motive is generated from a descending scale

Example 4a



Example 4b - motivic saturation

Embodied Music Theory: New Pedagogy for Creative and Aural Development

Nicholas Bannan
School of Music University of Western Australia

Introduction

This article presents a snapshot of pedagogical practice that integrates singing, expressive physical gesture, aural development, music theory and creativity. The approach it outlines forms an attempt to transcend the instructional mode by which music theory is perceived by students to be independent of musical practice,[1] or an artificial construct by which Western Conservatoire-trained educators impose their assumptions on students who find it of limited relevance or interest.[2] It represents a response to the position, encountered in several educational contexts internationally, whereby students whose aural and musicianship development has failed to match their performing abilities or musicological knowledge aspire to tertiary music courses. In this sense, it re-visits the same problems that motivated Émile Jaques-Dalcroze[3] to devise the pedagogical innovations he introduced, which also had their origin in meeting the needs of Conservatoire students, and similarly addresses the potential of teaching music theory with minimal reliance on verbal instruction or notation.

The pedagogy presented here, referred to as "harmony signing," sets out to provide real and quintessentially musical[4] experience through giving students leadership roles via which they can acquire the confidence to create and share within the discourse of music; and to achieve this through the elusive medium of collective creativity. It draws both on theories in evolutionary musicology to which I have contributed in complementary investigations,[5] and on

[1] Graham Welch, *The misunderstanding of music* (2001).

[2] Malcolm Ross, "What is wrong with school music?" *British Journal Of Music Education*, 12 (3) (1995): 185-202.

[3] Émile Jaques-Dalcroze, *Rhythm, music and education* (1921).

[4] Keith Swanwick, *Teaching Music Musically* (1997).

[5] Nicholas Bannan, "Language out of Music: the four dimensions

recent neurological research that advocates integrated learning in music.[6]

Background

Harmony signing initially developed as an extension of existing pedagogical practice rooted in Kodály.[7] It was first applied from 1994 in teaching members of the Reading University Children's Choir (ages 7-10) how to compose and arrange their own songs. Over the last fifteen years, harmony signing has been the subject of further research and development internationally,[8] leading to a framework that links the initial experience of which seven-year-olds have proved capable, to advanced work based on these foundations that has been achieved by teenage students of the Yehudi Menuhin School in the UK, by University and Conservatoire students in Germany, Brazil, England and Australia, and by Mandarin-speaking music teachers in Beijing, China. The technique has become embedded in the first year aural program at the University of Western Australia, since it proves a useful means of developing confidence in students for whom aural can appear as

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of vocal learning," *The Australian Journal of Anthropology* 19 (3) (2008) 272-293; Nicholas Bannan "'Reverse-Engineering' The Human Voice: Examining The Adaptive Prerequisites For Song And Language," *Proceedings of the Fifth Triennial Conference of the European Society for the Cognitive Sciences of Music* (2003); see also Steven Mithen, *The singing Neanderthals* (2005).

[6] Lawrence Parsons, "Exploring the functional neuroanatomy of music performance, perception, and comprehension," *Annals of the New York Academy of Sciences* 930 (2001): 211-231; Wilfried Gruhn & Frances Rauscher (Eds) *Neurosciences in music pedagogy* (2007); see also Steven Mithen "The diva within," *New Scientist* 197 (2008): 38-9.

[7] Zoltan Kodály, *The Selected Writings of Zoltán Kodály* (1974).

[8] Nicholas Bannan, "Music Teaching without words," *Proceedings of the 1st International Symposium on Cognition and the Musical Arts* (2005): 400-405.

_____. "A Role for Action Research Projects in Developing New Pedagogical Approaches to Aural and Musicianship Education," *The Music Practitioner: Exploring practises and research in the development of the expert music performer, teacher and listener.* (2004): 295-308; Nicholas Bannan, "Gestural Language for the Representation and Communication of Vocal Harmony," *Canadian Music Educator*, 41 (2000): 65-70.

attractive as a visit to the dentist's. Somehow, aural needs to be more active, musically satisfying and supportive of related skills (theory, rehearsal technique) than that. Later in our UWA courses, harmony signing features in the pedagogy elements of undergraduate and graduate teacher education. Its influence is beginning to be detected in some of the schools where our alumni are teaching. A more widespread introduction of harmony signing awaits completion of a book on the approach, as well as the influence of publications such as the current article.

While the influence of Kodály, Dalcroze and other music educators on harmony signing is clear, the intention to extend such physically-based and creative practices 'upwards' into high school and college owes a great deal to the example of composer-educators such as R. Murray Shafer, Peter Maxwell Davies and Cornelius Cardew,[9] concerned as they have been with the democratization of musical creativity. In addition, other less direct influences shaped the practice of harmony signing and the means by which it developed. The University of Reading hosted a degree in Theatre for the Deaf that provided compelling evidence of the expressivity and fluency with which hand movements can convey complex information.[10] My concurrent research into the evolutionary origins of human musical behavior,[11] and their implications for pedagogy,[12] provided insights

[9] A first full account of this movement is provided in: Jolyon Laycock, *A Changing Role for the Composer in Society* (2005).

[10] This phenomenon is fully described in: Oliver Sacks, *Seeing voices: a journey into the world of the deaf* (1989).

[11] Nicholas Bannan, *op. cit.* (2003); see also: Stephen Brown, "Contagious heterophony: A new theory about the origins of music," *Musica Scientiae*, XI, (1), (2007): 3-26; Tecumseh Fitch, "The biology and evolution of music: A comparative perspective," *Cognition* 100 (2006): 173–215; Iain Morley, "Evolution of the physiological and neurological capacities for music," *Cambridge Archaeological Journal* 12 (2) (2002): 195-216; Björn Merker, "Synchronous chorusing and human origins," *The Origins of Music* (2000): 315-327.

[12] _____. "Gestural Language for the Representation and Communication of Vocal Harmony," *Canadian Music Educator*, 41 (2000a): 65-70; Nicholas Bannan, "Instinctive singing: lifelong development of 'the child within,'" *The British Journal of Music Education* 17 (3) (2000b): 295-301.

into what can be achieved musically in the absence of words;[13] and this approach proved consistent with aspects of the music-analytical procedures devised by Schenker,[14] not least, a critical stance regarding the wholesale reliance on electronic keyboards and computers as the premium resource for student-centered pedagogy, and especially for creative work in music, led to an evaluation of the importance of social and simultaneous interaction in developing musical awareness and fluency as an alternative to the isolating consequences of computer-based resources. While this may suggest a Luddite attitude to technology, this is far from the truth. Many aspects of harmony signing owe a great deal to previous work that employed electronic echo and reverberation as stimuli to children's vocal improvisation;[15] and the realization that children and students rapidly acquire confidence in the use of TV remote controls and mobile phones without recourse to written instruction seemed consistent with the kind of hierarchical organization of symbolic processing that harmony signing was eventually to establish. In short, the approach was to exploit students' preference and capacity for learning by doing rather than through the second-hand abstractions of theoretical description.

Harmony signing was principally designed for students to employ: it is not a tool of instruction confined to the teacher. Its use is and has always been experimental. It represents a means of meaningfully re-introducing learning by discovery into a coherent framework that best supports musically satisfying results: in this respect, a significant aspect of the approach is motivational. In incorporating bodily movement into a social framework for musical participation and exchange, it seeks to re-activate the musical instincts with which each participant is born, and to extend these through play.

The foregoing represents a brief description of the processes by which harmony signing arose. What follows is set out in the form of an introductory tutor in the development of musical ideas that employ the harmony signing principles. Ironically, the written word is a poor medium for capturing these processes. In due course, the intention will be to publish a comprehensive guide to these techniques of teaching and learning in audio-visual format.

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[13] Nicholas Bannan, *op. cit.* (2005); see also Arnie Cox, "The mimetic hypothesis and embodied musical meaning," *Musica Scientiae* 5 (2) (2001): 195–212; Parsons, *op. cit.* (2001).

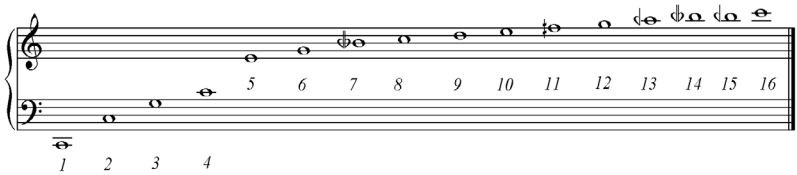
[14] Heinrich Schenker, *Harmonie* [Harmony] (1906/1954).

[15] Nicholas Bannan, "Aural feedback, vocal technique, and creativity," *The Phenomenon of Singing* (1998): 11-19.

The Foundations of Harmonic Perception

Harmony signing is first and foremost concerned with human responsiveness to consonance, which is taken to be fundamental to human perception.[16] The harmonic series (Figure 1) which governs

Figure 1 - The Harmonic Series in Music Notation



The first four octaves of the harmonic series of the note **C** (the bottom note of the 'cello), which has a frequency (F_0) of 64Hz. The harmonics proceed (1st, 2nd, 3rd, 4th, etc.) as multiplications of the F_0 (64, 128, 192, 256Hz, etc.); while each whole-number division of the string (into ½; 1/3; ¼, etc.) produces the subsequent harmonic. The harmonics therefore become closer together in pitch, beginning with the largest (the octave between F_0 and the first overtone); and reducing to approximately a semitone between harmonics 15 and 16.

While the convergence of the harmonics in acoustic space may suggest that they become more easily confused, discrimination between them remains possible due to aural sensitivity to relative harmonicity. The simpler the ratio between pitches, the more consonant will be the sound and its resulting timbre; the more complex, the more dissonant. Thus the pitches of the series 1, 2, 4, 8, 16 are heard as so closely related that they are labelled as the *same note*, despite the fact that they are widely spaced in range – from a C at the bottom of the bass range of the human voice to one at the top of the soprano. Pitches of the series 1, 2, 3, 4, 5, 6, 8, 10 12, 16 aggregate to make a consonant chord, as do any combinations of [1, 2, 4, 8 or 16] with [3, 6 or 12] and [5 or 10]. Pitches such as harmonics 7, 11, 13, 14 and 15 (which are hard to capture in equal-temperament music notation) have a less stable timbral relationship with F_0 and its closer relatives. The simpler the mathematical ratio between harmonics, the more closely related we perceive them to be.

[16] Nicholas Bannan, *op. cit.* (2008).

what we discern as consonant or dissonant is a fact of nature, like the speed of light, the temperature of absolute zero, or the boiling point of water.

In turn, the harmonic series is both the basis of the vowel sounds we employ in language,[17] and the foundation of our response to harmony, melodic contour and timbre in our engagement in music. Practicing the production of vocal harmonics is a valuable means of developing our aural capacities 'close to home' (Figure 2): if you can analyze your own voice with this level of skill, you are refining your hearing and setting up responses to intervals and harmony that will prove highly valuable as we employ them systematically in developing a scheme for understanding the use of harmonic conventions in music through harmony signing and related activities.

Figure 2 - Vowels as Harmonics

If we sing the following sequence of vowels on a sustained monotone, it should be possible to discern the rising harmonics that are associated with the formant frequencies to which each vowel gives rise (see Figure 1 for details). One should eventually perceive a kind of arpeggio made up of the intervals given in Figure 1.

oo – oa – or – o – ar – a – e – é – i – ee – ü

The Foundations of Melodic Perception

Speculation on the properties of generating distinct pitches from a sung monotone illustrates a chicken-and-egg paradox regarding the origins of music. Which came first, harmony or melody? Is harmony frozen melody? Or, is melody liberated harmony?[18] Is

[17] Nicholas Bannan, *op. cit.* (2008); see also Deborah Ross, Jonathan Choi and Dale Purves, "Musical intervals in speech," *Proceeding of the National Academy of Sciences,* 104 (2) (2007): 9852-9857.

[18] Jean-Philippe Rameau, *Observations sur notre instinct pour la musique* (1754/1968); David Cohen,"The 'Gift of Nature': Musical 'Instinct' and Musical Cognition in Rameau," *Music Theory and Natural Order from the Renaissance to the Early Twentieth Century*. (2001): 68–92.

the diatonic scale the result of laying out the notes of the harmonic series in a 'best fit' order? Comparative ethnomusicology,[19] taken together with experiments on the aural perception of non-human species including certain birds and monkeys,[20] would suggest that this is probably the case. So, we conventionally think in terms of scales as the sources of melody and harmony. The solfège system based on moveable Do that Kodály employed as the basis of his educational method is especially useful, and combines well with harmony signing. We, that is teachers and students together, need to be fluent in reading and responding instinctively to Kodály hand signs, and leading vocalization through employing them, if we are to explore the full potential of harmony signing.

Introducing Harmony Signing

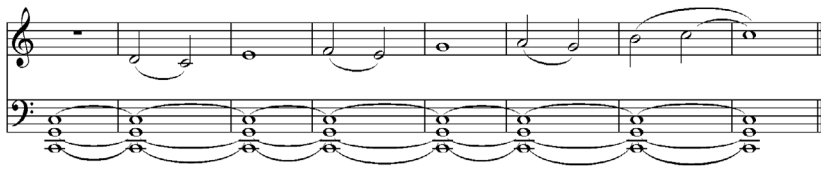
We first create triads: working with scale degrees 1/3/5 (do/mi/sol) in three parts we can sign the tonic triad with the left arm held across the chest, fingers straight but relaxed. These can be sung to their Kodály names (do/mi/sol) or to numbers (1, 3, 5), though a better blend is achieved on a resonant <AH> vowel; and it helps to develop musically instinctive responses in group work of this kind if everyone is singing the same sound. It also needs to be performed with energy: participants need to feel the effect of the resonances, which tends only to become apparent above a dynamic of *mezzoforte*.

We can explore melody over this single chord; or over a drone made of either just the tonic note; or the tonic and fifth. An independent group of participants (or a soloist) performs melodic material in combination with the maintained harmonic background (Figure 3). Exploring the diatonic scale (e.g. with no accidentals) illustrates that the following intervals over the drone are stable and can be viewed as consonant: unison; third; fifth; octave. The second, fourth and sixth are unstable, mild dissonances that resolve by falling. The seventh is an acute dissonance that resolves by rising.

[19] Constantin Brailoui, *Problems of Ethnomusicology* (1984); David Dargie, *Xhosa music: Its techniques and instruments, with a collection of songs* (1988).

[20] Anthony Wright et al., "Music perception and octave generalization in rhesus monkeys," Journal of Experimental Psychology: General, 129 (3): 291-307; Hollis Taylor, "Decoding the song of the pied butcherbird: an initial survey," Transcultural Music Review 12 (2008).

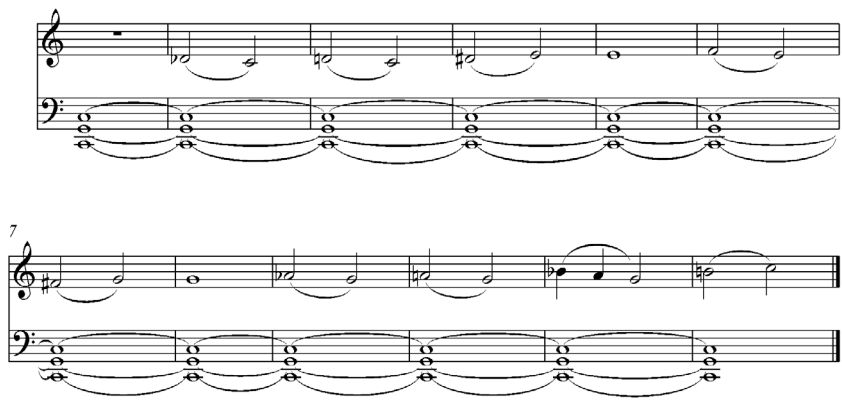
Figure 3 - An 'Alap' Exploring a Diatonic Scale Over a Drone



The remaining notes of the chromatic scale can also be explored in relation to these existing perceptions (Figure 4). The flattened second is an acute dissonance that resolves downwards: it features strongly in several exotic modes in, for instance, Greek and Jewish music as well as in the Neapolitan relationship. The flattened third can replace the normal major third presented by the harmonic series. The reverse of this, from minor to major, comprises the cadential device known as the *tièrce de Picardie* that is common in Medieval and folk music. Replacement of the major third by the minor produces a different tonal flavor we know as the minor mode (descended from the Aeolian mode), and the signature interval of the minor third, which features both in the tonic and subdominant chords, lends a different timbre to its principal harmonies. Sounded over the drone as in Figure 4, the flattened third demands upward resolution to the major third. This is characteristic of ragtime and some blues styles (e.g. the song "Stormy Weather"). The sharpened fourth (*diabolus in musica*) resolves upwards to the perfect fifth of the harmonic series in order to ward off evil spirits – which it does in melodies like "Maria" and "The Simpsons" but not in the music for Dracula films; or it undermines the tonic through implying a modulation to the dominant, of which it become the leading note. The flattened sixth falls to the fifth. In tonal music, the flattened seventh implies a replacement of the tonic triad, thus calling for modulation to the subdominant; or it falls by two steps via the sixth to the fifth in modal examples; or it can rise to the tonic in Dorian mode and Aeolian mode music such as written by Dvorak, Vaughan Williams, etc.

Working against a drone is an excellent way of evaluating the color and behavior of the different intervals that go to make up melodies; of experiencing these effects deeply and in practice so that students can learn to recognize them in dictation and transcription, and respond to their expressive qualities as a basis for their own interpretation while performing, as well as in improvisation and composition.

Figure 4 - An 'Alap' Exploring the Chromatic Scale Over a Drone



Moving to the Subdominant

While much music around the world is based on an unchanging drone, the opportunity to introduce other chords that confer harmonic variety has its attraction. The logical place to move, as the first chord to introduce after the tonic, is the subdominant (IV), since this is the chord over which the tonic 'dominates'. Fig. 5 illustrates how to sign movement from the tonic to the subdominant, and the voice-leading consequences this has for participants.

Figure 5 - How to sign movement from the tonic to the subdominant

The signer moves from the horizontal position for the tonic to a vertical position pointing straight upwards.

Participants interpret the voice-leading implications as follows:

1 (Do) 'anchors' (elbow) – does not move
3-4 (Mi-Fa) rises only a semitone (wrist)
5-6 (Sol-La) rises a whole tone (fingertips)

This now gives us two chords, and therefore the capacity to perform a rudimentary progression: for example the accompaniment to the opening of "Chariots of Fire" (three beats on the tonic followed by one beat on the subdominant).

Moving to the Dominant

Introducing the dominant completes the primary triads that are central to both art and popular music in the Western tradition, as well as to a great many styles that have developed around the world. Figure 6 illustrates how this is done for signer and participants:

Figure 6 - Introducing the dominant

The signer moves from the horizontal position for the tonic to a vertical position pointing straight downwards.

Participants interpret the voice-leading implications as follows:

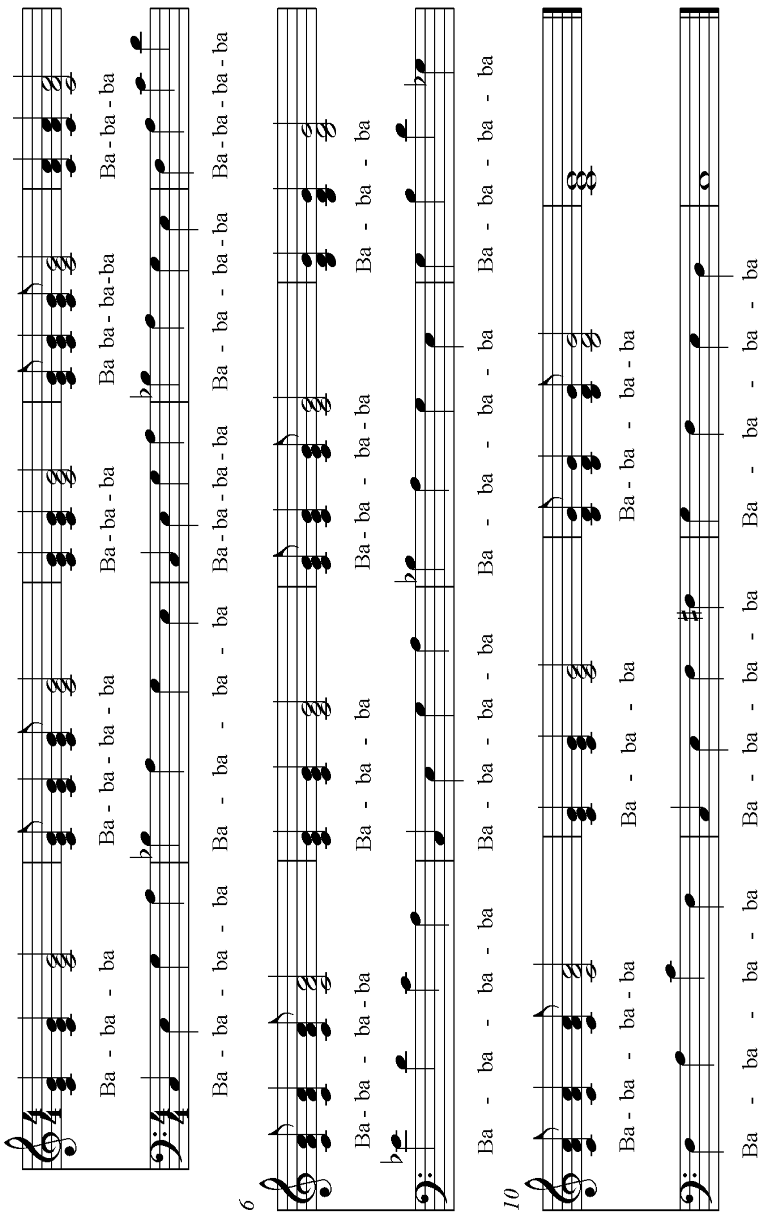
5 (Sol) 'anchors' (elbow) – does not move
3-2 (Mi-Re) falls a whole tone (fingertips)
1(8)-7 (Do-Ti) falls only a semitone (wrist)

Notice that while in three vocal parts, which is all we have covered so far (though any part may be doubled at the octave, especially where this is suitable for mixed male and female voices), we can relate to a pattern of voice-leading that has consequences that can become familiar as a key to more complex relationships that this will prepare us to recognize and respond to instinctively. While employing just the three primary triads in this way:

> When moving to and from the tonic, there is always one anchor note (i.e. a part that remains the same); one part that moves a semitone; and one part that moves a whole tone;
>
> In whatever inversion (see below) the tonic is first presented, the three chords of the tonic, dominant and subdominant will emerge such that one is in root position, one in first inversion, and one in second inversion.

Recognizing the consequences of these two patterns of voice-leading needs to become second nature, especially as a basis for confidence and accuracy in modulation (see below).

Fig. 7 - Vocal Boogie-Woogie on the 12-Bar Blues



Working with the Three Primary Triads: Tonic-Subdominant-Dominant

We can now improvise and compose with the three chords whose relationships we have mastered both as signers and participants; plenty of great music is limited to this selection. For example, we can put together a boogie-woogie blues (Fig 7); or, through applying rhythmic patterns to the pitches sung, a version of the song *Wimoweh*, or perform the accompaniment to the openings of Bernstein's "One Hand, One Heart" or Schumann's "Seit ich ihn gesehen" (No. 1 of the song-cycle *Frauenliebe und Leben*). These examples require us to employ the chords according to a *harmonic rhythm*, or rate of chord-change, and to articulate rests as well as differences between legato and disjunct continuity. Thus through using the right hand as a conductor would do to sign cues and cut-offs, we have a wide range of harmonic patterns we can devise and through which we can become familiar with the potential of this foundational level of harmony signing. An important step in consolidating what has been learned so far is that every participant have the opportunity to improvise in leading the group with these available resources: three chords; and the capacity to alternate them with silence.

Inverting Chords

However, it's still the same three chords, which means the performers get stuck with the same old notes until someone lets them swap parts with each other, and, because of the voice-leading principle at work, a fixed sequence whereby each chord is locked into a particular inversion. The next step is to free up this fixed position in which everything derives from the original tonic in root position. We can take harmony signing into a new dimension of range and texture by developing the use of inversions.

The sign for inverting is exhibited in the right hand, and is quite distinct from any of the Kodály hand signs or any harmony signing gestures encountered so far. It has the right hand palm facing upwards as if carrying drinks on a tray. Participants respond to changes of inversion signaled as rising or falling shapes by moving to the next available note of the same chord that they are already singing. This is absolutely dependent for its success on everyone listening carefully to the harmony that is already present.

A useful exercise for developing confidence in participants with the vocal requirements of responding to inversion is the "Quixote gesture," named after Cervantes's fictional Spanish knight who attacked the windmills. This exercise allows participants to locate in their own time and according to their own vocal range the different notes of a chord that is being sung: the signer makes a revolving windmill gesture with the right hand, and singers move in whatever way they like to as many notes as they want of the prevailing chord. It is a good idea to do this slowly at first, rather than through wild arpeggios, so that the balance and blend of harmony can be retained, and singers become adept at changing notes while continually listening to the overall effect. Again, this can play a significant part in priming the kind of instinctive response whereby participants sing the right notes without always knowing why.

Once participants and signers have made progress with these ideas, some available patterns worth trying first would be:

- Sing tonic; invert tonic up; return to original position;
- Sing tonic; move to subdominant; invert subdominant; return to original subdominant; return to original tonic;
- Sing tonic; invert tonic up; return to original position; move to subdominant; invert subdominant; return to original subdominant; return to original tonic; move to dominant; invert dominant upwards; return to original dominant; return to tonic.

These routines are vital in establishing aurally and practically the important contrasts between:

(i) different inversions of the same chord;
(ii) different chords in the same inversion.

Freeing Up the Chords: Towards Polyphony

We have concentrated so far on developing a scaffold for harmonic progression with the elements of the primary triads and their various inversions. Before moving on to further harmonic elaboration, we can consolidate our experiences through combining harmony on these lines with independent melody lines. This is achieved through employing Kodály hand signs in the right hand. There are two principal means of developing this:

(i) 'Capturing' notes contained in chords and 'liberating' the part singing from harmonic duties so as to explore features such as suspensions, anticipations, and melodic decoration.

To achieve this, the signer presents a sign for a chord – say the tonic. He or she then signs with the right hand one of the notes contained in that triad – let's say it is the third. All participants who had been singing the third of the original chord now follow whatever melodic roles the signer requires; while all other participants continue to follow the harmonic patterns signed as normal in the signer's left arm. According to whether the signer decides that 'melody' or 'harmony' moves first, suspension and anticipation can be modelled; and free melodic journeys can be controlled for the 'captured' voice-part while the skeletal harmony continues to be provided by everyone else.

(ii) Moving an independent melody part against chords. This is achieved by splitting the performers into four parts: three harmony parts who follow the left arm harmony signing as normal; and an additional melody part that follows Kodály hand signs given in the leader's right hand. The following examples have proved effective at this stage, giving opportunities for leaders to sign both melody and harmony simultaneously:

- Vangelis: *Chariots of Fire* (opening)
- *Wimoweh*
- Gruber: *Silent Night*
- Chopin: *Étude in E Major*, Op. 10 No. 3 (opening)

Widening the Harmonic Palette: The Secondary Triads

Conventional harmony textbooks present the secondary triads as being, in comparison with the primary triads, the 'leftover' or weaker chords that are formed on positions II (the supertonic), III (the mediant) and VI (the submediant). What their incorporation into harmony signing procedures makes explicit is that each has a dependent relationship with its relative primary triad in terms

of both generation and its implications for the voice-leading that connects all these chords together in a logical framework (Fig. 8).

Where the signs for primary triads involve a flat, extended hand, the determining feature of the sign for the secondary triads is a clenched fist. Movement from each primary triad to its relative secondary triad involved two anchor-voices while one part rises a tone:

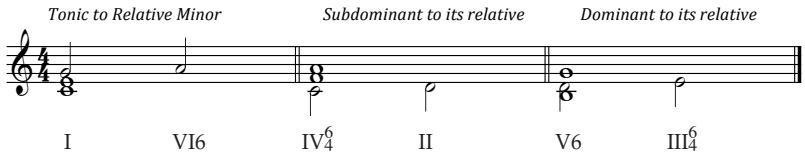
- The signer moves from the tonic to the submediant chord by curling the fingers into a fist and simultaneously moving the whole arm a little to the right. This signals that anyone singing the fifth moves to the sixth;

- The signer moves from the subdominant to the supertonic chord by curling the fingers into a fist and simultaneously moving the whole arm a little higher in the air. This signals that anyone singing the tonic moves to the second;

- The signer moves from the dominant to the mediant chord by curling the fingers into a fist and simultaneously lifting the whole arm a little higher in the air. This signals that anyone singing the supertonic moves to the mediant.

In all cases, the root of the chord (irrespective of what inversion is being sung) is the note that is introduced, and it is arrived at by step from the fifth note of the relative primary triad.

Figure 8 - The Relationship Between Primary and Secondary Triads



Once these new chords have become familiar, the whole array of six chords can be employed freely (see Figure 9). Exercises should include the inversion of the chords, and their combination with melodies as proposed above. In voice-leading terms, a great deal of useful experience should have been gained in forming and deploying chords in improvised progressions that provide a valuable

framework for understanding diatonic harmony. However, by this stage the somewhat unstable and superficial character of harmony limited to three parts will have become apparent. There is a need to provide bass notes in order to achieve root position completion of, especially, the secondary triads.

Figure 9 - A Progression Involving All Six Triads

Getting Into Four Parts

Initially, the participants can be divided into four groups, of which one is selected to provide the bass. This need not be restricted to lower voices – especially in mixed groups, it is important to revolve roles. Irrespective of considerations of range, female singers need as much experience of providing bass functions as male. As part of an aural development exercise, there is no harm in having parts doubled at the octave, as will have been the case already.

The role of the new group is to provide the root of any chord signed. An exercise that demands this is the opening of Pachelbel's *Canon*. While the chords are signed with the left hand (see above), their roots are conveyed in Kodály hand signs with the right hand:

I – V – VI – III – IV – I – IV – V - I

Once all participants have taken a turn at singing root bass notes, it becomes possible to develop more sophisticated bass lines by employing Kodály hand signs in the right hand to signal bass notes; as with combining melody and harmony, these can be freely signed so as to develop passing notes, arpeggiation, etc.

Conclusions

The material covered so far represents the initial diatonic application of harmony signing. This level of operation can be achieved by students from about seven years of age upwards. But it has proved especially valuable in collegiate institutions as a means of establishing confidence and practical capacity to deal with these phenomena for students who arrive with insufficient theoretical or musical experience to achieve these functions, or whose previous experience of music-making has been achieved where manual manipulation of instruments has become detached from creative, experimental or discriminating exploration of the relationships between sounds. Interviewing students and observing lessons on three continents has confirmed that aural development is often taught solely through testing, with few strategies provided that deal with students' fears and frustrations.

Space precludes illustrating in detail where harmony signing goes from here. But a considerable amount of freer and more complex material can build on the foundations presented above. A recent workshop in Beijing covered all this material and went on to deal with chromatic alterations (making major chords minor; the diminished triads; adding dominant 7^{th}s) and introducing modulation (to the subdominant using the flattened 7^{th}; to the dominant using the sharpened 4^{th}; to the relative minor, using the sharpened 5^{th}; tonicizing through confirming modulations and/or 'coming home'). Students at UWA have experimented with two-handed Kodály signing as a means of conveying improvised exercises in two-part species counterpoint. The project is a work-in-progress responsive to the needs of students as much as to the semantic space remaining to be effectively exploited within the system. What is increasingly apparent is that harmony signing makes a valuable contribution to student learning, creativity and understanding precisely because it employs action rather than words.

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Report on the 2010 Workshops in Music Theory Pedagogy at the University of Massachusetts Amherst

By William Helmcke

Nearly sixty participants, including college-level instructors and graduate students from more than thirty states and five countries, attended the second triennial Workshops in Music Theory Pedagogy at the University of Massachusetts Amherst from Monday, June 14 through Friday, June 18, 2010. Gary S. Karpinski, Coordinator of the Music Theory program at the University of Massachusetts Amherst, brought together some of the most eminent and influential names in music theory pedagogy: David Butler (music cognition), David Gagné (Schenkerian theory and analysis), Gary S. Karpinski (aural skills), Stefan Kostka (harmony and twentieth-century), and Michael Rogers (form, analysis, and aesthetics). Each day, participants attended three fifty-minute presentations in the morning, then enjoyed a leisurely lunch, followed by two more fifty-minute presentations, and finally an hour-long breakout session of their choice.

Every day, each faculty member gave one of the fifty-minute presentations and then hosted one of the breakout sessions. What follows is a summary of each faculty member's presentations over the five days.

David Butler

On Monday David Butler replicated an experiment by Killam and Baczewski (1985) in which participants had five minutes to write down the outer voices of a Bach chorale through listening. Participants also rated sonatas by Mozart and Barber for formal coherence and tonal closure.

On Tuesday Butler focused on the first three phases of Karpinski's four-phase model of music perception during dictation (Karpinski 1990). Butler acknowledged the "unhappy marriage" between music cognition scholars, who prefer musically relevant data, and cognitive scientists, who prefer reliable, replicable data.

On Wednesday Butler discussed absolute pitch and its pedagogical implications. He also tested cognitive aspects of interval recognition and temperaments.

On Thursday Butler discussed how Western musicians infer the tonic of a passage through listening. He also discussed David Huron's (2001) article on part-writing in *Music Perception* as an example of music cognition research that has clear pedagogical applications.

On Friday Butler reviewed several models of music cognition, including Miller (1956), Atkinson-Shiffrin (1968), working memory, and perceptual cycles. Such cognitive research has tremendous pedagogical value for instructors.

David Gagné

David Gagné began by providing a chronological list of Heinrich Schenker's writings, a bibliography of Schenkerian research, and a daily packet of Schenker graphs. He explained that he uses Schenkerian analysis to refine students' hearing so that they can hear musical relationships better. Gagné endorses starting with "relatively simple" melodies (Mozart, early Beethoven, Chopin's F Minor Nocturne). He tells students, "All I expect is the best from you." Gagné recommends chapter six of *Counterpoint in Composition* (Salzer and Schachter 1989). He "always stresses" that these examples emphasize counterpoint, not Roman numerals.

On Monday Gagné began with Bach's C Major Prelude from *Well-Tempered Clavier*, because it engages students and shows them the value of analysis. For example, his students usually find the symmetry between the E-F-F-E in the soprano voice of mm. 1-4 and the E-F-F-E in the alto voice in mm. 32-25 "astonishing" because "the symmetry is not obvious until one looks closely at the voice leading."

On Tuesday Gagné addressed melodic fluency, polyphonic melodies (unfolding), and linear intervallic patterns. These topics served a larger goal: "How to use Schenker to increase your appreciation of music." He modeled this; here's what he said about Chopin's Etude in E Major Op. 10 No. 3: "I love this example, first of all, because it's so beautiful." Gagné showed great enthusiasm for the first movement of Mozart's Piano Sonata in F Major K. 332. "Teaching this piece is sheer joy because there's so much here. There's extraordinary deftness in Mozart's handling of voice leading, motive, and register." He also said, "When you see where the G [in measure 3] is coming from, [how it] soars above the Bb, it's magical and wonderful."

On Wednesday Gagné began with the Bach Chorale "Wach' auf, mein Herz." He recommended that students begin with a chord-by-chord analysis because "some students struggle with this." Students should then create a multi-level Roman numeral analysis and label the harmonic functions of the structural chords. Gagné then illustrated the "clear interplay of harmony and counterpoint" in the slow movement of Beethoven's "Pathétique" sonata (Op. 13). He also discussed methods of prolongation. He then cited Figure 41 from Schenker's *Free Composition* (Schenker 1935/1979) to address reaching over, "an important concept in Schenkerian Theory." He concluded with a "relatively easy" example, the Trio from Mozart's *Eine kleine Nachtmusik*.

On Thursday Gagné described the "higher level explanatory power" of the *Ursatz* as a blueprint. "If you build a house, you need a blueprint. But the blueprint is not the house! The house is about the bushes, the granite countertops." He went on to show some clear examples of *Ursatz* replication, and commented that "*Lieder* of Schumann and Schubert make for great teaching pieces."

On Friday Gagné used Chopin's Nocturne in Eb Op. 9 No. 2 to illustrate the "deft dangling" of a neighbor note, "beautiful figuration" in the varied repetition of the second phrase, and motivic inversion in the coda. Gagné made several memorable remarks, including "One of the criteria for a good graph is that it should sound like the piece," "The piece lives in the foreground," and, "Composing-out is like looking at a tree in December versus looking at the same tree in June."

Gary S. Karpinski

On Monday Gary Karpinski asked, "What do we want to start with in the aural skills curriculum?" He advocated teaching rhythm before pitch at the beginning. He then demonstrated how a variety of metric and rhythmic skills and concepts can be taught by beginning with the simple instruction to "clap along" to some musical passage. (He used the slow movement of Beethoven's Seventh Symphony on this day.) Karpinski identified distinctive clapping styles and used them to illustrate the difference between pulse and rhythm, and between different levels of pulse. From this one experiential activity students can come to understand various terms, including pulse (both primary and secondary); meter (both duple and triple), beat, measure, and rhythm. Turning to pitch,

Karpinski said that — although it's possible to begin with smaller materials — in his teaching the major scale is "axiomatic" from day one. He insists that students be able to sing a major scale up and down with solmization at a tempo of two pitches per second (MM 120). He tells students, "You need to be able to do this at 3:00 a.m. at the point of a gun, for no credit." He referred to this as "the beginning of their brainwashing with solmization syllables."

On Tuesday Karpinski discussed his four-phase model of music perception and cognition during dictation: hearing (or attention); memory; understanding; and notation (See Karpinski 1990 and Karpinski 2000, 64-91), and examined how dictation can develop skills in each of these phases. Karpinski recommends teaching students tools that they can use in the future: "It's like the proverb. You're not just giving them a fish, you're teaching them to fish." Karpinski then said, "Why teach dictation? I would hope that we're inculcating our students with ways to hear." Dictation can diagnose serious problems with attentive hearing, requires students to exercise their short-term and extractive musical memory, demands that students understand what they hear and remember, and calls for fluency in music notation. Karpinski also emphasized the importance of error detection, and noted that it is one of the most valuable skills students can learn.

On Wednesday Karpinski discussed diagnosis and remediation in dictation. He began by demonstrating how notation alone is a poor diagnostic tool, and advocated using appropriate tools to get at each of the cognitive phases. For example, he noted that memory is best assessed by having students sing back whatever portion of a melody they remember, using a neutral syllable such as "loo." He went on to discuss similar tools for diagnosing difficulties in understanding and notation. He also suggested various remedial activities designed to bolster skills once difficulties have been diagnosed.

On Thursday, Karpinski explored the effects of chunking on musical memory. He gave participants 10 seconds to memorize 15 letters: ADO–GCH–ASE–DAC–ART. Naturally participants struggled. But when he chunked the letters differently, participants easily recalled all 15 letters: A–DOG–CHASED–A–CART. Karpinski then played an analogous demonstration involving pitches instead of letters. Twelve seemingly random pitches were very difficult for the participants to sing back after one hearing, but when Karpinski rearranged those same twelve pitches into a melody consisting

of three clearly chunked sections: an arpeggio, descending scale, and cadential figure, the group sang it back with great accuracy. "Chunking allows you to access and use what you already know in your long term memory."

On Friday Karpinski shared his thoughts about teaching music fundamentals. He discussed various pedagogical approaches to writing and identifying key signatures, identifying intervals, and writing and identifying modes.

Stefan Kostka

On Monday Stefan Kostka asked two questions. "Who are our customers?" and "What do they need?" According to Kostka, our customers are instrumental and vocal performance majors; instrumental and vocal music education majors; theory, composition, and musicology majors; non-music majors; and applied faculty. Kostka said, "We often don't consider what applied faculty members want from their students." When a horn professor once asked Kostka, "Why can't my students sing this passage," he said that students don't connect what they learn in aural skills with private lessons. Kostka then asked, "Who needs skills in part-writing? Form? Keyboard harmony? Aural dictation skills?" He said, "You want students to be able to hear a piece in their heads when they're in the library looking at a score." He recommended: "making an ally out of your class piano professor." (For example, Kostka "worked out a deal" that students would learn major scales according to tetrachords.) Kostka recommends using various pedagogical methods because "everyone's mind works differently." He also confirmed, "Drill is important."

On Tuesday Kostka listed the five kinds of voice-leading motion: static; parallel; oblique; contrary; and similar. Participants located these types of voice leading between the various voices in the chorale "Herr, wie du willst, so schick's mit mir." Kostka went on to discuss ways to teach and grade voice leading.

On Wednesday Kostka asked "What calls for accidentals?" Participants generated an extensive list. To clarify the problematic concept of tonicization, Kostka recommended two rules: "Rule 1 – You can tonicize only major and minor triads. Rule 2 – See Rule 1." Kostka remarked that the hardest thing to teach is the proper resolution of root position dominant seventh chords.

On Thursday Kostka discussed post-tonal theory. He gave step-

by-step methods for finding normal order, best normal order, and prime form, leading to set theory and some of its corollaries. Kostka engaged the group in drills, then led participants in analyzing the third movement of Webern's *Five Movements* for String Quartet, Op.5.

On Friday Kostka discussed movements one and four of *Quaderno musicale di Annalibera* by Luigi Dallapiccola. He recommends listening to compositions first, then analyzing them.

Michael Rogers

Each day, Michael Rogers distributed a list of quotes about learning. On Monday he discussed his eight-stage tonal plan: establishment of tonic; moving away from tonic; polarization (new key); exploration; far-out-point; drive to home; tonic return; coda.

On Tuesday Rogers presented various theories of plot archetypes, which can be summarized in one word – conflict. He encourages students to think about music in terms of plot. He likens chromatic pitches to "plot thickeners" ("...and then a man with a gun came into the room."). But he also stressed that students should ground their analyses in the score. Rogers discussed two paths towards form: "The bird's eye view of the forest versus the leaf collector's view of the forest." Instead of a melodic, "bottom-up approach" to form, Rogers prefers a harmonic approach.

On Wednesday Rogers discussed the relationship between music theory and performance. He discussed his "Communication Chain for Musical Performance." According to Rogers, performers have three main tools for affecting musical flow: dynamics; timing (rubato), and articulation. He illustrated the importance of phrasing by reading the text of a "Dear John" letter using two dramatically different combinations of inflection and timing. For example, the first version ended with "Will you let me be yours? —Gloria" whereas the second ended with "Will you let me be? Yours, Gloria." (For the complete text of both versions, see Rosenthal 1984.)

On Thursday Rogers asked, "What is the understanding that you need to bring into the concert hall to make sense of what you're listening to?" He listed ten "processing tools," which he applied for the purposes of illustration to a Bruckner symphony. According to Rogers, a comprehending listener hears this music as: (1) tonal; (2) symphonic; (3) Romantic; (4) in sonata form; (5) Brucknerian (he acknowledged the difficulty of listing composer-specific traits); (6) a series of connected musical events; (7) having expectations and

fulfillments; (8) reflecting performance means; (9) having emotional content; (10) having wider (religious, cultural) resonance.

On Friday Rogers discussed "bittersweet" moments in music. He tells students to think of a movie with a bittersweet ending, such as *Castaway*. He then illustrated ten bittersweet moments in the opening four bars of Mozart's Piano Concerto No. 23.

Additional Activities

In addition to daily presentations, there were also other activities. On Monday evening, participants enjoyed an ice cream social while overlooking the pastoral campus pond. On Tuesday evening, Karpinski hosted an entertaining music quiz show. On Wednesday evening, several participants went star gazing at the campus planetarium. On Thursday afternoon, University of Massachusetts Amherst professor Brent Auerbach presented his research on the pedagogical implications of the video game Dance Dance Revolution (see Auerbach 2010). And on Thursday evening, Karpinski presented a formal paper entitled "Defending the Straw Man: Modulation, Solmization, and What to Do with a Brain once You Get It" (Karpinski 2006).

The workshops concluded on Friday afternoon with a panel discussion about a variety of topics including such issues as curriculum development, the relationship between analysis and performance, textbook selection, and technology. Karpinski ended with, "Thank you for coming. Travel safely. And do good work." Thanks to these distinguished music theory pedagogues, participants certainly left the conference equipped to do "good work." The next Workshops in Music Theory Pedagogy at the University of Massachusetts Amherst will occur in June 2013. See you there!

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GUIDELINES FOR CONTRIBUTORS

1. Articles on any aspect of teaching or learning music theory will be welcome. Contributions will be judged on originality, relevance, interest to a diverse audience, and clarity of writing.

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